Cost and Resource Use
Steering Committee Meeting
May 8-9, 2013

National Quality Forum
Executive Building
1030 15th Street, NW, Suite 900
Washington, DC 20005
(202) 783-1300

AGENDA (Annotated)

Please use the following information to access the conference call line:

Participant Dial-in Number: 1-888-802-7237
Conference ID: Day 1: 31632008; Day 2: 31645569
Webinar link: http://eventcenter.commpartners.com/se/cplogin/
Webinar Meeting ID: Day 1: 268616; Day 2: 869992

Day 1: May 8

8:00am **Continental Breakfast**

8:30am **Welcome**
David Penson, MD, MPH, Co-chair
Eugene Nelson, DSc, MPH, Co-chair
Taroon Amin, MA, MPH, Senior Director

8:40am **Introductions and Disclosure of Interest**
Ann Hammersmith, JD, General Counsel

9:00am **Project Introduction and Overview of Evaluation Process**
Ashlie Wilbon, RN, MPH, Senior Project Manager
Lindsey Tighe, MS, Project Manager

- ***Materials:***
  - ***Tab 1) Resource Use Measure Evaluation Criteria***
  - ***Tab 2) Measure Evaluation Approach***
- Goals of the meeting/overview
- Broad evaluation considerations (includes input from the MAP)
- Criteria overview
- Evaluation process overview

9:45am **Consideration of Candidate Measure:** 2158: Medicare Spending Per Beneficiary *(CMS)*

- ***Materials:***
  - ***Tab 3) 2158: Medicare Spending Per Beneficiary evaluation form***

- Measure Developer Overview *(CMS)*
- Committee Evaluation of Importance & Scientific Acceptability
  - Lead Discussants by criterion

10:30am **Break**

10:45am **Consideration of Candidate Measure:** 2158: Medicare Spending Per Beneficiary *(CMS)*
- Committee Evaluation of Feasibilty and Use and Usability
- Committee Recommendations for Endorsement

11:45am **NQF Member and Public Comment**

12:00pm **Lunch**

1:00pm **Consideration of Candidate Measures:** 2165: Total Cost per Beneficiary *(CMS)*
- ***Materials:***
  - ***Tab 5) 2165: Total Cost per Beneficiary evaluation form***
- Measure Developer Overview
- Committee Evaluation Importance & Scientific Acceptability

2:00pm **Break**

2:15pm **Consideration of Candidate Measures:** 2165: Total Cost per Beneficiary *(CMS)*
- Committee Evaluation Feasibilty and Use and Usability
- Committee Recommendations for Endorsement

2:45pm **Considerations for the MAP**

3:00pm **Harmonization and measure gaps discussion**
- ***Materials:***
  - ***Tab 5) 2165: Total Cost per Beneficiary (CMS)***
  - ***Tab 6) 1598: Total Resource Use Population Based PMPM Index (Health Partners)***
  - ***Tab 7) Measure Comparison Table***
  - ***Tab 8) Harmonization Information Sheet***
  - ***Tab 9) Harmonization Definitions***
  - ***Tab 10) Joint Response from CMS and Health Partners***
- Overview of harmonization *(NQF Staff)*
- Developer overview of harmonization letter, description of measure similarities and differences
- Committee review and comparison of each of the measures

  - Do these measures have sufficiently different populations to justify the burden of having two similar endorsed measures in the field?
  - Are the justifications for the differences in the measures adequate?
  - Are there any recommendations for the developers/stewards on how these measures might better align given their differences? If yes, why are they important?
- Committee discussion on resource use measurement gaps:
  - What types of cost and resource use measures should be the focus of immediate measure development? For the future?
  - What aspects of or issues with cost/resource use measurement need additional exploration and/or targeted attention?
  - Given our goal of achieving measures of efficiency and value once we have resource use measures, what are the next steps to achieving this goal?
  - If NQF will be reviewing episode groupers in the future, what enhancements need to be considered to the current evaluation approach? Should measures within groupers be evaluated individually?

4:30 pm **NQF Member and Public Comment**

5:00 pm **Adjourn**

Day 2: May 9

9:00am **Continental Breakfast**

9:30am **Welcome, Recap of Day 1**
Dr. Penson
Dr. Nelson

9:45am **Risk Adjustment In Cost and Resource Use Measurement: Considerations for the field and future measure endorsement**
- ***Materials:***
  - ***Tab 11) Society of Actuaries Risk Assessment Report***
- Current state description and discussion *(NQF Staff, Society of Actuaries)*

10:30am **Public Comment**

10:45am **Risk Adjustment Discussion *(Cont'd)***
- Committee discussion:
  - As a standard setting organization, what are the pros and cons/unintended consequences of endorsing a single measure with multiple risk adjustors? (burden vs. market influences realities)
  - Should NQF allow measure developers to submit measures with the flexibility of multiple risk adjustment models carrying the same measure number without requiring demonstration of comparability?

- Should NQF encourage measure developers to submit multiple measures with similar specifications besides the risk adjustment approach without requiring a decision on "best-in-class" or selecting a single measure as a national standard?
- When evaluating competing measures for cost/resource use, are differences in the intended population (Medicare, Medicaid, and commercial) sufficient to warrant multiple measures or multiple risk adjustment approaches?

11:45pm **NQF Member and Public Comment**

12:30pm **Lunch**

- Committee feedback on submission forms and suggestions for improvements

1:00pm **Attribution Discussion**

- Committee Discussion:
  - NQF endorses national standards for performance measures that are intended for both accountability and performance improvement. In order to be useful to make conclusions about performance, especially relative performance, all entities need to be measured exactly the same way.
    - Across quality performance measures, the attribution approach is part of the measure specifications and is required for submission.
  - To the extent possible, NQF criteria should apply to all types of measures with only a minimum number of exceptions that are absolutely needed for specific types of measures.
  - What would be the rationale that RU measures should be handled differently?

2:00pm **Next Steps/Project Timeline**
Ms. Wilbon
Ms. Tighe

2:15pm **NQF Member and Public Comment**

2:30pm **Adjourn**

Resource Use Measure Evaluation Criteria

The resource use measure evaluation criteria are grounded in the standard NQF evaluation criteria, keeping the four major criteria (importance, scientific acceptability, feasibility and usability and use) in place but modifying the subcriteria as appropriate to reflect the specific needs of resource use measure evaluation.

Resource Use Measure Evaluation Criteria
Conditions for Consideration
Several conditions must be met before proposed measures may be considered and evaluated for suitability as voluntary consensus standards. **If any of the conditions are not met, the measure will not be accepted for consideration.** **A.** The measure is in the public domain or a measure steward agreement is signed. **B.** The measure owner/steward verifies there is an identified responsible entity and a process to maintain and update the measure on a schedule that is commensurate with the rate of clinical innovation, but at least every three years. **C.** The intended use of the measure includes both accountability applications[1] (including public reporting) and performance improvement to achieve high-quality, efficient healthcare. **D.** The measure is fully specified and tested for reliability and validity. [2] **E.** The measure developer/steward attests that harmonization with related measures and issues with competing measures have been considered and addressed, as appropriate. **F.** The requested measure submission information is complete and responsive to the questions so that all the information needed to evaluate all criteria is provided.
Criteria for Evaluation If all conditions for consideration are met, candidate consensus standards are evaluated for their suitability based on four sets of standardized criteria in the following order: *Importance to Measure and Report*, *Scientific Acceptability of Measure Properties*, *Usability*, and *Feasibility*. Not all acceptable measures will be equally strong among each set of criteria. The assessment of each criterion is a matter of degree. However, if a measure is not judged to have met the minimum requirements for *Importance to Measure and Report* or *Scientific Acceptability of Measure Properties*, it cannot be recommended for endorsement and will not be evaluated against the remaining criteria.

Conditions for Consideration Notes

1. Accountability applications are the use of performance results about identifiable, accountable entities to make judgments and decisions as a consequence of performance, such as reward, recognition, punishment, payment, or selection (e.g., public reporting, accreditation, licensure, professional certification, health information technology incentives, performance-based payment, network inclusion/exclusion). **Selection** is the use of performance results to make or affirm choices regarding providers of healthcare or health plans.

2. Resource use and cost measures are not eligible for time-limited endorsement because they are considered as complex measures.

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Resource Use Measure Evaluation Criteria

Resource Use Measure Evaluation Criteria
1. Importance to measure and report
Resource use measures will be evaluated based on the extent to which the specific measure focus is important to making significant contributions toward understanding healthcare costs for a specific high-impact aspect of healthcare where there is variation or a demonstrated high-impact aspect of healthcare (e.g., affects large numbers, leading cause of morbidity/mortality, variation in resource use [current and/or future], severity of illness, and patient/societal consequences of poor quality) or overall poor performance. Candidate consensus standards must be judged to be important to measure and report in order to be evaluated against the remaining criteria.
1a. The measure focus addresses: – a specific national health Goal/Priority identified by DHHS or the National Priorities Partnership convened by NQF: OR – a demonstrated high-impact aspect of healthcare[1] (e.g., affects large numbers, leading cause of morbidity/mortality, high resource use [current and/or future], severity of illness, and patient/societal consequences of poor quality). AND 1b. Demonstration of resource use or cost problems and opportunity for improvement, i.e., data[3] demonstrating variation in the delivery of care across providers and/or population groups (disparities in care). AND 1c. The intent of the resource use measure[4] and the measure construct are clearly described. AND The resource use service categories (i.e., types of resources/costs) that are included in the resource use measure are consistent with and representative of the intent of the measure.

Importance Notes

3. Examples of data on opportunity for improvement include, but are not limited to: prior studies, epidemiologic data, or data from pilot testing or implementation of the proposed measure. If data are not available, the measure focus is systematically assessed (e.g., expert panel rating) and judged to be a quality/cost/spending problem.

4. Resource use measures are broadly applicable and comparable measures of input counts (in terms of units or dollars) applied to a population or population sample. Resource use measures count the frequency of specific resources; these resource units may be monetized as appropriate.

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Resource Use Measure Evaluation Criteria

Resource Use Measure Evaluation Criteria
2. Scientific acceptability of the measure properties
Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the cost or resources used to deliver care. ***Measures must be judged*** *to meet the subcriteria for both reliability and validity to pass this criterion and be evaluated against the remaining criteria.*
2a. Reliability 2a1. The measure is well defined and precisely specified[5] so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).[6] 2a2. Reliability testing[7] demonstrates that the measure results are repeatable, producing the same results a high proportion of the time when assessed in the same population in the same time period, and/or that the measure score is precise. 2b. Validity 2b1. The measure specifications[5] are consistent with the measure intent described under criterion *1c* and captures the most inclusive target population. 2b2. Validity testing[8] demonstrates that the measure data elements are correct and/or the measure score correctly reflects the cost of care or resources provided. 2b3. Exclusions are supported by the clinical evidence[9]. AND/OR There is a rationale or analysis demonstrating that the measure results are sufficiently distorted due to the magnitude and/or frequency of the non-clinical exclusions; AND – Measure specifications for scoring include computing exclusions so that the effect on the measure is transparent (i.e., impact clearly delineated, such as number of cases excluded, exclusion rates by type of exclusion); AND – If patient preference (e.g., informed decision-making) is a basis for exclusion, there must be evidence that the exclusion impacts performance on the measure; in such cases, the measure must be specified so that the information about patient preference and the effect on the measure is transparent[10] (e.g., numerator category computed separately, denominator exclusion category computed separately). 2b4. For resource use measures and other measures when indicated: – an evidence-based risk-adjustment strategy (e.g., risk models, risk-stratification) is specified and is based on patient clinical factors that influence the measured outcome (but not factors related to

disparities in care or the quality of care) and are present at start of care[11,12] and has demonstrated adequate discrimination and calibration
OR
- rationale/data support no risk-adjustment/-stratification.

2b5. Data analysis demonstrates that methods for scoring and analysis of the specified measure allow for identification of statistically significant and practically/clinically meaningful[13] differences in performance.

2b6. If multiple data sources/methods are specified, there is demonstration that they produce comparable results.

2c. If disparities in care have been identified, measure specifications, scoring, and analysis allow for identification of disparities through stratification of results (e.g., by race, ethnicity, socioeconomic status, gender)
OR
rationale/data justifies why stratification is not necessary or not feasible.

Scientific Acceptability Notes

5. Cost/resource use measure specifications are comprised of three core modules: construction logic (i.e., concurrency of clinical events, measure redundancy or overlap, disease interactions, complementary services, missing data), clinical logic (i.e., clinical hierarchies, clinical inclusion/exclusion criteria, trigger and end mechanisms, clinical severity levels, comorbidities and disease interactions) and adjustments for comparability (risk adjustment/stratification, inclusions/exclusions, costing methodology) . These modules are further specified with the resource use service categories, definitions, data source, code lists with descriptors, sampling, and scoring/computation.

6. EHR measure specifications include data type from the QDM, code lists, EHR field, measure logic, original source of the data, recorder, and setting.

7. Reliability testing applies to both the data elements and computed measure score. Examples of reliability testing for data elements include, but are not limited to: inter-rater/abstractor or intra-rater/abstractor studies; internal consistency for multi-item scales; test-retest for survey items. Reliability testing of the measure score addresses precision of measurement (e.g., signal-to-noise).

8. Validity testing applies to both the data elements and computed measure score. Validity testing of data elements typically analyzes agreement with another authoritative source of the same information. Examples of validity testing of the measure score include, but are not limited to: testing hypotheses that the measures scores indicate higher or lower cost/resource use, e.g., measure scores are different for groups known to have differences in cost/resource use assessed by another valid cost/resource use measure or method; correlation of measure scores with another valid indicator of cost/resource use for the specific topic; or relationship to conceptually related measures (e.g., scores on process measures to scores on outcome measures). Face validity of the measure score as an indicator of cost/resource use may be adequate if accomplished through a systematic and transparent process, by identified experts, and explicitly addresses whether performance scores resulting from the measure as specified can be used to distinguish higher or lower cost/resource use.

9. Examples of evidence that an exclusion distorts measure results include, but are not limited to: frequency of occurrence, variability of exclusions across providers, and sensitivity analyses with and without the exclusion.

10. Patient preference is not a clinical exception to eligibility and can be influenced by provider interventions.

11. Risk factors that influence outcomes should not be specified as exclusions.

12. Risk models should not obscure disparities in care for populations by including factors that are associated with differences/inequalities in care, such as race, socioeconomic status, or gender (e.g., poorer treatment outcomes of African American men with prostate cancer or inequalities in treatment for CVD risk factors between men and women). It is preferable to stratify measures by race and socioeconomic status rather than to adjust out the differences.

13. With large enough sample sizes, small differences that are statistically significant may or may not be practically or clinically meaningful. The substantive question may be, for example, whether a statistically significant difference of $25 in cost for an episode of care (e.g., $5,000 v. $5,025) is practically meaningful. Measures with overall less-than-optimal performance may not demonstrate much variability across providers.

Resource Use Measure Evaluation Criteria
3. Feasibility
Extent to which the required data are readily available or could be captured without undue burden, and can be implemented for performance measurement.
3a. For clinical measures, the required data elements are routinely generated and used during care delivery (e.g., blood pressure, lab test, diagnosis, medication order). 3b. The required data elements are available in electronic health records or other electronic sources. If the required data are not in electronic health records or existing electronic sources, a credible, near-term path to electronic collection is specified. 3c. Demonstration that the data collection strategy (e.g., source, timing, frequency, sampling, patient confidentiality,[14] costs associated with fees/licensing of proprietary measures) can be implemented (e.g., already in operational use, or testing demonstrates that it is ready to put into operational use).

Feasibility Note

14. All data collection must conform to laws regarding protected health information. Patient confidentiality is of particular concern with measures based on patient surveys and when there are small numbers of patients.

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Resource Use Measure Evaluation Criteria

Resource Use Measure Evaluation Criteria
4. Usability and use
Extent to which potential audiences (e.g., consumers, purchasers, providers, policymakers) are using or could use performance results for both accountability and performance improvement to achieve the goal of high-quality, efficient healthcare for individuals or populations.
4a. Performance results are used in at least one accountability application one within three years after initial endorsement and are publicly reported within six years after initial endorsement (or the data on performance results are available). If not in use at the time of initial endorsement, then a credible plan for implementation within the specified timeframes is provided. AND 4b. Progress toward achieving the goal of high-quality, efficient healthcare for individuals or populations is demonstrated. If not in use for performance improvement at the time of initial endorsement, then a credible rationale describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations. AND 4c. The benefits of the performance measure in facilitating progress toward achieving high-quality, efficient healthcare for individuals or populations outweigh evidence of unintended negative consequences to individuals or populations (if such evidence exists). 4d. Data and result detail are maintained such that the resource use measure, including the clinical and construction logic for a defined unit of measurement can be deconstructed to facilitate transparency and understanding.

Usability and Use Notes

15. An important outcome that may not have an identified improvement strategy still can be useful for informing quality improvement by identifying the need for and stimulating new approaches to improvement.

16. Transparency is the extent to which performance results about identifiable, accountable entities are disclosed and available outside of the organizations or practices whose performance is measured. Maximal transparency is achieved with public reporting defined as making comparative performance results about identifiable, accountable entities freely available (or at nominal cost) to the public at large (generally on a public website). At a minimum, the data on performance results about

identifiable, accountable entities are available to the public (e.g., unformatted database). The capability to verify the performance results adds substantially to transparency.

17. This guidance is not intended to be construed as favoring measures developed by organizations that are able to implement their own measures (such as government agencies or accrediting organizations) over equally strong measures developed by organizations that may not be able to do so (such as researchers, consultants, or academics). Accordingly, measure developers may request a longer timeframe with appropriate explanation and justification.

18. Credible plan includes the specific program, purpose, intended audience, and timeline for implementing the measure within the specified timeframes. A plan for accountability applications addresses mechanisms for data aggregation and reporting.

19. Demonstrated progress toward achieving the goal of high-quality, efficient healthcare includes evidence of improved performance and/or increased numbers of individuals receiving high-quality healthcare. Exceptions may be considered with appropriate explanation and justification.

Resource Use Measure Evaluation Criteria
5. Comparison to Related or Competing Measures
If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure.
5a. The measure specifications are harmonized[20] with related measures; OR the differences in specifications are justified. 5b. The measure is superior to competing measures (e.g., is a more valid or efficient way to measure); OR multiple measures are justified.

Related and Competing Measures Note

20. Measure harmonization refers to the standardization of specifications for related measures with the same measure focus (e.g., influenza immunization of patients in hospitals or nursing homes); related measures with the same target population (e.g., eye exam and HbA1c for patients with diabetes); or definitions applicable to many measures (e.g., age designation for children) so that they are uniform or compatible, unless differences are justified (e.g., dictated by the evidence). The dimensions of harmonization can include numerator, denominator, exclusions, calculation, and data source and collection instructions. The extent of harmonization depends on the relationship of the measures, the evidence for the specific measure focus, and differences in data sources.

Evaluation Approach

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1

Measure Discussion Guide

- Co-Chair introduction of measure
  - Title, Developer, Description
- Developer overview of measure (3-5 minutes)
- NQF staff introduction of each criterion
  - Discussion of each subcriterion by Lead Discussant(s)
    - » Description/summary of submission relevant to assigned criterion
    - » Summary of relevant Committee preliminary ratings and comments (Highlight where there is agreement and disagreement)
    - » Summary of relevant public comments
- Open for Committee Discussion (Co-chairs)
- Vote on overall criteria

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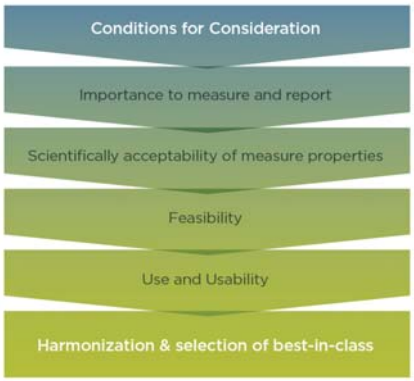
2

NQF Measure Evaluation Criteria



Lead Discussant Guide: Importance

Impact (1a)

- **Discussion points:**
  - Are large numbers affected by the measure?
  - Does the measure demonstrate variation in resource use or overall poor performance?
  - Are there patient/societal consequences of high or low resource use?

Opportunity for Improvement (1b)

- **Discussion points:**
  - Do data demonstrate a distribution of performance scores?
  - Is the number and representativeness of the entities included in the measure performance data?
  - Is there data showing disparities in the use of resources or cost of care for certain populations?
  - What is the size of the population at risk, and potential consequences of the cost/resource use problem?

Measure Intent (1c)

- **Discussion points:**
  - Is the intent of resource use measure clearly described?
  - Is the construction of the resource use measure consistent with the conceptual construct and the purpose of the measure?
  - Do the resource use categories specified (e.g., pharmacy, E&M) align with the intent of the measure?
  - Are all of the categories (or types of costs/resources) captured in the measure that you would expect based on the measure intent?

Lead Discussant Guide: Scientific Acceptability

Reliability of Specifications (2a)

- Preciseness of specifications
  - Examine for each module
- Testing appropriate
- *Vote on overall reliability*

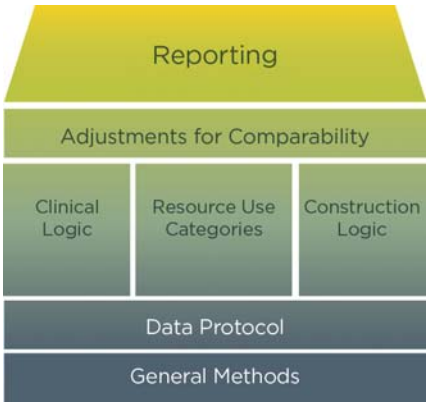
Validity of Specifications (2b)

- Specifications consistent with measure intent
  - Examine for each module
- Testing appropriate
- Exclusions appropriate and justified
- Risk adjustment approach valid
- Meaningful differences can be identified
- *Vote on overall validity*

Disparities (2c)

- Stratification for disparities, if appropriate
- *Vote on disparities criterion*

Building Resource Use Measures



Lead Discussant Guide: Scientific Acceptability

Reliability of Specifications (2a1)

- **Discussion points:**
  - Are the specifications precise within the context of each module?
    - » Construction Logic
    - » Clinical Logic
    - » Adjustments for Comparability
      - *Inclusion/Exclusion Criteria*
      - *Risk Adjustment*
      - *Costing Method*
  - Can the measure be implemented consistently across users?
  - Do you understand the sequential steps and data requirements necessary to implement the measure?
  - Were any relevant public comments submitted that should be considered?

Lead Discussant Guide: Scientific Acceptability

Reliability Testing (2a2)

- **Discussion points:**
  - Was an appropriate method used?
    - » Consider level (data or source), data source, type of measure, topic, potential sources of error, and feasibility
  - Was the scope of testing adequate?
    - » If it's a sample, consider number of entities, number of patients, representativeness
  - Were the results within acceptable norms?
  - Were any relevant public comments submitted that should be considered?

Lead Discussant Guide: Scientific Acceptability

Validity of Specifications (2b1)

- **Discussion points:**
  - Are the specifications consistent with the measure intent?
    - » Construction Logic
    - » Clinical Logic
    - » Adjustments for Comparability
      - *Inclusion/Exclusion Criteria*
      - *Risk Adjustment*
      - *Costing Method*
  - Were any relevant public comments submitted that should be considered?

Lead Discussant Guide: Scientific Acceptability

Validity Testing (2b2)

- **Discussion points:**
  - Was an appropriate method used?
    - » Consider level (data or source), data source, type of measure, topic, potential sources of error, conceptual relationships, and feasibility
  - Was the scope of testing adequate?
    - » If it's a sample, consider number of entities, number of patients, representativeness
  - Were the results within acceptable norms?
  - Were any relevant public comments submitted that should be considered?

Lead Discussant Guide: Scientific Acceptability

Exclusions (2b3)

- **Discussion points:**
  - Are the exclusions justified?
  - Does testing demonstrate that the exclusions are appropriate?
  - Were any relevant public comments submitted that should be considered?

Risk Adjustment (2b4)

- **Discussion points:**
  - Does the risk adjustment model include appropriate patient-level factors (e.g., age, diagnosis, severity)?
    - Are the factors associated with the outcome of interest?
  - Are the patient factors included in the model present prior to the measurement period?
  - Are factors associated with disparities included?
    - Generally they should not be included.
  - Are structures/characteristics of organizations/clinicians associated with resource use (e.g., experience, training, equipment) included?
    - Generally they should not be included.
  - Were any relevant public comments submitted that should be considered?

Lead Discussant Guide: Scientific Acceptability

Identification of Statistically Significant Differences (2b5)

- **Discussion points:**
  - Does the measure score and method of scoring allow for identification of statistically significant and practical differences in performance?
  - Were any relevant public comments submitted that should be considered?

Disparities (2c)

- **Discussion points:**
  - Were disparities identified in the demonstration of importance in the submission (i.e., evidence that supports disparities in care or resource use in specific populations)?
  - Does the measure allow for stratification of disparities?
    - If not, is the rationale provided adequate?
  - Were any relevant public comments submitted that should be considered?

Lead Discussant Guide: Feasibility

- **Discussion points:**
  - Is the required data readily available?
  - Is it retrievable without undue burden?
    - Generated during care delivery?
    - Available in electronic sources?
  - Is there susceptibility to inaccuracies, errors, or unintended consequences?
  - Can the measure be implemented for performance measurement?
    - Is the measure already in use, or did testing demonstrate that it is ready to put into use?

Lead Discussant Guide: Usability and Use

- **Discussion points:**
  - Is the measure currently in use?
    - If not, is there a plan for the measure to be in use?
  - Do the benefits of use of the measure outweigh the harms?
  - Are there any unintended consequences?
  - Can this measure be deconstructed to facilitate understanding for those being measured (e.g., providers, hospitals)? For those using the measure (e.g., consumers, purchasers)?
  - Does the measure intent align with the planned use and specifications?

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Resource Use Measure Evaluation Form Version 2.0

This form contains the information submitted by measure developers/stewards, organized according to NQF's measure evaluation criteria and process. For more information about Resource Use Measures and the Resource Use measure evaluation criteria, please visit the Cost & Resource Use Project Page.

Developer submission items are indicated by Blue Text
Questions to be answered by the Steering Committee about the criteria are indicated by Red Text

NQF Generic Rating Scale (for use unless otherwise indicated)
High - Based on the information submitted, there is high confidence (or certainty) that the criterion is met
Moderate - Based on the information submitted, there is moderate confidence (or certainty) that the criterion is met
Low - Based on the information submitted, there is low confidence (or certainty) that the criterion is met
Insufficient - There is insufficient information submitted to evaluate whether the criterion is met (e.g., blank, incomplete, or not relevant, responsive, or specific to the particular question)

Reviewer Name: **Date:**

Descriptive Measure Information

Measure Number and Name: #2158 Payment-Standardized Medicare Spending Per Beneficiary (MSPB)
Steward: Centers for Medicare and Medicaid Services
Description: The MSPB Measure assesses the cost of services performed by hospitals and other healthcare providers during an MSPB hospitalization episode, which comprises the period immediately prior to, during, and following a patient's hospital stay. Beneficiary populations eligible for the MSPB calculation include Medicare beneficiaries enrolled in Medicare Parts A and B who were discharged from short-term acute hospitals during the period of performance.
Resource Use Measure Type: Per episode
Data Source: Administrative claims
Level of Analysis: Facility
Costing Method: Standardized pricing
Target Population: Senior Care
Resource Use Service Categories: Inpatient services: Inpatient facility services; Inpatient services: Evaluation and management; Inpatient services: Procedures and surgeries; Inpatient services: Imaging and diagnostic; Inpatient services: Lab services; Inpatient services: Admissions/discharges; Ambulatory services: Outpatient facility services; Ambulatory services: Emergency Department; Ambulatory services: Evaluation and management; Ambulatory services: Procedures and surgeries; Ambulatory services: Imaging and diagnostic; Ambulatory services: Lab services; Durable Medical Equipment (DME)

1. Importance to Measure and Report

Resource use measures will be evaluated based on the extent to which the specific measure focus is important to making significant contributions toward understanding healthcare costs for a specific high-impact aspect of healthcare where there is variation or a demonstrated high-impact aspect of healthcare (e.g., affects large numbers, leading cause of morbidity/mortality, variation in resource use [current and/or future], severity of illness, and patient/societal consequences of poor quality) or overall poor performance. Candidate consensus standards must be judged to be important to measure and report in order to be evaluated against the remaining criteria.

1a. High Priority The measure focus addresses: A specific national health Goal/Priority identified by DHHS or the National Priorities	**To what extent does the summary of evidence of high**

Partnership convened by NQF:
OR
A demonstrated high-impact aspect of healthcare (e.g., affects large numbers, leading cause of morbidity/mortality, high resource use [current and/or future], severity of illness, and patient/societal consequences of poor quality).

IM.1. Demonstrated High Impact Aspect of Healthcare
Affects large numbers; High resource use
If other: N/A

IM.1.1. Summary of Evidence of High Impact *(Provide epidemiologic or resource use data)*
NQF's Measure Application Partnership (MAP) has already determined the MSPB Measure is an important measure that has potential for high impact. A 2012 NQF Pre-rulemaking report stated that "MAP strongly supports the direction of this measure pending additional specification and testing." [1] Similarly, the January 2013 MAP pre-rulemaking draft report states, "Recognizing the need for more measures addressing affordability, MAP agreed that additional cost measures should be included in the program measure set. MAP supported the Medicare Spending per Beneficiary measure". [2] The content below contains further evidence of the high impact nature of this measure. The scientific acceptability section discussed later in this application provides the additional specification and testing needed to meet NQF's stringent quality measure standard.
The growth of health care expenditures has put enormous strain on federal and state budgets, employers and families. Health expenditures in the United States neared $2.6 trillion in 2010, over ten times the $256 billion spent in 1980. [3] Although the rate of growth in recent years has slowed relative to the late 1990s and early 2000s, health care spending is still projected to grow faster than national income over the foreseeable future. [4] Further, CBO projects that federal spending on Medicare, Medicaid, and CHIP will increase from 5.6 percent of GDP in 2011 to 19.4 percent of GDP in 2085. [5] The most recent U.S. economic recession has put even more attention on health spending and affordability. [3] Since 2001, employer-sponsored health coverage for family premiums have increased by 113% and to address the rising cost employers have been shifting an increasing share of the cost burden on employees. [6] The aging of the baby boomer generation into retirement will cause Medicare to direct an increasing proportion of the health care resources in the U.S. [1], [7] Due to this enrollment growth as well as the growth in Medicare per capita spending, federal and state healthcare budgets are strained. In total, health spending accounted for 17.9% of the Nation's Gross Domestic Product (GDP) in 2010. [8]
Despite the fact that the U.S. leads the world in health expenditures per capita, the value that patients receive for these expenditures may be below that of other countries. [9] In particular, one source of inefficiency that creates rising healthcare costs includes payment systems that reward medical inputs rather than outcomes. [10] Transforming Medicare and other public and private insurers from systems that reward volume of service to ones that reward efficient, effective care and reduce delivery system fragmentation offers the possibility of reducing cost and improving patient outcomes.
To advance this transformation, CMS instituted the MSPB Measure. Recent legislation—specifically Section 1886(o)(2)(B)(ii) of the Social Security Act, as established by Section 3001 of the Patient Protection and Affordable Care Act (Affordable Care Act)—requires that CMS implement a measure of Medicare Spending Per Beneficiary as part of it Hospital Value-Based Purchasing (VBP) initiatives. By measuring the cost of care through a measure of Medicare Spending Per Beneficiary, CMS aims to recognize hospitals that can provide high quality care at a lower cost to Medicare.

Citations available in Appendix B

impact support the categories listed in IM.1.?

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

1b. Opportunity for Improvement

Demonstration of resource use or cost problems and opportunity for improvement, i.e., data demonstrating variation in the delivery of care across providers and/or population groups (disparities in care).

IM.2.1. **Briefly explain the benefits (improvements in performance) envisioned by use of this measure.**

Care coordination helps ensure a patient's needs and preferences for care are understood, and that those needs and preferences are shared between providers, patient, and families as a patient moves from one healthcare setting to another. People with chronic conditions, such as diabetes and hypertension, often receive care in multiple settings from numerous providers. As a result, care coordination among different providers is required to avoid waste, over-, under-, or misuse of prescribed medications and conflicting plans of care.

The MSPB Measure is designed to promote higher quality care for beneficiaries by financially incentivizing hospitals to improve care coordination, deliver efficient, effective care, and reduce delivery system fragmentation. For instance, hospitals can decrease (i.e., improve) their MSPB Amount through actions such as: 1) improving coordination with post-acute providers to reduce the likelihood of hospital readmissions, 2) identifying unnecessary or low-value post-acute services and reduce or eliminate these services, or 3) shifting post-acute care from more expensive services (e.g., skilled nursing facilities) to less expensive services (e.g., home health) in cases that would not affect patient outcomes.

CMS includes the MSPB Measure within the Hospital VBP program as a measure of efficiency; the Hospital VBP program, however, also provides financial incentives to hospitals based on their performance on additional quality measures. By measuring the cost of care through the MSPB Measure in combination with these other quality measures, CMS aims to incentivize value in healthcare by recognizing hospitals that can provide high quality care at a lower cost to Medicare.

IM.2.2. **Summary of Data Demonstrating Performance Gap** *(Variation or overall less than optimal performance across providers)*

Improved care coordination in the time period surrounding a hospital admission offers the possibility of reducing post-acute care cost and also decreasing the probability of a hospital readmission. Reducing post-acute care cost is of significant interest to policymakers as increased post-acute care utilization has been one of the key drivers of healthcare spending growth in recent years. From 2004 to 2010, long-term care costs have grown 4.7% to 6.6% per year, or a total increase of 31% to 47%, depending on the type of care. From 2008 to 2010, home health care costs increased an average of 13% - up from the 5% increase from 2006-2008. [1] Yet a number of studies have found that hospitals can identify individuals at high risk of permanent skilled nursing facility placement at the time of hospital discharge. [2] Improved discharge planning may improve the chances that these patients can return home.

In a 2007 report to Congress, the Medicare Payment Advisory Commission (MedPAC) estimated that in 2005, 17.5% of hospital patients were readmitted within 30 days of discharge and that 76% of these readmissions were potentially preventable. [3] Readmissions within 30 days of discharge cost Medicare more than $17 billion annually. [4]

Numerous studies have also found an association between quality of inpatient or transitional care and readmission rates for a wide range of conditions. [5], [6], [7], [8], [9], [10], [11], [12]. Randomized controlled trials, however, have shown that improvement in care coordination—in particular, improved discharge planning—can directly reduce readmission rates. [13], [14], [15], [16], [17], [18].

The MSPB Measure can be one mechanism to alter provider payments from volume-based to outcomes/efficiency based payments. The fee-for-service system of provider payment is also increasingly viewed as an obstacle to achieving effective, coordinated, and efficient care as it rewards the overuse of services, duplication of services, use of costly specialized services, and

To what extent does the information presented demonstrate this measurement area as a cost problem or that there is variation in resource across entities?

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

involvement of multiple physicians in the treatment of individual patients. It does not reward the prevention of hospitalization or re-hospitalization, effective control of chronic conditions, or care coordination. Pay for performance is one strategy for moving from payment based solely on the quantity of services rendered to payment based on the quality or efficiency of care. Most designs reward clinically high-quality care or patient-centered care; few reward care coordination or increased efficiency over time in the treatment of a particular condition. [19], [20] IM.2.4. **Summary of Data on Disparities by Population Group** *(for example by race/ethnicity, gender, age, insurance status, socioeconomic status, and/or disability, etc. If you do not have data on your specific measure, perform a literature search/review and report data for the measure or similar appropriate concept.)* The MSPB Measure gauges care provided in the period immediately prior to, during, and in the 30 days after a hospital discharge; a number of studies have shown that socioeconomic status affects the amount of resources used during the period in which patients are hospitalized as well as during post-acute care. Whereas one quarter of Medicare beneficiaries with incomes less than $20,000 percent used inpatient services in a given year, only 17 percent of patients earning over $30,000 per year used inpatient services. Beneficiaries with incomes below $20,000 are also twice as likely to use home health services as Medicare beneficiaries earning more than $30,000. [1] End-of-life care for black and Hispanic beneficiaries is substantially different than the end-of-life hospital services that white Medicare beneficiaries receive. Much of the variation is due to differences in utilization levels among hospitalized patients. Blacks and Hispanics are significantly more likely to be admitted to the ICU than whites, and minorities also receive significantly more intensive procedures, such as resuscitation and cardiac convers, mechanical ventilation, and gastrostomy for artificial nutrition. [2] Further, there also exists significant regional variation in the inpatient procedures received by patients of different races. Whites, for example, get almost three times as many carotid endarterectomies as blocks, and 30 percent more angiograms. On the other hand, blacks have higher rates of admission to the ICU in their last six months of life. On average, black enrollees have more money spent on them, particularly near the end of life, but receive less highly effective interventions. [3] In addition, a number of studies have shown that the quality of post-acute care varies across patient socioeconomic status. For example, an analysis of 30-day readmission rates revealed that among elderly Medicare beneficiaries, black patients were more likely to be readmitted after hospitalization for acute myocardial infarction (AMI), congestive heart failure (CHF), and pneumonia, a gap that was related to both race and to the site where care was received. Specifically, black patients had higher readmission rates than white patients across all three conditions, and patients from minority-serving hospitals had higher readmission rates than non-minority-serving hospitals. [4] ***Citations available in Appendix B***	
1c. Measure Intent The intent of the resource use measure and the measure construct are clearly described. **AND** The resource use service categories (i.e., types of resources/costs) that are included in the resource use measure are consistent with and representative of the intent of the measure. IM.3.1. **Describe intent of the measure and its components/ Rationale (including any citations) for analyzing variation in resource use in this way.** The Medicare Spending Per Beneficiary efficiency measure aims to incentivize hospitals to coordinate care and reduce unnecessary utilization during the period immediately prior to, during, and in the 30 days after a hospital discharge. Currently, Medicare's prospective payment system (PPS) reimburses hospitals on a case mix-adjusted, flat-rate basis, incentivizing hospitals to serve patients as efficiently as possible. Hospitals, however, could also have an incentive to discharge patients early to reduce their own cost. Such early discharge of patients decreases quality of care and increases costs to Medicare. For example, early discharge of patients has	**To what extent do the categories of costs represented by the resource use service categories (listed in S.7.7.) support the stated intent of the measure? (i.e., are all of the resource use service categories represented that should be? Are any missing?)** ☐ **High** ☐ **Moderate**

been shown to lead to avoidable re-hospitalizations. [1] It has been estimated that readmissions within 30 days of discharge cost Medicare more than $17 billion annually. [2] A 2006 Commonwealth Fund report further estimated that if national readmission rates were lowered to the levels achieved by the top performing regions, Medicare would save $1.9 billion annually. [3] Improved care coordination between acute and post-acute providers could stem the rising cost of post-acute care through avenues such as reducing unnecessary hospital readmission. From 2004 to 2010, long-term care costs have grown by 31% to 47% (i.e., 4.7% to 6.6% per year), depending on the type of care; from 2008 to 2010, home health care costs increased an average of 13% - up from the 5% increase from 2006-2008. [4] Unlike other measures reported on Hospital Compare, the MSPB Measure is not condition-specific; because a hospital's MSPB Measure is based on all Medicare Part A and Part B claims data for episodes during the period of performance, the MSPB Measure evaluates hospitals' efficiency across all conditions. The all-cause nature of the MSPB measure allows it to be applicable to a larger number of hospitals, maximizing its impact. The effect of patient health status and demographics on episode spending is accounted for by the MSPB's risk-adjustment methodology. Using this all-cause efficiency measure in conjunction with existing quality measures available on Hospital Compare and within the CMS Hospital VBP system, the MSPB Measure can identify efficient providers that provide high-quality, low-cost care. [5] NQF precedent defines efficient care to be a measure of cost of care associated with a specified level of quality of care. [6] One can measure whether hospitals provide efficient care by using the MSPB measure in concert with a variety of quality of care measures already developed as part of Hospital Compare [5]. For the May 15, 2010 to February 14, 2011 period of performance, the MSPB Measure will be calculated from the claims of over 806,000 Medicare beneficiaries and will affect 3,396 hospitals. • [1] Ashton CM, Del Junco DJ, Souchek J, Wray NP and Mansyur CL. "The Association between the Quality of Inpatient Care and Early Readmission: A Meta-Analysis of the Evidence." Medical Care , Vol. 35, No. 10 (Oct., 1997), pp. 1044-1059 • [2] Jencks SF, et al. "Rehospitalizations among patients in the Medicare fee-for-service program." New England Journal of Medicine 2009; 360(14): 1418-28. • [3] "Why Not the Best? Results from a National Scorecard on U.S. Health System Performance. Fund Report. Harrisburg, PA: The Commonwealth Fund, 2006. • [4] "Long-Term Care Cost Study." Prudential Research Report. 2010. • [5] U.S. Department of Health & Human Services. Hospital Compare. www.hospitalcompare.hhs.gov. • [6] National Quality Forum. "Resource Use Measurement White Paper." S.7.7. **Resource Use Service Categories (Units)** *(Select all categories that apply)* Inpatient services: Inpatient facility services; Inpatient services: Evaluation and management; Inpatient services: Procedures and surgeries; Inpatient services: Imaging and diagnostic; Inpatient services: Lab services; Inpatient services: Admissions/discharges; Ambulatory services: Outpatient facility services; Ambulatory services: Emergency Department; Ambulatory services: Evaluation and management; Ambulatory services: Procedures and surgeries; Ambulatory services: Imaging and diagnostic; Ambulatory services: Lab services; Durable Medical Equipment (DME) **If other:** N/A	☐ **Low** ☐ **Insufficient**

1. Overall Importance to Measure and Report

1a. High Impact	H	M	L	I
1b. Opportunity for Improvement	H	M	L	I
1c. Measure Intent	H	M	L	I

Based on your rating of the subcriteria, make a summary determination of the extent to which the criterion of **Importance to Measure and Report** has been met. Please provide a rationale based on specific subcriteria.

Rationale:

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

2. Scientific Acceptability of the Measure Properties

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the cost or resources used to deliver care. **Measures must be judged** to meet the subcriteria for both reliability and validity to pass this criterion and be evaluated against the remaining criteria.

Construction Logic

S.7.1. **Brief Description of Construction Logic**

The MSPB Measure assesses the cost to Medicare of services performed by hospitals and other healthcare providers during an MSPB episode. An MSPB episode is risk adjusted and includes Medicare payments for services provided to a beneficiary with start date falling between 3 days prior to an IPPS hospital admission (index admission) through 30 days post-hospital discharge.

S.7.2. **Construction Logic** *(Detail logic steps used to cluster, group or assign claims beyond those associated with the measure's clinical logic.)*

The MSPB Measure is calculated according to the following eight steps:

Step 1: Standardize Claims Payments. To capture differences in beneficiary resource use that a hospital can influence through appropriate practices and care coordination, the MSPB Measure removes local or regional price differences, which are sources of variation not directly related to decisions to utilize care. The MSPB Measure relies on a detailed price-standardization methodology to exclude geographic payment rate differences; in other words, the MSPB Measure adjusts observed payments for Medicare geographic adjustment factors, such as the hospital wage index and geographic practice cost index (GPCI). Specifically, the price-standardization methodology:

- Eliminates adjustments made to national payment amounts to reflect differences in regional labor costs and practice expenses (measured by hospital wage indexes and geographic practice cost indexes);
- Substitutes a national amount in the case of services paid on the basis of state fee schedules;
- Eliminates Medicare's payments to hospitals for graduate indirect medical education (IME) and for serving a disproportionate population of poor and uninsured (i.e., disproportionate share payments (DSH));
- Maintains differences that exist in actual payments resulting from: (i) the choice of setting in which a services is provided, (ii) the choice about who provides the service, (iii) the choice as to whether to provide multiple services in the same encounter, and (iv) differences in provider experience with regard to outlier cases; and
- Treats outlier payments as a given rather than trying to determine what outlier payment would have been in a standardized world. Actual outlier payments are adjusted for differences in wages using the wage index.

Step 2: Calculate Price-Standardized Episode Spending. Standardized spending during an episode is calculated as the sum of all the standardized Medicare claims payments made during the MSPB episode (i.e., between 3 days prior to the hospital admission until 30 days after discharge). [1]

Step 3: Calculate Expected Episode Spending. To estimate the relationship between the independent variables to be described in S.9.3. (i.e., age, HCC, enrollment status, comorbidity interactions, long-term care) and standardized episode cost, the MSPB methodology uses an ordinary least squares (OLS) regression. Using a separate model for episodes within each major diagnostic

category (MDC), these variables are regressed on standardized episode cost. The MDC is determined by the MS-DRG of the index hospital stay. [2] The predicted values from this regression are used to measure the spending levels one would expect for each episode given the patient demographics and health status.

Step 4: Truncate Predicted Values. Although including a large number of variables in the regression more accurately captures beneficiary case mix, including a larger number of variables can produce some extreme predicted values due to having only a few outlier individuals in a given cell. To prevent creating extreme predicted values, this step truncates (a.k.a. 'bottom-codes') predicted values at the 0.5th percentile. [3], [4] This step also renormalizes the predicted values to ensure that the average expected episode spending levels for each MS-DRG is the same before and after truncating. This normalization occurs by multiplying the truncated predicted values by the ratio of the average predicted spending levels and the average truncated predicted spending levels.

Step 5: Calculate Residuals. The residuals for each episode are calculated as the difference between the standardized episode spending level in Step 2 and the truncated predicted value of spending for that episode calculated in Step 4. If the variable Y_ijm represents standardized spending levels for episode i for hospital j of MS-DRG type m, and Y(hat)_ijm equals the predicted spending levels from Step 3, then one can calculate the residual mathematically as: Residual_ijm = Y_ijm - Y(hat)_ijm.

Step 6: Exclude Outliers. To mitigate the effect of high-cost outliers on each hospital's MSPB Measure score, MSPB episodes whose residuals fall above the 99th percentile or below the 1st percentile of the distribution of residuals within each index admission MS-DRG are excluded from the MSPB calculation. Excluding outliers based on residuals eliminates the episodes that deviate most from their predicted values in absolute terms.

Step 7: Calculate the MSPB Amount for Each Hospital. The MSPB Amount for each hospital depends on three factors: i) the ratio of the average standardized episode spending level from Step 2, ii) the average expected standardized episode spending for each hospital calculated in Step 3, and iii) the average standardized episode spending across all hospitals. To calculate the MSPB Amount for each hospital, one simply finds the ratio of the average standardized episode spending to the average expected standardized episode spending, and then multiplies this ratio by the average episode spending level across all hospitals. Mathematically, the MSPB Amount is calculated as: MSPB Amount_j = [(1/n_j)(the sum of Y_ij over all elements i in the set {I_j})]/](1/n_j)(the sum of Y(hat)_ij over all elements i in the set {I_j})] x [(1/n)(the sum of Y_ij over all i)] where Y_ij is the standardized spending for episode i in hospital j; Y(hat)_ij is the expected standardized spending for episode i in hospital j, using the truncated predicted values from the risk-adjustment regression in Step 3; n_j is the number of episodes for hospital j; n is the number of episodes across all hospitals in the U.S.; and "all elements i in the set {I_j}" indicates all episdoes i in the set of episodes attributed to hospital j.

In words, this equation defines the MSPB Amount for hospital j as the average spending level for a hospital divided by the expected episode spending level for that hospital, multiplied by the average spending over all episodes across all hospitals. Defining a hospital's MSPB Amount by calculating the ratio of the hospital's standardized payment total to its expected standardized payment total is a familiar methodology for implementing risk adjustment. The MSPB Amount represents the per-episode spending level for a hospital j assuming its composition of episodes matches that of the national average.

To enhance the usability of the measure for public reporting purposes, one can normalize the MSPB Amount to create the MSPB Measure. The MSPB Measure compares a hospital's efficiency level to the efficiency level across of the typical hospital. To perform this normalization, one relies on the following step:

Step 8: Calculate the MSPB Measure. The MSPB Measure for hospital j is calculated as the ratio of the MSPB Amount for a hospital (calculated in Step 7) divided by the median MSPB Amount across all hospitals: MSPB Measure_j = (MSPB Amount_j)/[med(MSPB Amount_j)].

The median MSPB Amount for hospital j is a weighted median, where the weights are the number of episodes in each hospital. [5] For public reporting purposes, one can limit the MSPB Measure values reported only to hospitals with a sufficient number of episodes as described in the final step below.

To reduce the likelihood that a hospital's MSPB score would be affected by only a few high-cost outliers, hospitals with less than a certain number episodes will not have their MSPB Measure publicly reported. In response to (2a2.2) of this measure submission form, Acumen evaluated changing the minimum number of MSPB cases required to be classified as a "hospital" under the Hospital Value-Based Purchasing (VBP) program. In sum, Acumen determined that as the minimum episode threshold increases, there is a trade-off between the size of the confidence interval for the 'average' hospital and the number of hospitals receiving an MSPB score.

•[1] Price-standardization uses similar methodology as adopted by IOM. http://iom.edu/Activities/HealthServices/GeographicVariation/Data-Resources.aspx

•[2] Certain MS-DRG's related to procedures (e.g., transplants) fall into the Pre-MDC category. For risk adjustment purposes, these episodes are grouped into one of the remaining MDCs based on the primary diagnosis code of the index admission.

•[3] In this form, "truncate" is equivalent "Winsorize." Winsorization is a statistical transformation that limits extreme values in data to reduce the effect of possibly spurious outliers. Thus, all predicted values below the 0.5th percentile are assigned the value of the 0.5th percentile.

•[4] To ensure that the lowest predicted values within an MS-DRG are adjusted even for MS-DRGs with few episodes, this methodology first sets the lowest predicted value within the MS-DRG to the second lowest predicted value within the MS-DRG before truncating at the 0.5th percentile.
•[5] For example, if there are 2 hospitals and one hospital had an MSPB of 1.5 and another had one of 0.5 but the first had 4 episodes and the second only 1, then the median would be 1.5.

Click here to go to the Construction Logic Attachment

S.7.3. **Concurrency of clinical events, measure redundancy or overlap, disease interactions** *(Detail the method used for identifying concurrent clinical events, how to manage them, and provide the rationale for this methodology.)*
We do not provide The MSPB Measure methodology does not separate concurrent events.
The MSPB Measure methodology defines an MSPB episode as all claims with start date falling between 3 days prior to an IPPS hospital admission (index admission) through 30 days post hospital discharge. It includes the period 3 days prior-hospital admission and 30 days post-hospital discharge to emphasize the importance of care transitions and care coordination in improving patient care. Please refer to S.8.4., which details the rationale for the construction of the MSPB episode, for a discussion of the advantages of this approach.
Although it is likely that a hospital will have some MSPB episodes whose costs are inflated by unrelated events, most hospitals have a large number of MSPB episodes (the median number of episodes for the period of May 1, 2011 to December 1, 2011 is 885), so averaged across a large number of episodes such random, post-acute events should have a fairly small effect on hospitals' overall MSPB Measure value.

S.7.4. **Complementary services** *(Detail how complementary services have been linked to the measure and provide rationale for this methodology.)*
To promote MSPB episode consistency regardless of where complementary services take place and to incorporate payments for services that may appear on the face of a claim to be unrelated to the original admission, a 3-day window prior to the index admission is included at the start of the MSPB episode. For additional discussion, please refer to S.8.4., which details the rationale for the construction of the MSPB episode.

S.7.5. **Clinical hierarchies** *(Detail the hierarchy of codes or condition groups used and provide rationale for this methodology.)*
Clinical hierarchies are embedded in the risk adjustment model; see S.9.5. for more details. The MSPB risk-adjustment methodology is discussed in additional detail in S.9.3. and S.9.4.

S.7.6. **Missing Data** *(Detail steps associated with missing data and provide rationale for this methodology (e.g., any statistical techniques to impute missing data)*
We do not provide All the data used to calculate hospitals' MSPB Measure values are included on Medicare claims data. The data fields used to calculate the MSPB Measure (e.g., payment amounts, DRGs, diagnosis and procedure codes, etc.) are included in all Medicare claims because hospitals only receive payments for complete claims. The quality of the diagnostic information on claims, however, is only as reliable as the information completed by providers. Because claims are not paid without the appropriate diagnostic information, missing data is not an issue. Additional information regarding the reliability of diagnostic information on claims is available in 2a2.2.

S.7.7. **Resource Use Service Categories (Units)** *(Select all categories that apply)*
Inpatient services: Inpatient facility services; Inpatient services: Evaluation and management; Inpatient services: Procedures and surgeries; Inpatient services: Imaging and diagnostic; Inpatient services: Lab services; Inpatient services: Admissions/discharges; Ambulatory services: Outpatient facility services; Ambulatory services: Emergency Department; Ambulatory services: Evaluation and management; Ambulatory services: Procedures and surgeries; Ambulatory services: Imaging and diagnostic; Ambulatory services: Lab services; Durable Medical Equipment (DME)
If other: N/A

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the construction logic well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population.	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*

Clinical Logic

S.8.1. **Brief Description of Clinical Logic** *(Briefly describe your clinical logic approach including clinical topic area, whether or not you account for comorbid and interactions, clinical hierarchies, clinical severity levels and concurrency of clinical events.)*

Objective: The MSPB Measure aims to improve care coordination in the period between 3 days prior to an acute inpatient hospital admission through the period 30 days after discharge.

Clinical Topic Area: Inpatient Admissions, all conditions

Accounting for Comorbidities: Application of a variant of the CMS-HCC risk adjustment model. The model includes a select number of interaction terms between comorbidities.

Measure of Episode Severity: Risk Adjustment model includes indicators for the MS-DRG of the index admission.

Concurrency of Clinical Events. The MSPB Episode spans the period 3 days prior to the index hospital admission through 30 days post-discharge. All events that occur during this time period are included in the MSPB episode.

S.8.2. **Clinical Logic** *(Detail any clustering and the assignment of codes, including the grouping methodology, the assignment algorithm, and relevant codes for these methodologies.)*

Objective: The MSPB Measure aims to improve care coordination in the period between 3 days prior to an acute inpatient hospital admission through the period 30 days after discharge.

Controlling for Comorbid Conditions and Interactions: The MSPB Measure accounts for comorbid conditions and interactions by broadly following the CMS-HCC risk-adjustment methodology, which is derived from Medicare Part A and B claims and is used in the Medicare Advantage (MA) program. Diagnosis codes on claims that occur during the 90-day period prior to the start of an MSPB episode are used to create HCC indicators. When applying the CMS-HCC framework to the MSPB Measure, the risk adjustment model is stratified by Major Diagnostic Category (MDC), which allows the effect of beneficiary health status and demographics on episode spending levels to vary by the MDC of the MSPB index admission. The MSPB Measure accounts for comorbid interactions by incorporating a number of health status interactions as currently used within the CMS-HCC model. The model includes paired-condition interactions, (e.g., chronic obstructive pulmonary disease (COPD) and congestive heart failure (CHF)) triple-interactions (e.g., diabetes mellitus, congestive heart failure, and renal failure) and interactions between conditions and disability status (e.g., disabled and cystic fibrosis). The full list of variables used in the risk adjustment model can be found in S.9.4.

Episode Severity: To control for the severity of the hospital admission, the risk adjustment model also controls for the MS-DRG of the index hospitalization. The full list of variables used in the risk adjustment model can be found in S.9.4.

Concurrent Clinical Conditions: To simplify the clinical logic and avoid the issue of attributing claims to MSPB episodes in the case of concurrent clinical events, all claims that begin during the period 3 days prior to the index admission through 30 days after discharge are included in a given MSPB episode.

Attribution: MSPB episodes are in turn assigned to the hospital of the index admission. Admissions which occur within 30 days of discharge from another index admission are not considered to be index admissions. In other words, if multiple hospitalizations appear during an episode window, the first hospitalization is consider the index admission and the hospital at which the first hospital admission occurred is assigned the episode; any subsequent hospitalizations that occur within the 30 day post-discharge window are considered re-hospitalizations.

Cost Calculation: The MSPB Amount includes the cost of services performed by hospitals and other healthcare providers during an

MSPB episode, which is comprised of the period 3 days prior to an inpatient PPS hospital admission (index admission) through 30 days post-hospital discharge. All costs are price-standardized to control for geographic variation in Medicare reimbursement rates. Risk adjusted costs are calculated as the average cost of an MSPB nationally, plus the difference between an episode's price-standardized episode cost and its expected cost produced from the risk adjustment model described above.
Clustering: None.
Any episodes where at any time during the episode, the beneficiary is enrolled in a Medicare Advantage plan; the beneficiary becomes deceased; or Medicare is the secondary payer will be excluded from the MSPB calculation. Regarding beneficiaries whose primary insurance becomes Medicaid during an episode due to exhaustion of Medicare Part A benefits, Medicaid payments made for services rendered to these beneficiaries are excluded; however, all Medicare Part A payments made before benefits are exhausted and all Medicare Part B payments made during the episode are included.

S.8.3. **Evidence to Support Clinical Logic Described in S.8.2 Describe the rationale, citing evidence to support the grouping of clinical conditions in the measurement population(s) and the intent of the measure** *(as described in IM3)*
The MSPB Measure methodology defines an MSPB episode as all claims with start dates falling between 3 days prior to an IPPS hospital admission (index admission) through 30 days post-hospital discharge and does not separate concurrent events. It includes the period 3 days prior-hospital admission and 30 days post-hospital discharge to emphasize the importance of care transitions and care coordination in improving patient care and reducing unnecessary readmissions. This episode definition is consistent with MedPAC's response to the FY 2012 IPPS proposed rule, in which they recommended that "both CMS and MedPAC should focus on creating parallel incentives for hospitals and post-acute care providers to work to reduce readmissions. The end goal is to align incentives across the sectors to encourage cooperation among providers to improve the quality of the episode of care, reduce the cost of the episode of care, and reduce the number of unnecessary inpatient episodes" (http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY-2012-IPPS-Final-Rule-Home-Page.html). The advantages of this approach are twofold. First, this approach is simple, as costs of Medicare services do not need to be divided into separate clinical events. Take for example, a Medicare beneficiary who is hospitalized for Acute Myocardial Infarction (AMI) and then has a doctor's visit in the 30 days post hospital discharge period where the doctor follows up on the AMI hospitalization as well as other conditions. Under the MSPB Measure methodology, costs do not need to be divided between those more relevant and those less relevant to the episode. Second, this approach incorporates payments for services due to care complications that may appear on the face of a claim to be unrelated to the original admission. For example, if a beneficiary is admitted for AMI, but develops pneumonia due to poor care coordination, these costs will be captured in the episode generated by the AMI admission. Additionally, NQF already has endorsed a number of 30-day all-cause measures. For example, NQF already endorses the Hospital-Wide All-Cause Unplanned Readmission Measure (NQF #1789), which estimates the hospital-level, risk-standardized rate of unplanned, all-cause readmission after admission for any eligible condition within 30 days of hospital discharge for patients aged 19 and older. (https://www.qualitynet.org/dcs/ContentServer?cid=1228772504318&pagename=QnetPublic%2FPage%2FQnetTier4&c=Page).

S.8.4. **Measure Trigger and End mechanisms** *(Detail the measure's trigger and end mechanisms and provide rationale for this methodology)*
Trigger Event: Inpatient admission, with the exception of acute-to-acute transfer cases
Start Date: 3 days prior to index inpatient admission
End Date: 30 days after discharge from the index hospital admission
As discussed in S.8.2., an MSPB episode is defined as all claims with start date falling between 3 days prior to an inpatient PPS hospital admission (index admission) through 30 days post hospital discharge. In other words, the MSPB Measure's trigger is an inpatient PPS hospital admission, and the start is 3 days prior to an index admission, while the end is 30 days post hospital discharge. Admissions that occur within 30 days of discharge from another index admission and admissions during which a beneficiary is transferred from one acute hospital to another are not considered to be index admissions. Hospitalizations that occur within the 30-day post discharge window of the index admission are attributed to the index admissions. On the other hand, hospitalizations that begin more than 30 days after the beneficiary is discharged from a hospital trigger a new MSPB episode as an index admission. Diagnostic services and non-diagnostic services related to the reason for admission are captured in the inpatient DRG payment for the hospitalization when they are performed by the hospital during the 3 days prior to admission (http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Three_Day_Payment_Window.html); however, if, during the 3 days prior to a hospital admission, a beneficiary receives diagnostic services from a provider other than the hospital or non-diagnostic services that appear on the claim to be unrelated to the reason for admission, those services are separately payable under Medicare. To promote MSPB episode consistency regardless of where these complementary services take place and to incorporate payments for services that may appear on the face of a claim to be unrelated to the original admission (as

described in section S.8.2), a 3-day window prior to the index admission is included at the start of the MSPB episode. The MSPB time frame also includes services that take place during the time period 30 days post-hospital discharge in order to emphasize the importance of care transitions and care coordination in improving patient care. As a result, services whose claim start dates fall between 3 days prior to an index admission through 30 days post hospital discharge are attributed to that index admission.
The advantages of this measure trigger and end mechanism are twofold. First, this approach is simple and easily-implementable since it includes all claims during the MSPB episode. An alternative would be to create separate episodes for each type of hospital admission. Although episode-based approaches are attractive for a number of purposes, the MSPB aims to evaluate overall hospital efficiency level across all types of care and creating are over 700 types of hospitals admission episodes (i.e., there are over 700 MS-DRGs) is not practical. Second, the MSPB approach incorporates costs due to care complications unrelated to the original admission, encouraging hospital care coordination. For example, if a beneficiary is admitted for AMI but develops pneumonia due to poor care coordination, these costs will be captured in the episode generated by the initial AMI index admission.

S.8.5. **Clinical severity levels** *(Detail the method used for assigning severity level and provide rationale for this methodology)*
Clinical Severity levels are embedded in the risk adjustment model, as described in S.9.2. through S.9.5.

S.8.6. **Comorbid and interactions** *(Detail the treatment of co-morbidities and disease interactions and provide rationale for this methodology.)*
Co-morbidities and disease interactions are accounted for in the MSPB Measure risk-adjustment methodology, as discussed in S.9.3. and S.9.4. As described in S.8.2., episodes where the beneficiary is not enrolled in both Medicare Part A and Medicare Part B for the 90 days prior to the episode are excluded because information on comorbidities for these beneficiaries will be incomplete. The 90-day period prior to the start of an episode is used to measure the conditions which most directly impact beneficiaries' health status at the time of the hospital admission and to capture beneficiaries' comorbidities in the risk adjustment. Additionally, because the relationship between comorbidities' episode cost may be non-linear in some cases (i.e., beneficiaries may also have more than one disease during a hospitalization episode), the model also takes into account a limited set of interactions between HCCs and/or enrollment status variables. Example variable interaction terms include Diabetes Mellitus/Congestive Heart Failure, Renal Failure/Congestive Heart Failure, and Disability/Opportunistic Infections (for a complete list of these variable interaction terms and other risk-adjustment variables, please refer to S.9.3 and S.9.4.). The MSPB Measure risk-adjustment methodology includes only a limited set of interaction terms for two reasons. First, inclusion of too many interaction terms will over-fit the model. Second, the MSPB Measure risk-adjustment methodology broadly follows the established CMS-HCC risk-adjustment methodology, which uses similar interaction terms.

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the clinical logic well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*

Adjustments for Comparability – Inclusion/Exclusion Criteria

S.9.1. **Inclusion and Exclusion Criteria Detail initial inclusion/exclusion criteria and data preparation steps** *(related to clinical exclusions, claim-line or other data quality, data validation, e.g. truncation or removal of low or high dollar claim, exclusion of ESRD patients)*
The MSPB Measure calculation includes five types of exclusions:
• [1] Any episodes without all observable claims or a complete episode window are excluded (i.e., episodes in which Medicare is the

secondary payer, episodes in which the beneficiary is enrolled in a Medicare Advantage plan, episodes in which the beneficiary is enrolled only in Medicare Part A, episodes in which the beneficiary becomes deceased). Episodes in which the beneficiary is enrolled only in Medicare Part A, for example, are excluded because these beneficiaries may receive services not observed in the data. Similarly, episodes in which the beneficiary dies at any point during the episode and episodes in which the patient dies are—by definition—truncated episodes and do not have a complete episode window are excluded. Including episodes without all observable claims or a complete episode window could potentially make hospitals seem efficient not due to any action of their own, but because the data is missing services that would be included in the MSPB Measure calculation.

• [2] Regarding beneficiaries whose primary insurance becomes Medicaid during an episode due to exhaustion of Medicare Part A benefits, Medicaid payments made for services rendered to these beneficiaries are excluded; however, all Medicare Part A payments made before benefits are exhausted and all Medicare Part B payments made during the episode are included.

• [3] Any episode in which the index admission inpatient claim has a $0 actual payment or a $0 standardized payment is excluded; $0 inpatient admissions may represent errors in the data, or payment corrections rather than actual services rendered.

• [4] Due to the uncertainty surrounding attributing episodes to hospitals in cases where the patient was transferred between acute hospitals during the index admission, acute-to-acute transfers during the index admission (where a transfer is defined based on the claim discharge code) are not considered index admissions for the purposes of the MSPB Measure. In other words, these cases will not generate new MSPB episodes; neither the hospital which transfers a patient to another short-term acute hospital, nor the receiving short-term acute hospital will have an index admission attributed to them. Although this exclusion decreases the number of eligible episodes by about 5 percent, it avoids the problem of assigning responsibility to an MSPB episode in a case where multiple hospitals treat the patient during the index admission.

• [5] In response to stakeholder comments, the FY 2012 IPPS Final Rule states that the MSPB Measure will "exclude statistical outliers from the calculation" (76 FR 51626: www.gpo.gov/fdsys/pkg/FR-2011-08-18/pdf/2011-19719.pdf). To mitigate the effect of high-cost outliers on each hospital's MSPB Measure score, MSPB episodes whose relative scores fall above the 99th percentile or below the 1st percentile of the distribution of residuals within each index admission MS-DRG are excluded from the MSPB calculation. Excluding outliers based on residuals eliminates the episodes that deviate most from their predicted values in absolute terms.

When the MSPB Measure is applied to Medicare FFS patients, exclusions are identified based on the following variables.

• [1] Episodes where Medicare is the secondary payer: if a beneficiary was the primary payer any time during the MSPB episode, the beneficiary was excluded (i.e., if bene_prmry_pyr_entlmt_strt_dt (start date of primary payer enrollment) bene_prmry_pyr_entlmt_end_dt (end date of primary payer enrollment) fell within the episode). In addition, an index hospitalization with death discharge code (STUS_CD "20" "41") was excluded. Similarly if a beneficiary's death was within an MSPB episode, the episode was excluded as well.

• [2] The MSPB Measure is calculated using only Medicare Part A and Part B claims; as a result no Medicaid claims are included in the MSPB Measure calculation.

• [3] Only when the Claim Payment Amount (Pmt_Amt) for the IP stay is greater than 0 OR Standard_allowed_amt is greater than 0 is the amount included in the MSPB Measure calculation.

• [4] An IP stay with discharge code (STUS_CD) in "02" "43" "66" or an IP stay with admission code (SRC_ADMS) in "04" is considered to be a transfer. Any IP stays with the same admsn_dt as the transfer stay or with the admsn_dt same as the dschrgdt of the transfer IP stay is also considered to be a transfer. An acute hospital is defined as those with provider variable's third position "0". Cancer hospitals, MD Hospitals (provider variable starting with "21"), emergency hospitals (provider variable last position "E" OR "F"), and Veteran's Hospitals (provider variable position "V") are also excluded.

2b.3. Exclusion Analysis

Click here to go to the developer submission for Exclusion Analysis (2b3)

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent are the inclusion/exclusion criteria well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*

2b1.The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population.	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*
2b3. Exclusions are supported by the clinical evidence. **AND/OR** There is a rationale or analysis demonstrating that the measure results are sufficiently distorted due to the magnitude and/or frequency of the non-clinical exclusions; **AND** Measure specifications for scoring include computing exclusions so that the effect on the measure is transparent (i.e., impact clearly delineated, such as number of cases excluded, exclusion rates by type of exclusion); **AND** If patient preference (e.g., informed decision-making) is a basis for exclusion, there must be evidence that the exclusion impacts performance on the measure; in such cases, the measure must be specified so that the information about patient preference and the effect on the measure is transparent (e.g., numerator category computed separately, denominator exclusion category computed separately).	**To what extent are the inclusion/exclusion criteria supported by the clinical evidence or supported by evidence of sufficient frequency and impact on performance results?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**

Adjustments for Comparability – Risk Adjustment

S.9.2. **Risk Adjustment Type** *(Select type)*

Statistical risk model

S.9.3. **Statistical risk model method and variables** *(Name the statistical method - e.g., logistic regression and list all the risk factor variables.)*

The model generally follows the CMS hierarchical condition category (HCC) risk-adjustment methodology. This model measures comorbid factors using diagnosis information from Medicare Part A and B claims. CMS uses a variant of the HCC risk-adjustment model in many payment systems including: the Medicare Advantage (MA) Capitation Payment program (implemented in 2004, fully phased-in in 2007), the Shared Savings Program Accountable Care Organizations (implemented in 2012), and the Medicare Physician Quality and Resource Use Reports (implemented in 2009). [1]

Just like the CMS-HCC model, the MSPB risk-adjustment approach uses a linear ordinary least squares (OLS) regression model. The independent variables used in the risk-adjustment model include beneficiary age, health status (as measured by hierarchical condition categories (HCCs)), disability-status, end-stage renal disease (ESRD) status, residence in a long-term care facility, and indicators for the MS-DRG of the index hospital admission. All variables are calculated using Medicare claims data during the period 90 days prior to the start of an episode. No risk-adjustment factors are determined using information contemporaneous with the MSPB episode to avoid circularity problems that would—by construction—cause the risk-adjustment factors to be correlated with episode spending. For a detailed list of explanatory variables in the risk-adjustment model, please the attached response to S.9.4.

The OLS model is stratified based on the MDC of the index admission. The use of separate models by MDC permits the effect of risk factors on episode spending to vary based on the bodily system treated during the index admission. More precisely, this approach allows the coefficient on each risk adjuster to vary by MDC.

DETAILED SPECIFICATIONS:

Although broadly relying on the CMS-HCC framework, MSPB risk-adjustment model, however, is tailored for this specific quality measure. To account for case-mix variation and other factors, the MSPB risk-adjustment methodology adjusts the MSPB Measure for five broad risk factors. These include:

•Beneficiary age
•Severity of illness using 70 HCC indicators
•Enrollment in Medicare due to disability or ESRD
•Whether the beneficiary recently required long-term care, and
•MS-DRG of the index hospitalization.

Although the CMS-HCC risk-adjustment model used in the MA setting includes 24 age/sex variables, the MSPB methodology does not adjust for patient sex; thus it only includes 12 age categorical variables in the risk-adjustment methodology. This policy is consistent with NQF's position on not adjusting for potential demographic (sex or race) or socioeconomic factors; including sex as a risk adjuster would mean that hospitals would be held to different standards of care based on the patient's sex. For similar reasons, beneficiary race is also not included as a risk adjuster. Thus, the only demographic variable included in the risk-adjustment model is beneficiary age.

Severity of illness HCC indicators are created based on Medicare Part A and Medicare Part B diagnosis code information during the time 90 days prior to the start of an episode (i.e., 93 days prior to the date of the index admission). Patients without a full 90-day look-back period have their episodes excluded from the MSPB Measure. This 90-day period prior to the start of an episode is used to measure beneficiary health status, which is used in the risk-adjustment model; this look-back period ensures that each beneficiary's claims record contains sufficient fee-for-service data both for measuring spending levels and for risk-adjustment purposes. As the length of the look-back period increases, there is a trade-off between the number of comorbidities captured and the number of false positives (i.e., diagnoses captured that may have been resolved). A longer look-back period, for example, will capture more comorbidities, while a shorter look-back period will capture fewer false positives. A longer look-back period will also decrease the number of episodes eligible to be included in the MSPB Measure calculation in the cases where a beneficiary would be required to have 365 of pre-admission Medicare enrollment to be included in the measure. Based on our analysis (see 2b4), increasing the look-back period to 365 days would not only decrease the number of valid episodes, but also would worsen the model fit. Based on these results, a 90-day look-back window is selected for the generation of the independent variables used in this risk-adjustment model.

The MSPB risk-adjustment methodology also includes status indicator variables for whether the beneficiary qualifies for Medicare through Disability or End-Stage Renal Disease (ESRD); one can view these enrollment status variables as two additional severity of illness measures, however, these variables are generated from enrollment rather than diagnosis information.

Patients who reside in long-term care facilities typically require more intensive care—particularly more intensive post-acute care—than beneficiaries who live in the community even for patients that may have illness severity measures. Thus, the risk-adjustment method also includes an indicator of whether a beneficiary resides in a long-term care facility as non-diagnostic measures of severity of illness.

This measure assumes that the reason the patient is admitted to the hospital is largely outside the control of the hospital; thus, the risk-adjustment measure also includes MS-DRG indicator variables as well. Additionally, the reason for admission directly affects payments and is predictive of post-acute care.

The relationship between comorbidities' episode cost may be non-linear in some cases. For instance, the marginal expected episode cost from having diabetes and congestive heart failure (CHF) may not be equal to the sum of the marginal expected cost from having diabetes and the marginal expected cost from having CHF. To account for these non-linearities, the MSPB risk-adjustment model also incorporates a series of interactions terms between HCCs and/or enrollment status variables that are included in the MA model.

The final set of explanatory variables in the risk-adjustment model can be found in the "MSPB Measure Information Form" available at the measure-specific web page URL identified in S.1 (see S.9.4.).

For your reference, the "Additional Information" appendix beginning on page 24 of the attached "Scientific Acceptability" section also includes regression coefficients and standard error of the covariates used in the risk-adjustment models. There are 26 tables, one for each risk adjustment by MDC.

• [1] Centers for Medicare and Medicaid Services, Office of the Actuary. "Announcement of Calendar Year (CY) 2009 Medicare Advantage Capitation Rates and Medicare Advantage and Part D Payment Policies." April 2008. http://www.cms.gov/MedicareAdvtgSpecRateStats/Downloads/Announcement2009.pdf

S.9.4. **Detailed Risk Model Specifications** *available at measure-specific Web page URL identified in S.1 OR in attached data dictionary/code list Excel or csv file.*

Available at measure-specific web page URL identified in S.1

S.9.5. **Stratification Details/Variables** *(All information required to stratify the measure results including the stratification variables, definitions, specific data collection items/responses, code/value sets)*

The risk-adjustment model is stratified by major diagnostic category (MDC). MDCs are aggregations of Diagnosis Related Groups

(MS-DRG), which CMS uses to classify acute inpatient admissions.
The MS-DRG/MDC crosswalk is available for order here:

http://solutions9.3m.com/wps/portal/!ut/p/c1/04_SB8K8xLLM9MSSzPy8xBz94NS8-NBg_Qj9KLP4IC8Py1BTI2MD9zAvFwMjYzMzCxNHd2OTACP9ggxHRQBm3gTM/

2b.4. Risk Adjustment Statistics
Click here to go to the developer submission for Risk Adjustment (2b4)

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the risk adjustment strategy well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*
2b4. An evidence-based risk-adjustment strategy (e.g., risk models, risk stratification) is specified; is based on factors that influence the measured outcome (but not factors related to disparities in care or the quality of care) and are present at start of care; and has demonstrated adequate discrimination and calibration **OR** Rationale/data support no risk-adjustment/-stratification.	**To what extent are the risk adjustment factors present at the start of care with adequate discrimination and calibration?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**

Adjustments for Comparability – Costing Method
S.9.6. Costing method *Detail the costing method including the source of cost information, steps to capture, apply or estimate cost information, and provide rationale for this methodology.*
Standardized pricing
S.9.6a. Describe the Costing method
As discussed in S.7.2., the MSPB Measure removes sources of variation which are not directly related to decisions to utilize care, such as local or regional price differences, to capture differences in beneficiary resource use that a hospital can influence through appropriate practices and care coordination. The MSPB Measure relies on a detailed price standardization methodology to exclude geographic payment rate differences; in other words, the MSPB Measure adjusts observed payments for Medicare geographic adjustment factors. A detailed price standardization description is available at the URL provided in S.1.

http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1228772057350

S.9.6b. Attach pricing table here *(Select Actual Prices Paid, Relative Value Units [RVUs], Other, or We do not provide specifications for a costing method)*

Pricing Table not provided

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the costing method well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*

Adjustments for Comparability – Scoring

S.10. **Type of Score** *(Select the most relevant)*

Ratio; Attachment

Click here to go to the sample score report

S.11. **Interpretation of Score** *(Classifies interpretation of a ratio score(s) according to whether higher or lower resource use amounts is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score, etc.)*

An MSPB Measure of 1 indicates that a hospital had average risk-adjusted spending levels which are equal to those of the median hospital. An MSPB Measure of greater than 1 indicates that a hospital had higher than average risk-adjusted spending levels compared to those of the median hospital. For example, an MSPB Measure of 1.1 indicates that the hospital had average risk-adjusted spending levels that are 10 percent higher than the median hospital. On the other hand, an MSPB Measure of less than 1 indicates that a hospital had lower than average risk-adjusted spending levels compared to those of the median hospital. For example, an MSPB Measure of 0.9 indicates that the hospital had average risk-adjusted spending levels that are 10 percent lower than the median hospital.

S.12. **Detail Score Estimation** *(Detail steps to estimate measure score.)*

A hospitals' MSPB Measure score is calculated as a hospital's average MSPB Amount divided by the median MSPB Amount across all hospitals. A hospital's MSPB Amount is defined as the sum of standardized, risk-adjusted spending across all of a hospital's eligible episodes divided by the number of episodes for that hospital. S.7.2. provides additional details describing the eight steps used to calculate hospitals' MSPB Measure values.

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the scoring method well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*

2b5. Data analysis demonstrates that methods for scoring and analysis of the specified measure allow for identification of statistically significant and practically/clinically meaningful differences in performance.	**To what extent does the scoring method allow for identification of statistically significant and practically/clinically meaningful differences in performance?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**
Comparability of Multiple Data Sources ***Measure not specified for multiple data sources – Not Applicable***	
2b6. If multiple data sources/methods are specified, there is demonstration that they produce comparable results.	**To what extent do the multiple data sources/methods produce comparable results?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient** ☐ **Not Applicable**
Reliability Testing ***Click here to go to the developer submission for Reliability Testing (2a2)***	
2a2. Reliability testing demonstrates the measure data elements are repeatable, producing the same results a high proportion of the time when assessed in the same population in the same time period and/or that the measure score is precise.	☐ **High** *(Data element **AND** measure score reliability testing done and is acceptable)* ☐ **Moderate** *(Data element **OR** measure score reliability testing is done and acceptable)* ☐ **Low** *(There is empirical evidence of Unreliability for either data elements or measure score)* ☐ **Insufficient** *(Inappropriate method or scope of reliability testing)*
Validity Testing ***Click here to go to the developer submission for Validity Testing (2b2)***	

2b2. Validity testing demonstrates that the measure data elements are correct and/or the measure score correctly reflects the quality of care provided, adequately identifying differences in quality.	☐ **High** *(Data element **AND** measure score were tested with the appropriate method, scope and the results are within acceptable norms **AND** Threats to validity are empirically assessed and adequately addressed; measure results are not biased)* ☐ **Moderate** *(Data element **OR** measure score were tested with the appropriate method, scope and the results are within acceptable norms **OR** face validity was systematically assessed **AND** Threats to validity are empirically assessed and adequately addressed; measure results are not biased)* ☐ **Low** *(Statistical results of the testing of data element OR measure score are outside of acceptable norms **OR** Threats to validity have not been addressed and the measure score is bias.)* ☐ **Insufficient** *(Inappropriate method or scope of testing; inadequate assessment of face validity)*

2a. Overall Reliability

2a1. Construction Logic	**H/M**		**L**	
2a1. Clinical Logic	**H/M**		**L**	
2a1. Adjustments for Comparability – Inclusion/Exclusion Criteria	**H/M**		**L**	
2a1. Adjustments for Comparability – Risk Adjustment	**H/M**		**L**	
2a1. Adjustments for Comparability – Costing Method	**H/M**		**L**	
2a1. Adjustments for Comparability – Scoring	**H/M**		**L**	
2a2. Reliability Testing	**H**	**M**	**L**	**I**

Based on your ratings for the above criteria, how would you rate the overall reliability of this measure? How well overall has the developer demonstrated the measure results are repeatable and can be implemented consistently?

☐ **High** *(Specifications are unambiguous; data element **AND** measure score reliability testing done and is acceptable)*
☐ **Moderate** *(Specifications are unambiguous and data element **OR** measure score reliability testing is done and acceptable)*
☐ **Low** *(One or more specifications are ambiguous **OR** there is empirical evidence of unreliability for either data elements or measure score)*
☐ **Insufficient** *(Inappropriate method or scope of reliability testing)*

Rationale:

2b. Overall Validity

2b1. Construction Logic	H/M L
2b1. Clinical Logic	H/M L
2b1. Adjustments for Comparability – Inclusion/Exclusion Criteria	H/M L
2b3. Exclusions	H M L I
2b1. Adjustments for Comparability – Risk Adjustment	H/M L
2b4. Risk Adjustment	H M L I
2b1. Adjustments for Comparability – Costing Method	H/M L
2b1. Adjustments for Comparability – Scoring	H/M L
2b5. Significant Differences in Performance	H M L I
2b6. Comparability of Multiple Data Sources	H M L I NA
2b2. Validity Testing	H M L I

Based on your ratings for the above criteria, how would you rate the overall validity of this measure? How well overall has the developer demonstrated this measure is valid?

☐ **High** *(Data element **AND** measure score were tested with the appropriate method, scope and the results are within acceptable norms **AND** Threats to validity are empirically assessed and adequately addressed; measure results are not biased)*
☐ **Moderate** *(Data element **OR** measure score were tested with the appropriate method, scope and the results are within acceptable norms **OR** face validity was systematically assessed **AND** Threats to validity are empirically assessed and adequately addressed; measure results are not biased)*
☐ **Low** *(Statistical results of the testing of data element **OR** measure score are outside of acceptable norms **OR** Threats to validity have not been addressed and the measure score is bias.)*
☐ **Insufficient** *(Inappropriate method or scope of testing; inadequate assessment of face validity)*

Rationale:

2c. Disparities in Care

If disparities in care have been identified, measure specifications, scoring, and analysis allow for identification of disparities through stratification of results (e.g., by race, ethnicity, socioeconomic status, gender)
OR
Rationale/data justifies why stratification is not necessary or not feasible.

SA.10.1. **If measure is stratified for disparities, provide stratified results** *(Scores by stratified categories/cohorts)*
N/A

SA.10.2. **If disparities have been reported/identified, but measure is not specified to detect disparities, please explain.**
Although poor MSPB scores could be due to low quality care, it could also be the case that unobservable factors (e.g., large populations of patients for whom English is a second language, low

To what extent do the measure specifications, scoring, and analysis allow for identification of disparities through stratification of results (Refer to item IM2.4 for summary of disparities data)?

☐ **High**
☐ **Moderate**
☐ **Low**

adherence to treatment regimens) cause these hospitals to perform worse.

To identify hospitals that treat a large number of socioeconomically disadvantaged patients, the following analysis classifies hospitals by their Disproportionate Share Hospital (DSH) percentage. The Medicare DSH percentage is equal to the sum of the percentage of Medicare inpatient days attributable to patients entitled to both Medicare Part A and Supplemental Security Income and the percentage of total inpatient days attributable to patients eligible for Medicaid but not eligible for Medicare Part A.

Table X stratifies hospitals' MSPB Measure performance by DSH percentage. The table shows that hospitals with a DSH percentage over 65 have an average MSPB Measure value of 0.979. This value is close to that of hospitals with a DSH percentage from 0-25, which have an average MSPB Measure value of 0.982. The distribution of average MSPB Amounts for all DSH percentage stratifications is also similar. Additionally, the correlation of MSPB Measure values with DSH percentage is near zero: 0.005. These results suggest that MSPB Measure performance is not correlated with a hospital's DSH status.

Table X: Impact Analysis by DSH Percentage

	N	Average MSPB Measure	Min	Percentiles					Max	Avg MSPB Amount
				10th	25th	50th	75th	90th		
DSH Percentage										
0-25	1,668	0.982	0.56	0.87	0.94	0.99	1.03	1.08	1.73	17,657
25-50	1,377	0.979	0.48	0.88	0.93	0.98	1.03	1.08	1.32	17,612
50-65	167	1.000	0.64	0.88	0.94	1.00	1.04	1.12	1.49	17,983
Over 65	171	0.979	0.32	0.84	0.90	0.99	1.06	1.12	1.44	17,615
Uncategorized	13	1.026	0.80	0.80	0.92	0.96	1.00	1.11	2.07	18,449

On the other hand, recall from Questions 2b3.1, 2b3.2, and 2b3.3 that MSPB episodes for beneficiaries who are eligible for Medicare and Medicaid (dual-eligible beneficiaries) cost, on average, $859 more than episodes for non-dual-eligible beneficiaries. Similarly, average expected cost of episodes with dual-eligible beneficiaries is $128 and $84 more expensive before and after excluding MSPB outlier episodes, respectively. Because Medicaid eligibility is highly correlated with income, Medicaid eligibility can be considered a proxy for socioeconomic status. As such, these results suggest that socioeconomically disadvantaged beneficiaries, as identified by dual-eligibility, may have higher average episode costs than non-socioeconomically disadvantaged beneficiaries, as identified by non-dual-eligibility, even after risk adjustment for other factors. At the hospital level, however, hospitals with higher percentages of dual-eligible episodes have similar MSPB Measure values; hospitals with dual-eligible episodes accounting for less than 25 percent of total episodes have an average MSPB Measure value of 0.980, while hospitals with dual-eligible episodes accounting for more than 75 percent of total episodes have a slightly higher average MSPB Measure value of 0.982. The correlation between the MSPB measure and the percentage of a hospital's episodes that are for dual-eligible beneficiaries is only 0.007. These findings present a mixed conclusion: while dual-eligible beneficiaries are more expensive per episode, hospitals with higher shares of duals and higher DSH percentages do not generally have worse MSPB measures than other hospitals.

Dual-eligible beneficiaries are not excluded from the MSPB Measure. First, care for dual-eligible beneficiaries represents a substantial portion of MSPB episodes and Medicare payments. In fact, 30% of episodes are flagged as dual-eligible beneficiaries, and 18% of hospitals assigned an MSPB Measure have a beneficiary population consisting of at least 50% dual-eligible

☐ **Insufficient**

beneficiaries. Revising the MSPB Measure to exclude MSPB episodes for Medicare beneficiaries who are dual-eligible would result in large changes to MSPB Measure values; Table Y shows that only 43 percent of hospitals would experience a change in their MSPB Measure values of less than 1 percent.

CMS adopted a position in the FY 2012 IPPS Final Rule that the MSPB Measure is risk adjusted based on beneficiaries' underlying health status, not socioeconomic factors, such as race or dual-eligible status to be consistent with NQF's position on not adjusting for socioeconomic factors (76 FR 51524-25). Again, because Medicaid eligibility is highly correlated with income, Medicaid eligibility can be considered a proxy for socioeconomic status; as a result, dual-eligibility was not included as a risk adjuster. If one were to include an indicator for dual-eligible status in the risk adjustment model, most hospitals experience only a small change in their MSPB Measure values; Table Z shows that 88% of hospitals experience a gain or loss in the MSPB Measure values of less than 1%. In addition, controlling for dual-eligible status leads to a very small improvement (one tenth of one percent) in the R-squared value of the regression.

Table Y: Impact Analysis, Excluding Dual-Eligible Beneficiaries

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,386**	**100**
> 0.10	37	1.1
0.03 to 0.10	230	6.8
0.01 to 0.03	672	19.8
0.00 to 0.01	**790**	**23.3**
-0.01 to 0.00	**667**	**19.7**
-0.03 to -0.01	585	17.3
-0.10 to -0.03	346	10.2
< -0.10	59	1.7

Table Z: Impact Analysis, Including Dual-Eligible Risk Adjuster

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,396**	**100**
> 0.10	0	0.0
0.03 to 0.10	5	0.1
0.01 to 0.03	34	1.0
0.00 to 0.01	**1,150**	**44.5**
-0.01 to 0.00	**1,469**	**43.3**
-0.03 to -0.01	366	10.8
-0.10 to -0.03	12	0.4
< -0.10	0	0.0

3. Feasibility

Extent to which the required data are readily available or could be captured without undue burden, and can be implemented for performance measurement.

3a. Byproduct of Care Processes

For clinical measures, the required data elements are routinely generated and used during care delivery (e.g., blood pressure, lab test, diagnosis, medication order).

F.1. **Data Elements Generated as Byproduct of Care Processes.**

Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims)

If other:

To what extent are the data elements generated as byproducts of care processes?

☐ High
☐ Moderate
☐ Low
☐ Insufficient

3b. Electronic Sources

The required data elements are available in electronic health records or other electronic sources. If the required data are not in electronic health records or existing electronic sources, a credible, near-term path to electronic collection is specified.

F.2. **To what extent are the specified data elements available electronically in defined fields?**

ALL data elements are in defined fields in electronic claims

To what extent are the data elements available in electronic health records or other electronic sources?

☐ High
☐ Moderate
☐ Low
☐ Insufficient

3c. Data Collection Strategy

Demonstration that the data collection strategy (e.g., source, timing, frequency, sampling, patient confidentiality, costs associated with fees/licensing of proprietary measures) can be implemented (e.g., already in operational use, or testing demonstrates that it is ready to put into operational use).

F.4. **Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues.**

CMS uses Medicare claims data that hospitals submit to CMS for payment to calculate the MSPB Measure. As a result, the required data are readily available and retrievable without undue burden. In fact, Acumen has already acquired all the data needed and has already calculated the MSPB Measure. These claims data used are maintained by CMS's Office of Information System. These data undergo additional quality assurance checks during measure development and maintenance. Specifically, CMS has in place several hospital auditing programs used to assess overall claims code accuracy, ensure appropriate billing, and for overpayment recoupment. CMS routinely conducts data analyses to identify potential problem areas and detect fraud. CMS also audits important data fields, including diagnosis and procedure codes, as well as other elements that are consequential to payment. Specifically, CMS works with Program Safeguard Contractors (PSCs)/Zone Program Integrity Contractors (ZIPCs) to ensure program integrity; the agency also uses Comprehensive Error Rate Testing (CERT) Contractors to ensure that Medicare payments are correct. Between 2000 and 2010, CERT estimates that improper payment ranged from 4 to 12 percent of total payments each year. (Comprehensive Error Rate Testing (CERT) Program: http://www.cms.gov/Research-Statistics-Data-and-Systems/Monitoring-Programs/CERT/Downloads/CERT_101.pdf)

During the data preview for the MSPB Measure, each hospital receives a Hospital-Specific Report

To what extent can the data collection strategy be implemented?

☐ High
☐ Moderate
☐ Low
☐ Insufficient

(HSR) that provides information on the hospital's performance on the MSPB Measure, as well as three supplementary hospital-specific data files (an index admission file, a beneficiary risk score file, and an MSPB episode file) related to the hospital's MSPB Measure. Together, these files provide an overview of how the hospital performed on the MSPB Measure as well as a summary of how hospitals in the state and in the nation performed. For example, each hospital's files provide the number of eligible admissions, average spending per episode, MSPB Amount, and MSPB Measure for the hospital as well as for the state and the nation. Additionally, each hospital's MSPB spending is broken into three categories (i.e., 3 days prior to index admission, during-index admission, and 30 days after hospital discharge), and within these categories, spending levels are broken down by claim type. For comparison, the state and national values for these breakdowns are given to hospitals as well. Further, each hospital's average spending and average expected spending (based on beneficiary age and health status) breakdowns by Major Diagnostic Category (MDC) are presented in the hospital's HSR alongside analogous values at the state and national levels to allow the hospital to compare its case mix against the state and the nation. In addition to helping hospitals verify their MSPB Measure scores and identify opportunities to improve efficiency, providing these files allows us to better communicate MSPB scores to hospitals and allows hospitals to provide informed feedback to Acumen and CMS. During the 30-day preview periods, Acumen and CMS received no reports of errors in the measure's calculation.

F.5. **Describe any fees, licensing, or other requirements to use any aspect of the measure as specified.**

There are no fees, licensing, or other requirements for use of the MSPB Measure values and MSPB Measure spending breakdowns made publicly available on Hospital Compare.

F.5.a. **If there are any fees associated with the use of this measure as specified, attach the fee schedule here**

3. Overall Feasibility

3a. Byproduct of Care Processes	H	M	L	I
3b. Electronic Sources	H	M	L	I
3c. Data Collection Strategy	H	M	L	I

Based on your rating of the subcriteria, make a summary determination of the extent to which the criterion of **Feasibility** has been met. Please provide a rationale based on specific subcriteria.

Rationale:

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

4. Usability and Use

Extent to which potential audiences (e.g., consumers, purchasers, providers, policymakers) are using or could use performance results for both accountability and performance improvement to achieve the goal of high-quality, efficient healthcare for individuals or populations.

4a. Accountability and Transparency

Performance results are used in at least one accountability application within three years after initial endorsement and are publicly reported within six years after initial endorsement (or the data on performance results are available). If not in use at the time of initial endorsement, then a

To what extent have performance results been used in

credible plan for implementation within the specified timeframes is provided.

U.1. Current and Planned Use

NQF-endorsed measures are expected to be used in at least one accountability application within 3 years and publicly reported within 6 years of initial endorsement in addition to performance improvement.

Planned	Current	For Current use, Provide URL
Payment Program	Public Reporting Quality Improvement with Benchmarking (external benchmarking to multiple organizations) Quality Improvement (Internal to the specific organization)	http://www.medicare.gov/hospitalcompare/?AspxAutoDetectCookieSupport=1; http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/hospital-value-based-purchasing/index.html http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/hospital-value-based-purchasing/index.html http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/hospital-value-based-purchasing/index.html

U.1.1. For each CURRENT use, checked above, provide:

- Name of program and sponsor
- Purpose
- Geographic area and number and percentage of accountable entities and patients included

Public Reporting (Current):
Program Name: Hospital Compare(http://www.medicare.gov/hospitalcompare/?AspxAutoDetectCookieSupport=1)
Sponsor: CMS
Purpose: Hospital Compare has information about the quality of care at over 4,000 Medicare-certified hospitals across the country. The public can use Hospital Compare to find hospitals and compare the quality of their care. Specifically, hospitals' MSPB Measure values will be publicly reported on the Hospital Compare website. However, only hospitals with 25 or more eligible episodes will have their MSPB values posted. This requirement reduces the likelihood that a hospital's MSPB Measure is skewed by a few high- or low-cost episodes.
Geographic Area: U.S.
Number/Percentage of Accountable Entities: 3,324 hospitals out of 3,376 hospitals eligible to receive an MSPB Measure value (98.5%) during the May 1, 2011 - December 31, 2011 period of performance
Number/Percentage of Patients Hospitalized in the Period of Performance: 3,109,463 beneficiaries out of 3,116,543 (9.8%) in the May 15, 2010 - February 14, 2011 period of performance
Quality Improvement with Benchmarking (External Benchmarking to Multiple Organizations)

accountability applications or a credible plan for use has been provided?

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

Program Name: Hospital Value-Based Purchasing (http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/hospital-value-based-purchasing/index.html)
Sponsor: CMS
Purpose: Section 3001 of the Patient Protection and Affordable Care Act (ACA) establishes the Hospital Value-Based Purchasing (VBP) program. The Hospital VBP program provides financial incentives to subsection (d) hospitals based on their performance on selected quality measures. Section 1886(o)(2)(B)(ii) of the Social Security Act, 3001 of the Patient Protection and Affordable Care Act requires that CMS implement a measure of Medicare Spending Per Beneficiary as part of it Hospital Value-Based Purchasing (VBP) initiatives. The hospital performance score for a performance period will be determined using a higher of its achievement or improvement score for the MSPB Measure as described in the FY 2012 IPPS Final Rule at 76 FR 51654-56. The MSPB Measure score will be incorporated into the HVBP Program as part of the Efficiency domain. Because the MSPB Measure is the only measure currently in the Efficiency domain, the total points earned for the domain would be the points earned on the MSPB Measure. Each hospital's Total Performance Score (TPS), used to calculate each hospital's incentive payment, is calculated by combining its component domain scores. A hospital's achievement score is calculated from a comparison of the hospital's MSPB Measure value against the median MSPB Measure value across all hospitals during the period of performance.
Geographic Area: U.S.
Number/Percentage of Accountable Entities: 3,375 hospitals received MSPB Measure values out of 3,506 hospitals in the FY 2015 Hospital VBP program (96.3%)
Number/Percentage of Patients: N/A
Quality Improvement (Internal to the specific organization)

Program Name: Hospital Value-Based Purchasing (http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/hospital-value-based-purchasing/index.html)
Sponsor: CMS
Purpose: Section 3001 of the Patient Protection and Affordable Care Act (ACA) establishes the Hospital Value-Based Purchasing (VBP) program. The Hospital VBP program provides financial incentives to subsection (d) hospitals based on their performance on selected quality measures. Section 1886(o)(2)(B)(ii) of the Social Security Act, 3001 of the Patient Protection and Affordable Care Act requires that CMS implement a measure of Medicare Spending Per Beneficiary as part of it Hospital Value-Based Purchasing (VBP) initiatives. The hospital performance score for a performance period will be determined using a higher of its achievement or improvement score for the MSPB Measure as described in the FY 2012 IPPS Final Rule at 76 FR 51654-56. The MSPB Measure score will be incorporated into the HVBP Program as part of the Efficiency domain. Because the MSPB Measure is the only measure currently in the Efficiency domain, the total points earned for the domain would be the points earned on the MSPB Measure. Each hospital's Total Performance Score (TPS), used to calculate each hospital's incentive payment, is calculated by combining its component domain scores. A hospital's improvement score is calculated from a comparison of the hospital's MSPB Measure value during a period of performance against the MSPB Measure value during a baseline period. Additionally, CMS provides each eligible hospital a confidential Hospital-Specific Report (HSR) that provides information on its performance on the MSPB Measure. These reports, along with the accompanying confidential data files, can be used by hospitals to validate the calculation of their MSPB Measure values.
Geographic Area: U.S.
Number/Percentage of Accountable Entities: 3,375 hospitals received MSPB Measure values out of 3,506 hospitals in the FY 2015 Hospital VBP program (96.3%); additionally, 3,322 hospitals out of 3,376 hospitals eligible to receive an MSPB Measure score (98.4%) received HSRs for the May 1, 2011 to December 31, 2011 period of performance
Number/Percentage of Patients: N/A

U.1.2. **If not currently publicly reported OR used in at least one other accountability application**

(e.g., payment program, certification, licensing) what are the reasons? N/A U.1.3. **If not currently publicly reported OR used in at least one accountability application, provide a credible plan for implementation within the expected timeframes -- any accountability application within 3 years and publicly reported within 6 years of initial endorsement.** N/A	
4b. Improvement Progress toward achieving the goal of high-quality, efficient healthcare for individuals or populations is demonstrated. If not in use for performance improvement at the time of initial endorsement, then a credible rationale describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations. U.2.1. **Provide data that demonstrate improvement in performance and/or health.** N/A U.2.2. **If no improvement was demonstrated, what are the reasons? If not in use for performance improvement at the time of initial endorsement, provide a credible rationale that describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.** N/A	**To what extent has progress toward high-quality, efficient healthcare been demonstrated or a credible rationale has been provided?** ☐ High ☐ Moderate ☐ Low ☐ Insufficient
4c. Unintended Consequences The benefits of the performance measure in facilitating progress toward achieving high-quality, efficient healthcare for individuals or populations outweigh evidence of unintended negative consequences to individuals or populations (if such evidence exists). U.3. **Were any unintended negative consequences to individuals or populations identified during testing; OR has evidence of unintended negative consequences to individuals or populations been reported since implementation? If so, identify the negative unintended consequences and describe how benefits outweigh them or actions taken to mitigate them.** No unintended consequences to individuals or populations have been identified during testing, and no evidence of unintended negative consequences to individuals or populations have been reported since implementation.	**To what extent do the benefits of the measure outweigh any evidence of unintended negative consequences?** ☐ High ☐ Moderate ☐ Low ☐ Insufficient
4d. Measure Deconstruction Data and result detail are maintained such that the resource use measure, including the clinical and construction logic for a defined unit of measurement can be deconstructed to facilitate transparency and understanding.	**Based on your review of the specifications, to what extent can the measure be deconstructed to facilitate transparency and understanding for those being measured (e.g., clinicians, hospitals) and those using the measure results (e.g., consumers, purchasers)?** ☐ High

	☐ **Moderate** ☐ **Low** ☐ **Insufficient**

4. Overall Usability and Use

4a. Accountability and Transparency	**H**	**M**	**L**	**I**
4b. Improvement	**H**	**M**	**L**	**I**
4c. Unintended Consequences	**H**	**M**	**L**	**I**
4d. Measure Deconstruction	**H**	**M**	**L**	**I**

Based on your rating of the subcriteria, make a summary determination of the extent to which the criterion of **Usability and Use** has been met. Please provide a rationale based on specific subcriteria.

Rationale:

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

5. Comparison to Related or Competing Measures

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure.

5a. Harmonization

The measure specifications are harmonized with related measures;
OR
The differences in specifications are justified

H.1. If there are related measures (conceptually, either same measure focus or target population) or competing measures (conceptually both the same measure focus and same target population), select the NQF # and title of all related and/or competing measures.
N/A

H.1.1. If this measure conceptually addresses EITHER the same measure focus OR the same target population as NQF-endorsed measure(s): Are the measure specifications completely harmonized?
N/A

H.1.2. If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden.
N/A

5b. Competing Measures

The measure is superior to competing measures (e.g., is a more valid or efficient way to measure);
OR
Multiple measures are justified.

H.1. If there are related measures (conceptually, either same measure focus or target population) or competing measures (conceptually both the same measure focus and same target population), select the NQF # and title of all related and/or competing measures.

N/A

H.1.3. If this measure conceptually addresses both the same measure focus and the same target population as NQF-endorsed measure(s): Describe why this measure is superior to competing measures (e.g., a more valid or efficient way to measure quality); OR provide a rationale for the additive value of endorsing an additional measure. (Provide analyses when possible.)

The MSPB Measure evaluates hospitals' efficiency relative to the efficiency of the median hospital. The target population is Medicare beneficiaries enrolled in Medicare Parts A and B who were discharged from short-term acute hospitals. There are currently no NQF-endorsed measures that address both this same measure focus AND this same target population.

Preliminary Recommendation for Endorsement

In this section we ask for your preliminary recommendation for this measure on its overall suitability for endorsement. Based on your individual rating of each of the four major criteria, provide your initial recommendation for endorsement for this measure.

Based on your individual rating of all the criteria, does the measure meet the criteria to be suitable for endorsement?

1. Importance to Measure and Report	H	M	L	I
2a. Overall Reliability	H	M	L	I
2b. Overall Validity	H	M	L	I
2c. Disparities in Care	H	M	L	I
3. Feasibility	H	M	L	I
4. Usability and Use	H	M	L	I

Rationale:

☐ **Yes**
☐ **No**

Appendix A

Reporting Guidelines (Optional)

S.13.1. **Describe discriminating results approach** *Detail methods for discriminating differences (reporting with descriptive statistics--e.g., distribution, confidence intervals).*

The distribution of hospitals' MSPB Measure scores for the period of May 15, 2010 through February 14, 2011 is as follows:
Maximum: 2.07
90th Percentile: 1.08
75th Percentile: 1.03
50th Percentile: 0.99
25th Percentile: 0.93
10th Percentile: 0.87
Minimum: 0.32

This distribution of hospitals' MSPB Measure values is provided to hospitals as part of their hospital specific reports (HSRs). Recall from S.7.2. that the denominator of the MSPB Measure is weighted by the number of episodes; as a result, the median hospital MSPB Measure score is not necessarily always equal to one.

For public reporting purposes, hospitals' MSPB Measure values are currently displayed on Hospital Compare. Currently, however, CMS is working to display state and national MSPB Measure averages as well. [Note that only hospitals with at least 25 eligible admissions have their MSPB score published on Hospital Compare].

Because CMS uses the full population of Medicare Parts A and B claims data to calculate the MSPB Measure and due to the large sample sizes, confidence intervals are of limited value. The calculated MSPB Measure represents the true measure for the time period of interest; in this case, the interpretation of the confidence interval is not entirely clear. Further, most hospitals have a large number of episodes and thus any reported confidence intervals calculated using standard statistical methods would be fairly narrow. About 96% of hospitals have 50 or more episodes and 93% of hospitals have 100 or more MSPB episodes.

S.13.2. **Detail attribution approach** *Detail the attribution rules used for attributing resources/costs to providers (e.g., a proportion of total measure cost or frequency of visits during the measure's measurement period) and provide rationale for this methodology.*

The MSPB episode is attributed to the hospital on the trigger inpatient claim for the index hospital admission that begins an MSPB episode. Specifically, for any period of performance selected, the first set of hospitalizations that can be included in the MSPB Measure are those that begin on the fourth day of the period of performance. This permits sufficient data for the 3-day pre-hospitalization period. Hospitalizations eligible to start an MSPB episode also must end in a discharge 30 days prior to the end of the period of performance to permit the collection of claim information during the post-discharge period. For instance, for the current MSPB figures available on Hospital Compare, the period of performance is May 1, 2011 to December 31, 2011. In this case, hospitalizations that start on May 4 and have a discharge date before December 1 are eligible to be included as index admissions. As discussed in S.9.1., however, due to the uncertainty surrounding attributing episodes to hospitals in cases where the patient was transferred between acute hospitals during the index admission, acute-to-acute transfers during the index admission are not considered index admissions for the purposes of the MSPB Measure. In other words, these cases will not generate new MSPB episodes; neither the hospital which transfers a patient to another short-term acute hospital, nor the receiving short-term acute hospital will have an index admission attributed to them.

S.13.3. **Identify and define peer group** *Identify the peer group and detail how peer group is identified and provide rationale for this methodology.*

All short-term acute hospitals.

In the current MSPB approach, only short-term acute episodes paid via Medicare inpatient prospective payment system (IPPS) are included in the measure. Only claims for beneficiaries admitted to short-term acute hospitals during the period of performance are included in the calculation of the MSPB Measure. Short-term acute hospitals are hospitals in the 50 States and D.C. other than: psychiatric hospitals, rehabilitation hospitals and long-term care hospitals. The measure also excludes inpatient facilities whose patients are predominantly under 18 years old, hospitals whose average inpatient length of stay exceeds 25 days, and hospitals involved extensively in treatment for or research on cancer. [1] The claims for inpatient admissions to short-term acute hospitals are grouped into "stays" by beneficiary, admission date, and provider.

Although this measure was developed for public reporting and incentive payment programs for hospitals that Medicare pays under the IPPS system, one can readily expand this measure to include hospitals outside of the IPPS system, such as hospitals in Maryland

and other non-IPPS hospitals. To incorporate these hospitals into the IPPS requires price-standardizing their reimbursements in a way that measures what they would have been paid if Medicare had reimbursed them under an IPPS framework. Because Maryland hospitals, for example, report MS-DRGs, one can assign the IPPS payment rates to each MS-DRG to standardize the inpatient admission to hospitals in Maryland hospitals. These hospitals, however, do report outlier payments on their claims. One can utilize cost and charge data and cost-to-charge ratios from hospital claims and cost reports to estimate what outlier payment these non-IPPS hospitals would have received if they were to be paid under IPPS. The methodology to implement this updated price standardization has already been created and can be readily implemented. In fact, implementing this methodology has little effect on hospitals' MSPB Measure values for the May 1, 2011 – December 31, 2011 period of performance; approximately 98% of current hospitals' MSPB Measure values change by ±0.01 when including Maryland hospitals. [2]

• [1] The MSPB uses the CMS definition of a cancer hospital: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/PPS_Exc_Cancer_Hospasp.html

• [2] These results reflect the effects of including Maryland hospitals and Railroad Retirement Board (RRB) beneficiaries in the MSPB risk adjustment.

S.13.4. **Sample size** ***Detail the sample size requirements for reporting measure results.***

For the May 15, 2010 to February 14, 2011 period of performance, hospitals' MSPB Measure scores were publicly reported on Hospital Compare for hospitals with 10 or more eligible episodes. Out of 3,396 IPPS hospitals eligible for a MSPB Measure score, only 28 were not reported on Hospital Compare because they did not meet this minimum threshold. For the May 1, 2011 to December 31, 2011 period of performance, however, hospitals' MSPB Measure scores will be publicly reported on Hospital Compare for hospitals with 25 or more eligible episodes. Only 0.82 percent of hospitals did not have at least 25 admissions during this period. 2a2.3 presents analyses supporting this minimum number of cases required for the MSPB Measure.

S.13.5. **Define benchmarking and comparative estimates** *Detail steps to produce benchmarking and comparative estimates and provide rationale for this methodology.*

The MSPB Measure itself is not calculated using benchmarks but is a comparison between a given hospital's MSPB Amount and that of the median hospital nationally. The measure is expressed as a ratio to that national amount, wherein a measure rate of less than one indicates lower Medicare spending than the national median, a ratio of one indicates spending that is equivalent to the national median, and a rate of greater than one indicates spending that is greater than the national median.

The MSPB Measure can be scored against benchmarks for the purpose of inclusion in incentive payment or other performance measurement programs. In this way, value in healthcare can be recognized and incentivized. The Hospital Value-Based Purchasing (VBP) Program provides financial incentives to short-term acute hospitals based on their performance on selected quality measures. By measuring the cost of care through the MSPB Measure, CMS aims to recognize hospitals that can provide high quality care at a lower cost to Medicare. Combined with the other quality measures that comprise the Total Performance Score (TPS) under the Hospital VBP Program, the MSPB Measure allows CMS to assess the value of care and incentivize both achievement and improvement in efficiency.

Under the Hospital VBP Program, hospital performance on the MSPB measure will be determined using the higher of its achievement or improvement score, as described in the FY 2012 IPPS Final Rule at 76 FR 51654-56. The MSPB measure score will then be included in the hospital's Total Performance Score (TPS) within the new "Efficiency" domain.

For information on how the MSPB Measure score will be incorporated into the Hospital VBP Program, please refer to the FY 2012 IPPS/LTCH PPS final rule: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY-2012-IPPS-Final-Rule-Home-Page.html

Appendix B

Citations

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Additional Information

Workgroup/Expert Panel involved in measure development
Ad.1 **Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.**

Measure Developer/Steward Updates and Ongoing Maintenance
Ad.3 **Year the measure was first released:** 2012
Ad.4 **Month and Year of most recent revision:** 12/2012
Ad.5 **What is your frequency for review/update of this measure?** Yearly
Ad.6 **When is the next scheduled review/update for this measure?** 07/2013

Ad.7 **Copyright statement:**
Ad.8 **Disclaimers:**
Ad.9 **Additional Information/Comments:**

Measure Testing to Demonstrate Scientific Acceptability of Measure Properties

Measure Title: Medicare Spending Per Beneficiary (MSPB)
Date of Submission: 1/31/2013
Type of Measure: Cost and Resource Use 2012

☐ Composite	☐Outcome
☒Cost/resource	☐Process
☐Efficiency	☐Structure

This Word document template must be used to submit information for measure testing.

- **For all measures, sections 1, 2a2, 2b2, 2b3, 2b5 must be completed**
- **For outcome or resource use measures**, section **2b4** also must be completed
- If specified for **multiple data sources** (e.g., claims and medical records), section **2b6** also must be completed
- Respond to all questions with answers immediately following the question (*unless meet the skip criteria or those that are indicated as optional*).
- Maximum of 10 pages (*incuding questions/instructions; do not change margins or font size; contact project staff if need more pages*)
- All information on testing to demonstrate meeting the criteria for scientific acceptability of measure properties (2a,2b) must be in this form. An appendix for *supplemental* materials may be submitted, but there is no guarantee it will be reviewed.

1. DATA/SAMPLE USED FOR ALL TESTING OF THIS MEASURE
Often the same data are used for all aspects of measure testing. In an effort to eliminate duplication, the first five questions apply to all measure testing. If there are differences by aspect of testing,(e.g., reliability vs. validity) be sure to indicate the specific differences in question 7.

1.1. What type of data was used for testing? (*Check all the sources of data identified in the measure specifications and data used for testing the measure. Testing must be provided for all the types of data specified and intended for measure implementation*)

Measure Specified to Use Data From:	Measure Tested with Data From:
☐abstracted from paper record	☐abstracted from paper record
☐administrative claims	☒administrative claims
☐clinical database/registry	☐clinical database/registry
☐abstracted from electronic health record	☐abstracted from electronic health record
☐eMeasure implemented in electronic health record	☐eMeasure implemented in electronic health record
☐other: Click here to describe	☐other: Click here to describe

1.2. If used an existing dataset, identify the specific dataset (*the dataset used for testing must be consistent with the measure specifications for target population and healthcare entities being measured; e.g., Medicare Part A claims, Medicaid claims, other commercial insurance, nursing home MDS, home health OASIS, clinical registry*).
Medicare Parts A and B claims data from the Common Working File (CWF).

1.3. What are the dates of the data used in testing? May 15, 2010 – February 14, 2011

1.4. What levels of analysis were tested? (*testing must be provided for all the levels specified and intended for measure implementation, e.g., individual clinician, hospital, health plan*)
☐ **individual clinician** ☐ **group/practice** ☒ **hospital/facility/agency** ☐ **health plan**
☐ **other**: Click here to describe

1.5. How many and which measured entities were included in the testing and analysis (by level of analysis and data source)? (*identify the number and descriptive characteristics of measured entities included in the analysis (e.g., size, location, type); if a sample was used, describe how entities were selected for inclusion in the sample*)
3,396 IPPS hospitals received an MSPB Measure value (5/15/2010-2/14/2011 period of performance)

1.6. How many and which patients were included in the testing and analysis (by level of analysis and data source)? (*identify the number and descriptive characteristics of patients included in the analysis (e.g., age, sex, race, diagnosis); if a sample was used, describe how patients were selected for inclusion in the sample*)
3,566,422 beneficiaries. These beneficiaries are enrolled Medicare fee-for-service and were discharged from short-term acute hospitals between (5/15/2010 and 2/14/2011)

1.7. If there are differences in the data or sample used for different aspects of testing (e.g., reliability, validity, exclusions, risk adjustment), identify how the data or sample are different for each aspect of testing reported below.
The data samples used for the different aspects of testing below are identical.

2a2. RELIABILITY TESTING
***Note**: If accuracy/correctness (validity) of data elements was empirically tested, separate reliability testing of data elements is not required – report validity of data elements in 2b2*

2a2.1. What level of reliability testing was conducted? (*may be one or both levels*)
☐ **Critical data elements used in the measure** (*e.g., inter-abstractor reliability*)
☒ **Performance measure score** (e.g., *signal-to-noise*)

2a2.2. For each level checked above, describe the method of reliability testing and what it tests (*describe the steps—do not just name a method; what type of error does it test; what statistical analysis was used*)

Data Element Reliability: Due to CMS's extensive auditing program, we believe that patient demographics, diagnostic information, and payment information are very reliable. As described in F.4., CMS uses various auditing programs used to assess overall claims code accuracy, to ensure appropriate billing, and for overpayment recoupment. CMS also routinely conducts data analysis to identify potential problem areas and detect fraud, and audits important data fields used in our measures.

Measure Reliability: The reliability of a measurement is the degree to which repeated measurements of the same entity agree with each other. For measures of hospital performance, the measured entity is naturally the hospital, and reliability is the extent to which repeated measurements of the same hospital give similar results. To estimate measure reliability, we utilize four approaches: (1) Test/Retest, (2) Seasonality, (3) Reliability Score, and (4) Bootstrapping.

Our first approach to assessing reliability is to consider the extent to which assessments of a hospital using different but randomly selected subsets of patients produces similar measures of hospital performance. That is, we take a "test-retest" approach in which hospital performance is measured once using a random subset of patients, then measured again using a second subset (over the same time period) that excludes the MSPB episodes chosen for the first sample. We examine the correlation, and quintile rank stability between a hospital's MSPB scores calculated from both samples.

Second, because the MSPB Measure values reported on *Hospital Compare* in April 2012 use Medicare claims data from May through February, Acumen conducted a seasonality analysis to examine how MS-DRGs change within a year. Providers that efficiently treat specific DRGs may receive higher MSPB Measure values during a season where the DRG occurs frequently and lower MSPB Measure values during a season where the DRG occurs less frequently. For this specific analysis, we split inpatient claims data with through date in 2010 into two categories: claims with through dates from January through April and claims with through dates from May through December.

Our third approach calculates reliability scores as: $R_j = V_b/(V_b + (V_{w_j}/n_j)$ where R_j is the reliability for Hospital *j*, V_b is the between hospital variance, V_{w_j} is the within hospital variance for hospital *j*, and n_j is the number of MSPB episodes for hospital *j*.

Fourth, Acumen measured how reliability varies based on the number of MSPB episodes a hospital is assigned. This fourth analysis is divided into two parts. The first evaluates how the number of MSPB episodes a hospital receives affects its 95 percent confidence interval. This analysis also informs how CMS should set the minimum number of episode required for public reporting purposes. When increasing the threshold for the minimum number of cases (or hereafter referred to as 'episode'), one decreases the likelihood an outlier episode[1] materially affects a hospital's MSPB score, but also decreases the number of hospitals able to publicly report their MSPB Measure.

Whereas determining the number of hospitals that would be dropped when the minimum episode threshold increases is straight-forward, our second approach for measuring the effect of the minimum episode threshold on the MSPB confidence interval requires additional explanation. Typically, confidence intervals are constructed for commonly used quantities, such as the sample mean in which the distribution of the sample quantity is known, and can be used in the interval calculation. However, the MSPB score is a ratio of weighted means and does not have an easily identifiable statistic that corresponds to dispersion. Further, the MSPB score is not normally distributed, and typical measures of the dispersion of a distribution—such as the standard deviation—will not fully characterize the variation in the MSPB distribution.

In this analysis, Acumen instead uses a non-parametric bootstrap methodology to measure how the confidence interval of the MSPB score changes when the minimum episode threshold increases. This analysis measures the MSPB score for an 'average' hospital, where the 'average' hospital case is considered to be one whose MSPB episode distribution mimics that of the entire population of MSPB episodes. The bootstrap simulates the process of randomly drawing MSPB episodes from the population, and thus approximates the actual shape of the MSPB score distribution from which confidence intervals are determined. By repeatedly calculating an MSPB score for this simulated hospital under differing assumptions on the number of episodes observed, one can create a confidence interval for the MSPB score of this 'average' hospital.

To implement the bootstrap procedure, this analysis examines cases where the 'average' hospital has *X* episodes, where *X* = 1, 2, 3, 5, 10, 25, and 100. The five step methodology used to implement this analysis is as follows: (1) Draw 10,000 random samples (with replacement) each with *X* number of episodes from the original dataset containing MSPB episodes; (2) Calculate MSPB Amount for each sample; (3) Calculate MSPB Measure—normalization of the MSPB Amount—as the MSPB Amount for the hospital divided by the median MSPB Amount across all hospitals; (4) Calculate the 95 percent

confidence interval using the 2.5th and 97.5th percentiles of the MSPB Measure distribution[2]; and (5) Divide the width of this confidence interval by the width of the confidence interval for *X* = 100 episodes.

2a2.3. For each level checked above, what were the statistical results from reliability testing? (e.*g., percent agreement and kappa for the critical data elements; distribution of reliability statistics from a signal-to-noise analysis and association with case volume*)

1. Test/Re-Test: Over 70 percent of hospitals in the lowest-spending quintile in one sample are in the lowest-spending quintile in the next; similarly, over 70 percent of hospitals in the highest-spending quintile in one sample are in the highest-spending quintile in the next. The Spearman rank correlation for a hospital across samples is 0.835.

2. Seasonality Analysis: Between the January 2010 – April 2010 period and the May 2010 – December 2010 period, the average absolute change in the relative frequency of an MS-DRG index admission was 8.9%. Certain lung-related admissions (e.g., pneumonia, COPD, asthma) appear more frequently in the winter.

3. Reliability Score: The MSPB Measure's overall reliability is 0.951. Over 98 percent of hospitals have a reliability score greater than 0.4; 62 percent of hospitals have a reliability score greater than 0.9. Previous work proposed that 0.4 is the lower limit of "moderate" reliability[3]; the MSPB measure exceeds this threshold.

4. Minimum Number of Cases Required for the MSPB Measure: As the minimum episode threshold increases, there is a trade-off between the size of the confidence interval for the 'average' hospital and the number of hospitals receiving an MSPB score. Table 1 in the appendix shows that as the minimum episode threshold, *X,* increases, the confidence interval becomes narrower and more reliable. Specifically, the 95% confidence interval decreases by almost a third as cutoff number is moved from *X = 5* to *X* = 50. However, as the minimum episode threshold increases from *X = 5* to *X = 50*, the number of hospitals that could publicly report this measure included decreases; in fact, at the cutoff *X* = 50 episodes, the share of hospitals included decreases to 95.9%.

2a2.4 What is your interpretation of the results in terms of demonstrating reliability? (i.*e., what do the results mean and what are the norms for the test conducted?*)

1. Quintile Rank Stability Across Groups: Sample selection does not have a material effect on a hospital's MSPB score for different data samples drawn from the same period.

2. Seasonality Analysis: The seasonality analysis indicates that the incidence of different types of hospitalizations (i.e., MS-DRGs) varies across the year, but this variability for the most part is concentrated in DRGs lung-related diseases.

3. Reliability Score: Overall reliability of the MSPB score is extremely high due to the large number of MSPB episodes attributed to most hospitals. Reporting the MSPB Measure for hospitals that have at least 25 attributed episodes provides a balance between reliability and measure inclusiveness.

4. Minimum Number of Cases Required for the MSPB Measure: Based on the empirical results presented in 2a2.3., reporting the MSPB Measure as part of the Hospital VBP program for hospitals that have at least 25 attributed episodes provides a balance between the size of the confidence interval and the number of hospitals receiving and MSPB Measure score.

Return to Measure Evaluation

2b2. VALIDITY TESTING

2b2.1. What level of validity testing was conducted? (*may be one or both levels*)

☐ **Critical data elements**

☒ **Performance measure score**

- ☒ **Empirical validity testing**
- ☒ **Systematic assessment of face validity of performance measure score as an indicator** of quality

or resource use (*i.e., is an accurate reflection of performance quality or resource use and can distinguish performance*)

2b2.2. For each level checked above, describe the method of validity testing and what it tests (*describe the steps—do not just name a method; what was tested, e.g., accuracy of data elements compared to authoritative source, relationship to another measure as expected; what statistical analysis was used)*

The first validity test examines the correlation between hospitals' MSPB scores and the percent of beneficiaries with multiple episodes. This analysis examines whether high-cost hospitals may have below average (i.e., efficient) MSPB Measure values if the MSPB episode definition separates a single episode of care into two or more MSPB episodes. Division of a single episode of care into multiple MSPB episodes occurs when a hospital admission takes place more than 30 days after the initial discharge.

The second test of the validity of the MSPB Measure compares the MSPB Measure against other related outcome measures. Specifically, we will examine whether hospitals with low MSPB scores (i.e., efficient hospitals) are also less likely to have various types of hospital readmissions.

2b2.3. What were the statistical results from validity testing? (*e.g., correlation; t-test, ANOVA*)

1. Beneficiaries with Multiple Episodes: The analysis indicated a positive correlation between MSPB Measure values and the percent of beneficiaries with multiple episodes. The hospital-level correlation between the MSPB Measure and the percent of beneficiaries with multiple episodes was 0.13; when accounting for variation in the MS-DRG of the index admission when measuring readmission rates, the correlation between readmissions and the MSPB Measure increases slightly to 0.16.

2. Correlation with Other Outcome Measures: The MSPB Measure exhibits a positive correlation with a number of hospital readmission measures. The correlation between the MSPB Measure and Heart Attack, Heart Failure, and Pneumonia Readmission Rates are of 0.08, 0.07, and 0.06, respectively.

2b2.4. What is your interpretation of the results in terms of demonstrating validity? (i*.e., what do the results mean and what are the norms for the test conducted?*)

1. Beneficiaries with Multiple Episodes: Hospitals are not likely to be postponing necessary re-admissions—and thus creating a new episode—to improve their MSPB Measure values. High-cost hospitals are *not* more likely to treat beneficiaries with multiple hospitalization episodes.

2. Correlation with Other Outcome Measures: The positive correlation between the MSPB Measure and Heart Attack, Heart Failure, and Pneumonia Readmission Rates indicate that hospitals that are more expensive generally have higher readmission rates. The correlation, however, is weak for all three readmission rates. A weak correlation can be explained by the fact that the MSPB Measure assesses the cost to Medicare of *all* services performed by hospitals and other healthcare providers during an MSPB episode. As a result, a hospital's MSPB Measure value is driven by both acute *and* post-acute spending.

Return to Measure Evaluation

2b3. EXCLUSIONS ANALYSIS

NA ☐ no exclusions — *skip to #2b5*

2b3.1. Describe the method of testing exclusions and what it tests (*describe the steps—do not just name a method; what was tested, e.g., whether exclusions affect overall performance scores; what statistical analysis was used*)

Acumen evaluated the validity of the inclusion/exclusion criteria by producing impact analyses which show the effect of recalculating the MSPB Measure while independently reversing each of the following inclusion/exclusion criteria: (1) beneficiaries in Medicare Advantage; (2) beneficiaries in

Medicare Part A only; (3) acute-to-acute transfers[4]; (4) death episodes[5]; and (5) outlier episodes[6]. With respect to (3), Acumen's analysis evaluates assigning transfers to the transferring hospital and to the receiving hospital. The first three restrictions occur because of incomplete data or problems attributing episodes to individual hospitals. For (4), we re-calculate the MSPB Measure using beneficiaries who die during the episode. Specifically, Acumen examined the percent of beneficiaries who die during the MSPB episode and after the MSPB episode and whether or not to calculate separate MSPB Measures for beneficiaries who died during the episode versus beneficiaries who did not die. For (5), we examine top-coding/bottom-coding distribution outliers in place of completely excluding them.

Acumen also conducted a number of analyses on *potential* exclusion criteria. These unimplemented exclusions include: (6) beneficiaries discharged against medical advice (AMA) and (7) dual-eligibles. Acumen's analysis evaluates not counting admissions in which the beneficiary was discharged AMA as an index admission. Although excluding patients discharged against medical advice would avoid attributing the costs of non-compliant beneficiaries to a hospital's MSPB Measure value, hospitals would be incentivized to encourage high-cost beneficiaries to leave against medical advice to avoid having their episode included in the hospital's MSPB Measure. We also evaluate (i) including a dual-eligible indicator in the MSPB risk-adjustment and (ii) examining MSPB scores separately for duals/non-duals.

2b3.2. What were the statistical results from testing exclusions? (*include overall number and percentage of individuals excluded, frequency distribution of exclusions across measured entities, and impact on performance measure scores*)

Medicare Advantage or Part A Only: 25% of Medicare beneficiaries are enrolled in Medicare Advantage; about 10 percent of Medicare FFS beneficiaries are enrolled in Part A only.

Transfers: Episodes that include an acute-to-acute transfer account for 5% of total episodes. Episodes containing an acute-to-acute transfer have an average risk-adjusted spending of $25,151 per episode, while the average episode not containing an acute-to-acute transfer has an average risk-adjusted spending of $19,489 per episode. Because transfer episodes cost 29% more than non-transfer episodes on average, excluding transfer episodes eliminates a significant portion of MSPB episodes and Medicare payments. Small rural hospitals are the most likely facilities to transfer to large, urban hospitals (see Tables 2 and 3 in the appendix). Assigning transfer episodes to the transferring hospital has a larger effect on the MSPB Measure than assigning transfer episodes to the receiving hospital. When transfer episodes are assigned to the receiving hospital, 90% of hospitals experience a change in their MSPB Measure values of less than 3 percent, but only 80% of hospitals experience a change in their MSPB Measure values of less than 3 percent when transfer episodes are assigned to the transferring hospital (see Tables 4 and 5 in the appendix)

Death Episodes: In approximately 8.0% of MSPB episodes, the beneficiary dies before the end of the 30-day post-acute period. Death episodes are much more expensive than non-death episodes. Whereas death episodes cost $26,883 on average, non-death episodes cost $19,141, a 40% difference in average episode cost. Since death episodes are typically expensive, including death episodes in the MSPB Measure would increase the skewness of the episode cost distribution. Including death episodes (after outlier episodes have been excluded) increases the ratio of the 99th percentile cost to the median cost by 3 percent. If death is included as a variable in the 'risk-adjustment' model, death episodes are only 16 percent more expensive than non-death episodes.

Outlier Episodes: As an alternative to excluding outlier episodes from the MSPB Measure, outlier episodes can instead be top-coded and/or bottom-coded. Rather than excluding episodes that are outliers, top-coding/bottom-coding assigns outliers the value of an episode at a specified threshold. Tables 6 through 10 in the appendix present the impacts of top-coding/bottom-coding episodes at the 99.9th/0.1th, 99.5th/0.5th, 99.0th/1.0th, 98.0th/2.0th, and 95.0th/5.0th percentiles, respectively, compared to

a baseline that excludes outlier episodes at the 99th and 1st percentiles of the risk-adjusted episode cost distribution. When top-coded/bottom-coded at the 99.9th/0.1th, 99.5th/0.5th, and 99.0th/1.0th percentiles, at least 85 percent of MSPB Measure values change less than 3 percent. However, when top-coded/bottom-coded at the 98.0th/2.0th, and 95.0th/5.0th percentiles, at least 95% of MSPB Measure values change less than 3 percent (see Table 11).

Discharged AMA: Not only do episodes with an AMA discharge code make up a small percent of MSPB episodes (0.7%), AMA episodes have lower risk-adjusted spending than non-AMA episodes. ($13,851 vs. $19,025 for non-AMA). About 99% of hospitals experienced a change in their MSPB Measure values less than one percentage point when excluding AMA episodes (see Table 12).

Dual-Eligibles: 30% of episodes are flagged as dual-eligible beneficiaries; 18% of hospitals assigned an MSPB Measure have a beneficiary population consisting of at least 50% dual-eligible beneficiaries. Dual-eligible beneficiaries have $859 extra spending per episode than non-dual-eligible beneficiaries. If dual eligible are excluded, 43% of hospitals experience a change in their MSPB value of more than 1 percentage point (Table 13); including dual eligible in the risk adjustment model increases the R^2 of the model by less than 0.001 and causes 12% of hospitals to change their MSPB Measure by more than 1 percentage point (Table 14).

2b3.3. What is your interpretation of the results in terms of demonstrating that exclusions are needed to prevent unfair distortion of performance results? (*i.e., the value outweighs the burden of increased data collection and analysis. Note: **If patient preference is an exclusion**, the measure must be specified so that the effect on the performance score is transparent, e.g., scores with and without exclusion*)

Medicare Advantage or Part A Only: Due to missing claims problems, only beneficiaries enrolled in Medicare Parts A and B Fee-for-service are included in the sample.

Transfers: Adding transfers to the MSPB measure would significantly change hospital MSPB scores and make episode attribution more complicated. Assigning transfer episodes to the transferring hospital would avoid giving providers an incentive to transfer high-cost patients to game the system; however, once the transferring hospital transfers the patient, they may have little opportunity to coordinate or affect the patient's post-discharge care. Small rural hospitals, for example, often transfer patients in cases where they do not have the capacity to treat the patient within their current facilities. Assigning transfer episodes to the receiving hospital, however, incentivizes the initial hospital to transfer complex patients to improve their MSPB score. Further, post-acute care coordination may be difficult if the receiving hospital is out of area.[7] Public comment in the FY 2012 IPPS notice of proposed rulemaking voiced concern over attribution in transfer cases. In response, CMS excluded these types of transfers from the finalized MSPB Measure (76 FR 51621).

Death Episodes: In the baseline specification, cases where the beneficiary dies during the episode are not eligible to be included in the MSPB Measure. Episodes during which a beneficiary dies are "truncated"; in other words, costs that might have occurred if the beneficiary had not died are not observed due to death. To avoid including episodes of care with incomplete costs, episodes during which a beneficiary dies are excluded from the MSPB Measure calculation. As shown in 2b3.3., these episodes are typically high cost. In fact, the Dartmouth Atlas also notes that patients with chronic illness in their last two years of life account for about 32% of total Medicare spending, much of it going toward physician and hospital fees associated with repeated hospitalizations.[8] This evidence indicates that including death as a risk adjuster reduces the disparity in death/non-death episode cost. However, if death is a risk adjuster, hospitals could improve their MSPB score by increasing mortality rates. Further, using death as a risk adjuster implies that the risk adjustment model is no longer prospective, since events that occur during an episode now influence the model's expected cost.

Outlier Episodes: Outliers are excluded from the MSPB Measure calculation to avoid cases where a handful of high-cost and low-cost outliers have a disproportionate effect on each hospital's MSPB

Measure score. The distribution of hospital risk-adjusted episode spending is significantly right-skewed: the 99th percentile is almost 4.5 times the value of the median, while the 1st percentile is only approximately 1/2 the value of the median. Excluding outliers based on risk-adjusted cost eliminates the episodes that deviate most from the spending levels one would expect based on patient demographics and severity of illness. Outliers are identified across all episodes rather than within a hospital; thus, some hospitals may have no outlier episodes excluded and others many have many.

Discharged AMA: Episodes with AMA index admissions should be eligible to be considered as index admissions, as the effect of excluding AMA episodes from the MSPB Measure calculation is minimal (as shown in Table 12). Additionally, episodes with an AMA discharge code make up a small percent of MSPB episodes, and AMA episodes on average have lower risk-adjusted spending than non-AMA episodes.

Dual-Eligibles: Medicare beneficiaries who are dually-eligible for Medicare and Medicaid are not excluded from the MSPB Measure to be consistent with NQF's position on not adjusting for potential demographic (sex or race) or socioeconomic factors.

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2b5. IDENTIFICATION OF STATISTICALLY SIGNIFICANT & MEANINGFUL DIFFERENCES IN PERFORMANCE

2b5.1. Describe the method for determining if statistically significant and clinically/practically meaningful differences in performance measure scores among the measured entities can be identified (*describe the steps—do not just name a method; what statistical analysis was used)*

MSPB summary statistics include the percentile distribution of the MSPB score both overall and by hospital type (e.g., urban/rural status, bed size, region, teaching status). Although poor MSPB scores could be due to low quality care, it could also be the case that unobservable factors (e.g., large populations of patients for whom English is a second language, low adherence to treatment regimens) outside of hospitals' control make these hospitals perform worse. To identify hospitals that treat a large number of socioeconomically disadvantaged patients, the following analysis also classifies hospitals by their Disproportionate Share Hospital (DSH) percentage.[9]

2b5.2. What were the statistical results from testing the ability to identify differences in performance measure scores across measured entities? (*at a minimum, the distribution of performance measure scores for the measured entities by decile/quartile, mean, std dev; preferably also number and percentage statistically different from mean or some benchmark, different form expected, etc.*)

Key findings include: (1) the hospital with the highest MSPB score costs Medicare more than six times as much as the lowest cost hospital; (2) hospitals at the 90th percentile MSPB Measure cost Medicare 25 percent more per episode than hospitals at the 10th percentile; (3) rural hospitals out-perform urban hospitals; (4) the average MSPB Measure value in New England and the West South Central regions are the highest for both urban and rural hospitals; (5) teaching hospitals have higher average spending levels, but they also have higher expected spending amounts (due to a sicker patient case mix); and (6) hospitals with a large number of DSH-eligible patients are not significantly less efficient than hospitals with few DSH beneficiaries. Tables 15 through 18 in the appendix present these results.

2b5.3. What is your interpretation of the results in terms of demonstrating the ability to identify statistically significant and clinically/practically meaningful differences in performance across measured entities? (i*.e., what do the results mean and what are the norms for the test conducted?*)

There exists significant variation in spending relative to the typical hospital. For example, hospitals at the 90th percentile use 25 percent more resources per episode than hospitals at the 10th percentile. These figures also vary across hospital characteristics.

2b4. RISK ADJUSTMENT/STRATIFICATION FOR OUTCOME OR RESOURCE USE MEASURES

2b4.1. What method of controlling for differences in case mix is used?

☒ **Statistical risk model with 833 risk factors**

☐ **Stratification by** Click here to enter number of categories **risk categories**

☐ **No risk adjustment or stratification**

☐ **Other,** Click here to enter description

2b4.2. If an outcome or resource use measure is not risk adjusted or stratified, provide rationale and analyses to demonstrate that controlling for differences in patient characteristics (case mix) is not needed to achieve fair comparisons across measured entities.

N/A

2b4.3. Describe the conceptual/clinical and statistical methods and criteria used to select factors used in the statistical risk model or for stratification by risk (*e.g., potential factors identified in literature and/or expert panel; regression analysis; statistical significance of p<0.10; correlation of x or higher*)

To account for case-mix variation and other factors, the MSPB risk-adjustment methodology broadly follows the CMS-HCC risk-adjustment methodology, which CMS uses to estimate Medicare Advantage (MA) premium adjustments.[10] Medicare also uses the HCC model to risk-adjust spending in: the Shared Savings Program Accountable Care Organizations (implemented in 2012) and the Medicare Physician Quality and Resource Use Reports (implemented in 2009). The accuracy of the ICD-9 codes used to create HCCs has also been evaluated in previous studies, and all studies found high positive predictive values for Medicare claims-based diagnosis of acute myocardial infarction (AMI), chronic kidney disease (CKD), heart failure, coronary artery disease, diabetes, hypertension, and stroke with a diagnosis based on structured hospital record review.[11,12,13] A 2003 study found that CMS "administrative data was found to have diagnoses and conditions that were highly specific but that vary greatly by condition in terms of sensitivity."

Severity of illness is measured using 70 HCC indicators derived from the beneficiary's claims during the period 90 days prior to the start of the episode, an indicator of whether the beneficiary recently required long-term care, as well as the MS-DRG of the index hospitalization. The MSPB risk-adjustment methodology also includes status indicator variables for whether the beneficiary qualifies for Medicare through Disability or End-Stage Renal Disease (ESRD) and whether a beneficiary resides in a long-term care facility. Because the relationship between comorbidities' episode cost may be non-linear, the model includes interactions between HCCs and/or enrollment status variables. The MSPB risk-adjustment method does not control for the beneficiary's sex and race, but does include 12 age categorical variables. For a complete list of MSPB risk-adjustment variables, see the "MSPB Measure Information Form" available on QualityNet at the link provided in S.1.

All explanatory variables are calculated during the 90 days prior to the start of an episode. Calculating all health status variables prior to the start of an episode avoids the endogeneity problem which could occur if the diagnosis codes a hospital uses are included in the risk-adjustment model. Using claims data during the episode would incentivize hospitals to inflate the number of co-morbidities (i.e., number of diagnosis codes) that a beneficiary has to make their health status appear worse.

The MSPB risk-adjustment methodology (along with the entire MSPB methodology) was also put through official notice and comment rulemaking. The majority of commenters supported the risk adjustment for age and severity of illness. Some suggested further adjustment for race, sex, or socioeconomic factors, but Acumen and CMS opted to maintain consistency with the NQF's position against adjusting for these factors.

2b4.4. What were the statistical results of the analyses used to select risk factors?

The MSPB Measure broadly replicates the CMS-HCC model. The literature has extensively tested the use of the HCC model as applied to Medicare claims data.[14] Although the variables in the HCC model were chosen to predict annual cost, CMS also uses this risk-adjustment model in a number of other settings (e.g., ACOs and physician QRUR programs). [15]

2b4.5. Describe the method of testing/analysis used to develop and validate the adequacy of the statistical model or stratification approach (*describe the steps—do not just name a method; what statistical analysis was used*)

Because the CMS-HCC model has already been extensively tested, we focus on adapting the CMS-HCC model to the MSPB Measure methodology. To empirical evaluate the MSPB risk-adjustment methodology, we analyzed two specifications of the modified CMS-HCC risk-adjustment methodology by using R^2 to measure model ability to explain variation: (1) evaluate the health status variables in the risk-adjustment by using one year of data prior to calculate comorbidities rather than 90 days; and (2) evaluate options for stratifying the risk-adjustment model (e.g., by MDC, MDC/Institutional Status). To demonstrate the validity of the MSPB risk-adjustment methodology, we (3) calculated the distribution of episode spending and R-squared by decile to examine the model's ability to predict both very low and high cost episodes. Specifically, we created a "risk score" for each episode calculated as the predicted values from each episode divided by the national average predicted value. After arranging episodes into deciles based on the risk score, we calculated the R-squared for each decile using the formula 1-(SSE/SST), where SSE = the sum of (episode observed spending – episode predicted spending) and SST = the sum of (episode observed spending – average overall observed spending).

2b4.6. Statistical Risk Model Discrimination Statistics:

The overall R-squared for the MSPB Measure risk adjustment model described in S.9.2. through S.9.4. is 0.4621. For your reference, the "Additional Information" Appendix beginning on page 24 of the "Scientific Acceptability" section also includes regression coefficients, standard error, and p-values of the covariates used in the risk-adjustment models. Recalling that the risk model relies on the existing CMS-HCC model, more information on discrimination testing for the CMS-HCC model can be found at Pope et al. 2011.[14]

2b4.7. Statistical Risk Model Calibration Statistics:

1. Assessing the use of one year of data prior to the index admission to calculate comorbidities in the risk adjustment methodology rather than 90 days: When changing the HCC "look-back" period from 90 days to 365 days: (i) 6% of episodes are dropped (see Table 19 in the appendix) and (ii) the model fit (i.e., R-squared) decreases from 0.4621 to 0.4601. The impact analysis also reveals that, despite the drop in episodes included and a decrease in model fit, most hospitals experience only a small change in their MSPB Measure values when switching the "look-back" period from 90 days to 365 days; in fact, Table 20 in the appendix shows that 78% of hospitals experience a gain or loss in the MSPB Measure values of less than 1 percentage point.

2. Evaluating options for stratifying the risk adjustment model (e.g., by MDC, MDC/Institutional Status): When stratifying the risk-adjustment model by MDC with a Long-Term Institutional (LTI) indicator (current specification), the R-squared is 0.4621. On the other hand, when stratifying the risk-

adjustment model by MDC, but with separate regressions for institutional and community beneficiaries, the R-squared is 0.4645. When stratifying the risk-adjustment model by MDC, but with separate regressions for MDC type (i.e., MED, SURG), the R-squared is 0.4636. The MDC option was preferred because: (i) the improvement in R-squared is very small when moving to the MDC/Institutional Status specification and (ii) increasing the number of stratifications increases the risk of over-fitting, especially for MDCs with relatively few admissions.

2b4.8. Statistical Risk Model Calibration – Risk decile plots or calibration curves:

3. Calculate the distribution of episode spending and R-squared by decile to show that the MSPB risk adjustment methodology does equally well predicting spending through all values of the model: The R-squared in the 3rd through 9th deciles are lower than overall R-squared in Table A below (includes outlier episodes) as well as Table B below (excludes outlier episodes). The R-squared in the 6th and 7th deciles are relatively low, ranging from approximately 1% to 3%. Additionally, the R-squared is always higher in Table B when outlier episodes are excluded.

Table A: Distribution of Spending and R-Squared by Decile* (Includes Outlier Episodes)

Decile	Episode Count	Min Risk Score	Max Risk Score	Avg. Obs Spending	Avg. Pred Spending**	Difference	R-Squared
1	446,268	-0.38	0.46	$7,442	$7,365	$77	0.7774
2	446,234	0.46	0.56	$9,607	$9,763	-$156	0.5861
3	446,197	0.56	0.65	$11,472	$11,506	-$34	0.3876
4	446,234	0.65	0.74	$13,379	$13,276	$103	0.2365
5	446,260	0.74	0.85	$15,164	$15,114	$50	0.1194
6	446,205	0.85	0.98	$17,452	$17,350	$101	0.0229
7	446,512	0.98	1.14	$20,047	$20,226	-$179	0.0100
8	445,951	1.14	1.31	$23,108	$23,237	-$128	0.0858
9	446,130	1.31	1.66	$27,830	$27,631	$199	0.1680
10	446,339	1.66	20.09	$45,115	$45,148	-$33	0.6903
TOTAL	4,462,330	-0.38	20.09	$19,062	$19,062	$0	0.4621

Note: *Decile are based on risk score calculated as ratio of predicted spending over national average predicted spending.
**Predicted spending is the predicted value from the regression.

Table B: Distribution of Spending and R-Squared by Decile* (Excludes Outlier Episodes)

Decile	Episode Count	Min Risk Score	Max Risk Score	Avg. Obs Spending	Avg. Pred Spending**	Difference	R-Squared
1	437,305	0.04	0.46	$7,087	$7,348	-$262	0.8644
2	437,313	0.46	0.56	$9,140	$9,730	-$590	0.6989
3	437,309	0.56	0.65	$10,905	$11,458	-$553	0.5135
4	437,248	0.65	0.74	$12,776	$13,213	-$436	0.3249
5	437,370	0.74	0.84	$14,596	$15,035	-$439	0.1744
6	437,310	0.84	0.98	$16,887	$17,247	-$360	0.0329
7	437,298	0.98	1.14	$19,566	$20,124	-$558	0.0140
8	437,320	1.14	1.31	$22,534	$23,144	-$609	0.1288
9	436,500	1.31	1.66	$27,237	$27,502	-$265	0.3627
10	438,118	1.66	20.17	$44,304	$45,039	-$735	0.7752
TOTAL	4,373,091	0.04	20.17	$18,506	$18,987	-$481	0.5978

Note: *Deciles are based on risk score calculated as ratio of predicted spending over national average predicted spending.
**Predicted spending is the Winsorized and renormalized predicted value.

2b4.9. Results of Risk Stratification Analysis: N/A

2b4.10. What is your interpretation of the results in terms of demonstrating adequacy of controlling for differences in patient characteristics (case mix)? (i*.e., what do the results mean and what are the norms for the test conducted*)

1. Assessing the use of one year of data prior to the index admission to calculate comorbidities in the risk adjustment methodology rather than 90 days: When the FFS continuous enrollment requirement starts from 365 days prior to the start of the episode instead of 90 days prior to the start of the episode, there is no trade-off between the number of episodes included in the MSPB Measure and the model fit. In fact, both the number of episodes included and the model fit decrease (i.e., get worse).

2. Evaluating options for stratifying the risk adjustment model (e.g., by MDC, MDC/Institutional Status): The R-squared between the different options for stratifying the risk-adjustment model are comparable, indicating that the output is not very different. However, when separate regressions for the community/institutional model or the MED/SURG MDC model are run, degrees of freedom are lost and may cause over-fitting of the model.

3. Calculate the distribution of episode spending and R-squared by decile to show that the MSPB risk adjustment methodology does equally well predicting spending through all values of the model: Based on the distribution of spending and R-squared by decile, we believe that the MSPB risk-adjustment methodology is robust and fit consistently across deciles.

***2b4.11. Optional Additional Testing** (*not required, but would provide additional support of adequacy of risk model, e.g., testing of risk model in another data set; sensitivity analysis for missing data; other methods*)

Limited additional testing was performed because the MSPB Measure risk-adjustment methodology is intended to closely follow the established and extensively tested CMS-HCC risk-adjustment methodology. As previously discussed, however, we did test stratifying the model by MDC/Institutional Status rather than just stratifying the model by MDC. We also tested different look-back periods from the current 90 days.

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APPENDIX: FOOTNOTES

[1] Statistical outlier episodes are excluded from the MSPB calculation to mitigate the effect of high-cost and low-cost outliers on each hospital's MSPB Measure. The MSPB Measure methodology uses "residuals" to define outlier episodes, where a residual equals the standardized episode spending minus the expected episode spending. High-cost outliers are defined as episodes whose residual falls above the 99th percentile of the residual cost distribution within any MS-DRG admission category; similarly, low-cost outliers are defined as episodes whose residual falls below the 1st percentile of the residual cost distribution within any MS-DRG category. For additional details on the definition of statistical outliers for the MSPB Measure, see the response to Question 2a1.20 of this measure submission form.

[2] If a hospital has a true MSPB Measure value of 1.0, a 95% confidence interval indicates that 95% of the time the hospital's MSPB Measure value will fall between the 2.5th and 97.5th percentiles if the hospital gets *X* number of episodes from the original dataset containing MSPB episodes.

[3] Mathematica, Inc. "Memorandum: Reporting Period and Reliability of AHRQ, CMS 30-Day and HAC Quality Measures – Revised." http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/hospital-value-based-purchasing/Downloads/HVBP_Measure_Reliability-.pdf

[4] Recall from S.9.1. that transfers, defined based on the claim discharge code, are not considered eligible as index admissions. In other words, these cases will not generate new MSPB episodes; neither the hospital which transfers a patient to another short-term acute hospital, nor the receiving short-term acute hospital will have an index admission attributed to them. The rationale for exclusion of these acute-to-acute transfer cases is that CMS wished to perform further analysis of hospital impacts and explore potential unintended consequences of attribution of the MSPB episode to either the transferring or the receiving hospital.

[5] Recall from S.9.1. that any episode where at any time during the episode the beneficiary becomes deceased is excluded from the MSPB calculation.

[6] Recall from S.9.1. that MSPB episodes whose relative scores fall above the 99th percentile or below the 1st percentile of the distribution of residuals (see 2a1.20 for a description of MSPB residuals) within each index admission MS-DRG are excluded from the MSPB calculation.

[7] As an alternative to completely assigning transfer episodes to either the transferring hospital or the receiving hospital, transfer episode costs could be split between both hospitals. A simple 50/50 weighting scheme would be one potential solution. To implement a 50/50 weighting scheme, each hospital receives 50% of the observed cost in the MSPB Amount numerator and 50% of the expected in the denominator of the MSPB Amount risk-adjustment factor (α_j). This weighting scheme, however, does not take into account the length of stay at each hospital or the fact that the receiving hospital is in control of post-discharge spending. More complicated alternative weighting schemes (e.g., assigning a fixed weight to the receiving hospital and splitting the remaining weight based on the relative number of days the patient spends at each hospital) could be tailored to the particular application of the MSPB Measure, but these approaches would also increase the complexity of the MSPB Measure methodology.

[8] http://www.dartmouthatlas.org/keyissues/issue.aspx?con=2944

[9] The Medicare DSH patient percentage is equal to the sum of the percentage of Medicare inpatient days attributable to patients entitled to both Medicare Part A and Supplemental Security Income and the percentage of total inpatient days attributable to patients eligible for Medicaid but not eligible for Medicare Part A.

[10] Centers for Medicare and Medicaid Services, Office of the Actuary. "Announcement of Calendar Year (CY) 2009 Medicare Advantage Capitation Rates and Medicare Advantage and Part D Payment Policies." April 2008. http://www.cms.gov/MedicareAdvtgSpecRateStats/Downloads/Announcement2009.pdf

[11] Kiyota, Uka, et al. "Accuracy of Medicare Claims-Based Diagnosis of Acute Myocardial Infarction: Estimating Positive Predictive Value on the Basis of Review of Hospital Records." American Heart Journal. 148(1): 99-104, July 2004.

[12] Winkelmayer, W. C., et al. "Identification of Individuals with CKD from Medicare Claims Data: A Validation Study." Am J Kidney Dis. 46(2): 225-232, Aug 2005.

[13] Birman-Deych, Elena, et al. "Accuracy of ICD-9-CM Codes for Identifying Cardiovascular and Stroke Risk Factors." Medical Care. 43(5): 480-485, May 2005.

[14] Pope, Gregory C., John Kautter, Melvin J. Ingber, Sara Freeman, Rishi Sekar, and Cordon Newhart. "Evaluation of the CMS-HCC Risk-Adjustment Model: Final Report." RTI International: March 2011.

[15] Department of Health and Human Services, Centers for Medicare and Medicaid Services, Medicare Program; Medicare Shared Savings Program: Accountable Care Organizations, Proposed Rule, Federal Register, April 7, 2011 76(67):19528–654.

APPENDIX: SCIENTIFIC ACCEPTABILITY TABLES

Table 1: Average MSPB Measure and 95% Confidence Interval by Bootstrapping

Minimum Episode Threshold	MSPB Measure			Change in CI Range*	% of Hospitals
	Average	2.5th Pctl	97.5th Pctl		
1	1.00	0.41	2.57	10.29	100.0%
2	1.00	0.50	1.99	7.10	99.9%
3	1.00	0.56	1.76	5.73	99.7%
5	1.00	0.62	1.57	4.49	99.3%
10	1.00	0.71	1.38	3.21	98.9%
25	1.00	0.81	1.23	2.00	97.8%
50	1.00	0.86	1.16	1.43	95.9%
100	1.00	0.90	1.11	1.00	93.0%

* Defined as ratio of (width confidence interval for *X* episodes) / (width confidence interval for 100 episodes)

Table 2: Episodes Breakdown, Assigning Transfer Episodes to the Transferring Hospital

	Transfer Episodes		Non-Transfer Episodes		Transfer Average Episode Spending		Non-Transfer Average Episode Spending	
	#	%	#	%	#	%	#	%
All Hospitals	**233,043**	**4.73%**	**4,698,316**	**95.27%**	**$29,426**	**$25,151**	**$18,731**	**$19,489**
Large Urban	85,956	3.73%	2,215,513	96.27%	$31,038	$26,303	$19,613	$19,993
Other Urban	104,386	5.39%	1,831,578	94.61%	$27,938	$24,573	$18,708	$19,683
Rural Area	42,619	6.15%	650,401	93.85%	$29,825	$24,258	$15,793	$17,229
Uncategorized	82	9.05%	824	90.95%	$25,917	$19,336	$14,659	$16,558
Urban hospitals								
0-99 beds	14,269	6.09%	220,012	93.91%	$29,451	$24,066	$17,052	$18,279
100-199 beds	36,327	4.09%	851,849	95.91%	$30,193	$24,817	$18,173	$18,758
200-299 beds	34,709	3.82%	874,163	96.18%	$29,688	$25,190	$18,865	$19,429
300-499 beds	51,892	4.21%	1,180,797	95.79%	$28,731	$25,279	$19,548	$20,192
500 or more beds	53,145	5.46%	920,270	94.54%	$29,086	$26,246	$20,552	$21,212
Rural hospitals								
0-49 beds	7,387	7.71%	88,407	92.29%	$28,620	$22,812	$13,618	$15,238
50-99 beds	13,256	5.98%	208,600	94.02%	$31,171	$24,637	$15,035	$16,636
100-149 beds	9,355	5.77%	152,763	94.23%	$30,687	$24,388	$16,074	$17,274
150-199 beds	4,957	5.20%	90,335	94.80%	$30,555	$25,157	$17,180	$18,409
200 or more beds	7,664	6.50%	110,296	93.50%	$27,134	$24,257	$17,448	$18,921

Table 3: Episodes Breakdown, Assigning Transfer Episodes to the Receiving Hospital

	Transfer Episodes		Non-Transfer Episodes		Transfer Average Episode Spending		Non-Transfer Average Episode Spending	
	#	%	#	%	#	%	#	%
All Hospitals	**233,043**	**4.73%**	**4,698,316**	**95.27%**	**$29,426**	**$25,151**	**$18,731**	**$19,489**
Large Urban	96,014	4.15%	2,215,513	95.85%	$32,052	$26,763	$19,613	$19,993
Other Urban	115,574	5.94%	1,831,578	94.06%	$28,033	$24,497	$18,708	$19,683
Rural Area	21,437	3.19%	650,401	96.81%	$25,174	$21,472	$15,793	$17,229
Uncategorized	18	2.14%	824	97.86%	$23,743	$14,437	$14,659	$16,558
Urban hospitals								
0-99 beds	8,063	3.54%	220,012	96.46%	$25,387	$21,740	$17,052	$18,279
100-199 beds	26,421	3.01%	851,849	96.99%	$26,103	$22,068	$18,173	$18,758
200-299 beds	33,498	3.69%	874,163	96.31%	$28,162	$24,278	$18,865	$19,429
300-499 beds	65,048	5.22%	1,180,797	94.78%	$29,769	$25,605	$19,548	$20,192
500 or more beds	78,558	7.87%	920,270	92.13%	$32,374	$27,542	$20,552	$21,212
Rural hospitals								
0-49 beds	1,850	2.05%	88,407	97.95%	$20,513	$16,596	$13,618	$15,238
50-99 beds	3,656	1.72%	208,600	98.28%	$24,335	$19,506	$15,035	$16,636
100-149 beds	4,264	2.72%	152,763	97.28%	$25,309	$20,800	$16,074	$17,274
150-199 beds	3,499	3.73%	90,335	96.27%	$26,527	$22,545	$17,180	$18,409
200 or more beds	8,168	6.89%	110,296	93.11%	$25,955	$23,348	$17,448	$18,921

Table 4: Impact Analysis, Assigning Transfer Episodes to the Transferring Hospital

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,404**	**100.0**
> 0.10	25	0.7
0.03 to 0.10	160	4.7
0.01 to 0.03	419	12.3
0.00 to 0.01	**613**	**18.0**
-0.01 to 0.00	**973**	**28.6**
-0.03 to -0.01	1062	31.2
-0.10 to -0.03	149	4.4
< -0.10	3	0.1

Table 5: Impact Analysis, Assigning Transfer Episodes to the Receiving Hospital

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,405**	**100.0**
> 0.10	53	1.6
0.03 to 0.10	455	13.4
0.01 to 0.03	760	22.3
0.00 to 0.01	**718**	**21.1**
-0.01 to 0.00	**812**	**23.8**
-0.03 to -0.01	552	16.2
-0.10 to -0.03	49	1.4
< -0.10	6	0.2

Table 6: Top-Coding 99.9th Percentile and Bottom-Coding 0.1th Percentile vs. Excluding Outliers at 99th and 1st percentiles

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,397**	**100**
> 0.10	42	1.2
0.03 to 0.10	303	8.9
0.01 to 0.03	489	14.4
0.00 to 0.01	**593**	**17.5**
-0.01 to 0.00	**875**	**25.8**
-0.03 to -0.01	973	28.6
-0.10 to -0.03	118	3.5
< -0.10	4	0.1

Table 7: Top-Coding 99.5th Percentile and Bottom-Coding 0.5th Percentile vs. Excluding Outliers at 99th and 1st percentiles

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,397**	**100**
> 0.10	28	0.8
0.03 to 0.10	219	6.4
0.01 to 0.03	490	14.4
0.00 to 0.01	**664**	**19.5**
-0.01 to 0.00	**1032**	**30.4**
-0.03 to -0.01	882	26.0
-0.10 to -0.03	78	2.3
< -0.10	4	0.1

Table 8: Top-Coding 99.0th Percentile and Bottom-Coding 1.0th Percentile vs. Excluding Outliers at 99th and 1st percentiles

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,397**	**100**
> 0.10	17	0.5
0.03 to 0.10	146	4.3
0.01 to 0.03	475	14.0
0.00 to 0.01	**741**	**21.8**
-0.01 to 0.00	**1203**	**35.4**
-0.03 to -0.01	751	22.1
-0.10 to -0.03	61	1.8
< -0.10	3	0.1

Table 9: Top-Coding 98.0th Percentile and Bottom-Coding 2.0th Percentile vs. Excluding Outliers at 99th and 1st percentiles

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,397**	**100**
> 0.10	9	0.3
0.03 to 0.10	77	2.3
0.01 to 0.03	395	11.6
0.00 to 0.01	**907**	**26.7**
-0.01 to 0.00	**1507**	**44.4**
-0.03 to -0.01	463	13.6
-0.10 to -0.03	36	1.1
< -0.10	3	0.1

Table 10: Top-Coding 95.0th Percentile and Bottom-Coding 5.0th Percentile vs. Excluding Outliers at 99th and 1st percentiles

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,397**	**100**
> 0.10	4	0.1
0.03 to 0.10	50	1.5
0.01 to 0.03	314	9.2
0.00 to 0.01	**1304**	**38.4**
-0.01 to 0.00	**1315**	**38.7**
-0.03 to -0.01	348	10.2
-0.10 to -0.03	52	1.5
< -0.10	10	0.3

Table 11: Number of Hospitals with Higher/Lower MSPB Measure Values

	Number of Hospitals				
	99.9th/0.1th	**99.5th/0.5th**	**99.0th/1.0th**	**98.0th/2.0th**	**95.0th/5.0th**
Hospitals with Higher MSPB Measure Value	1,425	1,400	1,378	1,387	1,671
Hospitals with Lower MSPB Measure Value	1,972	1,997	2,019	2,010	1,726

Table 12: Impact Analysis, Excluding Beneficiaries Discharged AMA

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,396**	**100**
> 0.10	0	0.0
0.03 to 0.10	1	0.0
0.01 to 0.03	14	0.4
0.00 to 0.01	**1,411**	**41.5**
-0.01 to 0.00	**1,954**	**57.5**
-0.03 to -0.01	15	0.4
-0.10 to -0.03	1	0.0
< -0.10	0	0.0

Table 13: Impact Analysis, Excluding Dual-Eligible Beneficiaries

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,386**	**100**
> 0.10	37	1.1
0.03 to 0.10	230	6.8
0.01 to 0.03	672	19.8
0.00 to 0.01	**790**	**23.3**
-0.01 to 0.00	**667**	**19.7**
-0.03 to -0.01	585	17.3
-0.10 to -0.03	346	10.2
< -0.10	59	1.7

Table 14: Impact Analysis, Including Dual-Eligible Risk Adjuster

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,396**	**100**
> 0.10	0	0.0
0.03 to 0.10	5	0.1
0.01 to 0.03	34	1.0
0.00 to 0.01	**1,150**	**44.5**
-0.01 to 0.00	**1,469**	**43.3**
-0.03 to -0.01	366	10.8
-0.10 to -0.03	12	0.4
< -0.10	0	0.0

Table 15: Impact Analysis by Geographic Location

	N	Average MSPB Measure	Min	Percentiles					Max	Avg MSPB Amount
				10th	25th	50th	75th	90th		
All Hospitals	**3,396**	**0.982**	**0.32**	**0.87**	**0.93**	**0.99**	**1.03**	**1.08**	**2.07**	**17,656**
Large Urban	1,325	1.011	0.54	0.91	0.96	1.01	1.06	1.11	1.59	18,192
Other Urban	1,103	0.981	0.56	0.90	0.94	0.98	1.02	1.06	1.73	17,640
Rural Area	955	0.941	0.32	0.84	0.89	0.95	0.99	1.03	1.30	16,920
Uncategorized	13	1.026	0.80	0.80	0.92	0.96	1.00	1.11	2.07	18,449
Urban hospitals	**2,428**	**0.997**	**0.54**	**0.90**	**0.95**	**1.00**	**1.04**	**1.09**	**1.73**	**17,941**
0-99 beds	605	0.966	0.54	0.84	0.90	0.96	1.02	1.08	1.73	17,375
100-199 beds	751	1.010	0.70	0.92	0.96	1.00	1.05	1.10	1.49	18,168
200-299 beds	441	1.008	0.70	0.93	0.97	1.01	1.05	1.09	1.22	18,125
300-499 beds	427	1.004	0.72	0.93	0.97	1.00	1.04	1.08	1.25	18,067
500 or more beds	204	1.007	0.78	0.95	0.98	1.00	1.04	1.07	1.19	18,121
Rural hospitals	**955**	**0.941**	**0.32**	**0.84**	**0.89**	**0.95**	**0.99**	**1.03**	**1.30**	**16,920**
0-49 beds	346	0.916	0.32	0.80	0.86	0.93	0.98	1.03	1.30	16,478
50-99 beds	352	0.943	0.65	0.85	0.89	0.94	0.99	1.03	1.30	16,962
100-149 beds	152	0.972	0.81	0.89	0.94	0.97	1.00	1.04	1.21	17,486
150-199 beds	58	0.969	0.53	0.91	0.94	0.98	1.01	1.05	1.09	17,430
200 or more beds	47	0.967	0.83	0.90	0.93	0.96	1.00	1.06	1.12	17,392

Table 16: Impact Analysis by Region

	N	Average MSPB Measure	Min	Percentiles					Max	Avg MSPB Amount
				10th	25th	50th	75th	90th		
Urban by Region										
New England	119	1.025	0.91	0.98	1.00	1.02	1.05	1.08	1.16	18,442
Middle Atlantic	314	1.002	0.56	0.90	0.96	1.01	1.05	1.09	1.43	18,015
South Atlantic	376	1.005	0.56	0.93	0.96	1.00	1.05	1.11	1.20	18,069
East North Central	395	0.998	0.65	0.92	0.96	1.00	1.03	1.07	1.29	17,950
East South Central	151	0.995	0.56	0.93	0.97	1.00	1.02	1.06	1.32	17,901
West North Central	167	0.955	0.80	0.89	0.92	0.95	1.00	1.02	1.11	17,178
West South Central	363	1.032	0.61	0.92	0.98	1.03	1.08	1.14	1.73	18,571
Mountain	163	0.983	0.63	0.90	0.94	0.98	1.02	1.09	1.59	17,681
Pacific	380	0.970	0.54	0.83	0.91	0.97	1.03	1.11	1.49	17,448
Puerto Rico	0	.	.	.	.	.	.	.	.	.
Rural by Region										
New England	24	0.973	0.85	0.87	0.95	0.98	1.00	1.04	1.07	17,494
Middle Atlantic	69	0.932	0.74	0.82	0.87	0.95	0.99	1.04	1.07	16,766
South Atlantic	164	0.937	0.53	0.86	0.90	0.94	0.99	1.02	1.22	16,862
East North Central	121	0.964	0.83	0.88	0.92	0.96	1.00	1.04	1.16	17,332
East South Central	172	0.961	0.48	0.87	0.92	0.97	1.01	1.03	1.30	17,285
West North Central	105	0.904	0.61	0.83	0.87	0.91	0.95	0.98	1.05	16,258
West South Central	187	0.967	0.62	0.84	0.91	0.97	1.03	1.09	1.30	17,391
Mountain	81	0.873	0.32	0.71	0.84	0.89	0.95	0.99	1.23	15,701
Pacific	32	0.894	0.76	0.83	0.86	0.88	0.95	0.96	1.03	16,087
Puerto Rico	0	.	.	.	.	.	.	.	.	.
Uncategorized	13	1.026	0.80	0.80	0.92	0.96	1.00	1.11	2.07	18,449

Table 17: Impact Analysis by Teaching Status

	N	Average MSPB Measure	Min	Percentiles					Max	Avg MSPB Amount
				10th	25th	50th	75th	90th		
Teaching Status										
Teaching	994	0.994	0.70	0.92	0.96	1.00	1.03	1.08	1.23	17,887
Non-Teaching	2,389	0.976	0.32	0.87	0.92	0.98	1.03	1.08	1.73	17,555
Uncategorized	13	1.026	0.80	0.80	0.92	0.96	1.00	1.11	2.07	18,449

Table 18: Impact Analysis by DSH Percentage

	N	Average MSPB Measure	Min	Percentiles					Max	Avg MSPB Amount
				10th	25th	50th	75th	90th		
DSH Percentage										
0-25	1,668	0.982	0.56	0.87	0.94	0.99	1.03	1.08	1.73	17,657
25-50	1,377	0.979	0.48	0.88	0.93	0.98	1.03	1.08	1.32	17,612
50-65	167	1.000	0.64	0.88	0.94	1.00	1.04	1.12	1.49	17,983
Over 65	171	0.979	0.32	0.84	0.90	0.99	1.06	1.12	1.44	17,615
Uncategorized	13	1.026	0.80	0.80	0.92	0.96	1.00	1.11	2.07	18,449

Table 19: Percent of Episodes Dropped

"Look-Back" Period	Number of MSPB Episodes
90 days	4,462,330
365 days	4,175,966
% of MSPB Episodes that get Dropped	**6.4%**

Table 20: Impact Analysis, Switching to 365-Day Look-Back from 90-Day Look-Back

MSPB Measure Difference	# of Hospitals	% of Hospitals
All	**3,396**	**100.0**
> 0.10	5	0.1
0.03 to 0.10	43	1.3
0.01 to 0.03	299	8.8
0.00 to 0.01	**1,376**	**40.5**
-0.01 to 0.00	**1,293**	**38.1**
-0.03 to -0.01	322	9.5
-0.10 to -0.03	53	1.6
< -0.10	5	0.1

APPENDIX: ADDITIONAL INFORMATION

The remainder of this document includes regression coefficients and standard error of the covariates used in the risk-adjustment models described in S.9.2. through S.9.4. There are 26 tables, one for each risk-adjustment by MDC. The **overall** R-squared for the MSPB Measure risk adjustment model is 0.4621; this overall R-squared was calculated as (1-SSE/SST) where SSE=sum[(observed-predicted)^2] and SST=sum[(observed-mean_observed)^2].

Table 21: MDC_1_Nervous System

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		7,218	193	0.00
HCC1	HIV/AIDS	584	411	0.16
HCC2	SEPTICEMIA/SHOCK	1,375	210	0.00
HCC5	OPPORTUNISTIC INFECTIONS	673	590	0.25
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	404	189	0.03
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	361	228	0.11
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	994	167	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-29	105	0.78
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,421	127	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	821	122	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	641	611	0.29
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	721	201	0.00
HCC19	DIABETES WITHOUT COMPLICATION	484	68	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	1,949	200	0.00
HCC25	END-STAGE LIVER DISEASE	780	427	0.07
HCC26	CIRRHOSIS OF LIVER	-833	378	0.03
HCC27	CHRONIC HEPATITIS	48	440	0.91
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	655	233	0.00
HCC32	PANCREATIC DISEASE	409	242	0.09
HCC33	INFLAMMATORY BOWEL DISEASE	-395	329	0.23
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,404	264	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	369	127	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,413	274	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC45	DISORDERS OF IMMUNITY	341	310	0.27
HCC51	DRUG/ALCOHOL PSYCHOSIS	557	392	0.16
HCC52	DRUG/ALCOHOL DEPENDENCE	571	388	0.14
HCC54	SCHIZOPHRENIA	2,539	189	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,170	104	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	-196	385	0.61
HCC68	PARAPLEGIA	2,302	428	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	1,089	248	0.00
HCC70	MUSCULAR DYSTROPHY	2,935	1,047	0.01
HCC71	POLYNEUROPATHY	669	100	0.00
HCC72	MULTIPLE SCLEROSIS	1,055	273	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,985	130	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	345	94	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	618	277	0.03
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	4,827	496	0.00
HCC78	RESPIRATORY ARREST	4,452	1,185	0.00
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	805	145	0.00
HCC80	CONGESTIVE HEART FAILURE	280	111	0.01
HCC81	ACUTE MYOCARDIAL INFARCTION	816	268	0.00
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	43	189	0.82
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-51	119	0.67
HCC92	SPECIFIED HEART ARRHYTHMIAS	249	70	0.00
HCC95	CEREBRAL HEMORRHAGE	-177	216	0.41
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	383	100	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	2,133	142	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	1,551	355	0.00
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,244	165	0.00
HCC105	VASCULAR DISEASE	302	67	0.00
HCC107	CYSTIC FIBROSIS	-2,797	3,889	0.47
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	125	84	0.14
HCC111	ASPIRATION AND SPECIFIED BACTERIAL	520	264	0.05

Coef Name	Label	Coef Value	Std Error	P Value
	PNEUMONIAS			
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-299	526	0.57
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	414	260	0.11
HCC130	DIALYSIS STATUS	1,421	280	0.00
HCC131	RENAL FAILURE	153	97	0.11
HCC132	NEPHRITIS	298	584	0.61
HCC148	DECUBITUS ULCER OF SKIN	1,253	199	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,094	158	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	575	5,093	0.91
HCC154	SEVERE HEAD INJURY	1,104	1,174	0.35
HCC155	MAJOR HEAD INJURY	95	230	0.68
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,008	224	0.00
HCC158	HIP FRACTURE/DISLOCATION	556	236	0.02
HCC161	TRAUMATIC AMPUTATION	2,336	667	0.00
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	210	150	0.16
HCC174	MAJOR ORGAN TRANSPLANT STATUS	699	490	0.15
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-16	266	0.95
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	1,116	342	0.00
Age_Lt_35		-2,181	204	0.00
Age_Lt_45		-2,290	162	0.00
Age_Lt_55		-1,654	123	0.00
Age_Lt_60		-839	138	0.00
Age_Lt_65		-133	129	0.31
Age_Lt_75		711	87	0.00
Age_Lt_80		1,461	86	0.00
Age_Lt_85		2,366	87	0.00
Age_Lt_90		3,112	93	0.00
Age_Lt_95		3,327	118	0.00
Age_Gt_94		3,167	198	0.00
ORIGDS		671	81	0.00
ESRD		3,500	174	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	-287	1,148	0.80
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	1,323	612	0.03
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	725	580	0.21

Coef Name	Label	Coef Value	Std Error	P Value
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-367	490	0.45
D_HCC107	DISABLED, CYSTIC FIBROSIS	6,448	4,926	0.19
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	318	148	0.03
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	-80	165	0.63
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	50	378	0.89
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	676	208	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	232	165	0.16
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	357	232	0.12
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	150,558	480	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	124,049	532	0.00
DRG_CD=009	BONE MARROW TRANSPLANT	39,453	9,533	0.00
DRG_CD=010	PANCREAS TRANSPLANT	35,461	3,895	0.00
DRG_CD=011	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W MCC	19,221	13,475	0.15
DRG_CD=014	ALLOGENEIC BONE MARROW TRANSPLANT	88,165	13,478	0.00
DRG_CD=020	INTRACRANIAL VASCULAR PROCEDURES W PDX HEMORRHAGE W MCC	85,695	986	0.00
DRG_CD=021	INTRACRANIAL VASCULAR PROCEDURES W PDX HEMORRHAGE W CC	54,166	1,408	0.00
DRG_CD=022	INTRACRANIAL VASCULAR PROCEDURES W PDX HEMORRHAGE W/O CC/MCC	28,482	2,164	0.00
DRG_CD=023	CRANIO W MAJOR DEV IMPL/ACUTE COMPLEX CNS PDX W MCC OR CHEMO IMPLANT	61,718	496	0.00
DRG_CD=024	CRANIO W MAJOR DEV IMPL/ACUTE COMPLEX CNS PDX W/O MCC	32,652	607	0.00
DRG_CD=025	CRANIOTOMY & ENDOVASCULAR INTRACRANIAL PROCEDURES W MCC	45,147	281	0.00
DRG_CD=026	CRANIOTOMY & ENDOVASCULAR INTRACRANIAL PROCEDURES W CC	26,292	283	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=027	CRANIOTOMY & ENDOVASCULAR INTRACRANIAL PROCEDURES W/O CC/MCC	15,709	262	0.00
DRG_CD=028	SPINAL PROCEDURES W MCC	54,410	582	0.00
DRG_CD=029	SPINAL PROCEDURES W CC OR SPINAL NEUROSTIMULATORS	24,331	397	0.00
DRG_CD=030	SPINAL PROCEDURES W/O CC/MCC	8,851	383	0.00
DRG_CD=031	VENTRICULAR SHUNT PROCEDURES W MCC	36,190	708	0.00
DRG_CD=032	VENTRICULAR SHUNT PROCEDURES W CC	16,482	449	0.00
DRG_CD=033	VENTRICULAR SHUNT PROCEDURES W/O CC/MCC	7,987	397	0.00
DRG_CD=034	CAROTID ARTERY STENT PROCEDURE W MCC	25,072	724	0.00
DRG_CD=035	CAROTID ARTERY STENT PROCEDURE W CC	7,991	450	0.00
DRG_CD=036	CAROTID ARTERY STENT PROCEDURE W/O CC/MCC	3,871	313	0.00
DRG_CD=037	EXTRACRANIAL PROCEDURES W MCC	23,881	338	0.00
DRG_CD=038	EXTRACRANIAL PROCEDURES W CC	5,800	250	0.00
DRG_CD=039	EXTRACRANIAL PROCEDURES W/O CC/MCC	307	206	0.14
DRG_CD=040	PERIPH/CRANIAL NERVE & OTHER NERV SYST PROC W MCC	36,233	370	0.00
DRG_CD=041	PERIPH/CRANIAL NERVE & OTHER NERV SYST PROC W CC OR PERIPH NEUROSTIM	17,019	312	0.00
DRG_CD=042	PERIPH/CRANIAL NERVE & OTHER NERV SYST PROC W/O CC/MCC	9,818	391	0.00
DRG_CD=052	SPINAL DISORDERS & INJURIES W CC/MCC	22,406	724	0.00
DRG_CD=053	SPINAL DISORDERS & INJURIES W/O CC/MCC	12,475	1,043	0.00
DRG_CD=054	NERVOUS SYSTEM NEOPLASMS W MCC	16,498	340	0.00
DRG_CD=055	NERVOUS SYSTEM NEOPLASMS W/O MCC	12,990	306	0.00
DRG_CD=056	DEGENERATIVE NERVOUS SYSTEM DISORDERS W MCC	15,106	278	0.00
DRG_CD=057	DEGENERATIVE NERVOUS SYSTEM DISORDERS W/O MCC	8,126	211	0.00
DRG_CD=058	MULTIPLE SCLEROSIS & CEREBELLAR ATAXIA W MCC	18,140	698	0.00
DRG_CD=059	MULTIPLE SCLEROSIS & CEREBELLAR ATAXIA W CC	10,681	449	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=060	MULTIPLE SCLEROSIS & CEREBELLAR ATAXIA W/O CC/MCC	6,176	434	0.00
DRG_CD=061	ACUTE ISCHEMIC STROKE W USE OF THROMBOLYTIC AGENT W MCC	36,722	489	0.00
DRG_CD=062	ACUTE ISCHEMIC STROKE W USE OF THROMBOLYTIC AGENT W CC	22,751	348	0.00
DRG_CD=063	ACUTE ISCHEMIC STROKE W USE OF THROMBOLYTIC AGENT W/O CC/MCC	10,642	538	0.00
DRG_CD=064	INTRACRANIAL HEMORRHAGE OR CEREBRAL INFARCTION W MCC	22,498	208	0.00
DRG_CD=065	INTRACRANIAL HEMORRHAGE OR CEREBRAL INFARCTION W CC	15,019	193	0.00
DRG_CD=066	INTRACRANIAL HEMORRHAGE OR CEREBRAL INFARCTION W/O CC/MCC	5,956	199	0.00
DRG_CD=067	NONSPECIFIC CVA & PRECEREBRAL OCCLUSION W/O INFARCT W MCC	8,903	575	0.00
DRG_CD=068	NONSPECIFIC CVA & PRECEREBRAL OCCLUSION W/O INFARCT W/O MCC	3,046	282	0.00
DRG_CD=069	TRANSIENT ISCHEMIA	679	193	0.00
DRG_CD=070	NONSPECIFIC CEREBROVASCULAR DISORDERS W MCC	15,429	270	0.00
DRG_CD=071	NONSPECIFIC CEREBROVASCULAR DISORDERS W CC	8,223	258	0.00
DRG_CD=072	NONSPECIFIC CEREBROVASCULAR DISORDERS W/O CC/MCC	3,168	326	0.00
DRG_CD=073	CRANIAL & PERIPHERAL NERVE DISORDERS W MCC	10,214	289	0.00
DRG_CD=074	CRANIAL & PERIPHERAL NERVE DISORDERS W/O MCC	4,074	218	0.00
DRG_CD=075	VIRAL MENINGITIS W CC/MCC	11,142	576	0.00
DRG_CD=076	VIRAL MENINGITIS W/O CC/MCC	2,413	768	0.00
DRG_CD=077	HYPERTENSIVE ENCEPHALOPATHY W MCC	12,793	515	0.00
DRG_CD=078	HYPERTENSIVE ENCEPHALOPATHY W CC	4,348	450	0.00
DRG_CD=079	HYPERTENSIVE ENCEPHALOPATHY W/O CC/MCC	728	691	0.29
DRG_CD=080	NONTRAUMATIC STUPOR & COMA W MCC	9,439	563	0.00
DRG_CD=081	NONTRAUMATIC STUPOR & COMA W/O MCC	4,082	337	0.00
DRG_CD=082	TRAUMATIC STUPOR & COMA, COMA >1 HR W MCC	26,543	694	0.00
DRG_CD=083	TRAUMATIC STUPOR & COMA, COMA >1 HR W CC	14,134	500	0.00
DRG_CD=084	TRAUMATIC STUPOR & COMA, COMA	5,255	507	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=085	>1 HR W/O CC/MCC TRAUMATIC STUPOR & COMA, COMA <1 HR W MCC	22,750	329	0.00
DRG_CD=086	TRAUMATIC STUPOR & COMA, COMA <1 HR W CC	11,688	255	0.00
DRG_CD=087	TRAUMATIC STUPOR & COMA, COMA <1 HR W/O CC/MCC	4,215	258	0.00
DRG_CD=088	CONCUSSION W MCC	12,091	698	0.00
DRG_CD=089	CONCUSSION W CC	6,868	421	0.00
DRG_CD=090	CONCUSSION W/O CC/MCC	1,041	454	0.02
DRG_CD=091	OTHER DISORDERS OF NERVOUS SYSTEM W MCC	13,394	289	0.00
DRG_CD=092	OTHER DISORDERS OF NERVOUS SYSTEM W CC	6,503	236	0.00
DRG_CD=093	OTHER DISORDERS OF NERVOUS SYSTEM W/O CC/MCC	2,303	255	0.00
DRG_CD=094	BACTERIAL & TUBERCULOUS INFECTIONS OF NERVOUS SYSTEM W MCC	40,662	710	0.00
DRG_CD=095	BACTERIAL & TUBERCULOUS INFECTIONS OF NERVOUS SYSTEM W CC	25,646	761	0.00
DRG_CD=096	BACTERIAL & TUBERCULOUS INFECTIONS OF NERVOUS SYSTEM W/O CC/MCC	17,768	986	0.00
DRG_CD=097	NON-BACTERIAL INFECT OF NERVOUS SYS EXC VIRAL MENINGITIS W MCC	31,200	711	0.00
DRG_CD=098	NON-BACTERIAL INFECT OF NERVOUS SYS EXC VIRAL MENINGITIS W CC	21,194	720	0.00
DRG_CD=099	NON-BACTERIAL INFECT OF NERVOUS SYS EXC VIRAL MENINGITIS W/O CC/MCC	9868.958403	976.390234	0.00
DRG_CD=100	SEIZURES W MCC	10688.87757	235.1161851	0.00
DRG_CD=101	SEIZURES W/O MCC	2363.402905	202.2853584	0.00
DRG_CD=102	HEADACHES W MCC	5091.802316	558.5048376	0.00
DRG_CD=103	HEADACHES W/O MCC	0	0	.
LTI_Indicator		1387.428996	118.793996	0.00

Table 22: MDC_2_Eye

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		7,566	405	0.00
HCC1	HIV/AIDS	1,321	1,420	0.35
HCC2	SEPTICEMIA/SHOCK	1,933	1,177	0.10

Coef Name	Label	Coef Value	Std Error	P Value
HCC5	OPPORTUNISTIC INFECTIONS	-2,345	2,291	0.31
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	-62	968	0.95
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	3,149	1,249	0.01
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	1,189	755	0.12
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-450	492	0.36
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,891	634	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	981	657	0.14
HCC17	DIABETES WITH ACUTE COMPLICATIONS	-1,719	2,843	0.55
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	493	828	0.55
HCC19	DIABETES WITHOUT COMPLICATION	318	357	0.37
HCC21	PROTEIN-CALORIE MALNUTRITION	3,847	1,131	0.00
HCC25	END-STAGE LIVER DISEASE	-4,802	2,129	0.02
HCC26	CIRRHOSIS OF LIVER	431	1,864	0.82
HCC27	CHRONIC HEPATITIS	5,104	1,937	0.01
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	138	1,374	0.92
HCC32	PANCREATIC DISEASE	3,646	1,376	0.01
HCC33	INFLAMMATORY BOWEL DISEASE	-3,021	1,626	0.06
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	2,377	1,536	0.12
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	1,481	560	0.01
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,241	1,252	0.32
HCC45	DISORDERS OF IMMUNITY	3,147	1,248	0.01
HCC51	DRUG/ALCOHOL PSYCHOSIS	-568	2,597	0.83
HCC52	DRUG/ALCOHOL DEPENDENCE	4,668	2,758	0.09
HCC54	SCHIZOPHRENIA	2,548	978	0.01
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	727	564	0.20
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	-5,005	3,041	0.10
HCC68	PARAPLEGIA	3,598	2,700	0.18
HCC69	SPINAL CORD DISORDERS/INJURIES	-84	1,781	0.96
HCC70	MUSCULAR DYSTROPHY	-997	5,381	0.85
HCC71	POLYNEUROPATHY	123	566	0.83

Coef Name	Label	Coef Value	Std Error	P Value
HCC72	MULTIPLE SCLEROSIS	2,018	1,335	0.13
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	1,984	931	0.03
HCC74	SEIZURE DISORDERS AND CONVULSIONS	2,227	666	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	1,327	4,234	0.75
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	2,301	2,684	0.39
HCC78	RESPIRATORY ARREST	45,243	8,099	0.00
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	884	774	0.25
HCC80	CONGESTIVE HEART FAILURE	846	595	0.16
HCC81	ACUTE MYOCARDIAL INFARCTION	-4,674	2,105	0.03
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	2,045	1,138	0.07
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	116	663	0.86
HCC92	SPECIFIED HEART ARRHYTHMIAS	378	371	0.31
HCC95	CEREBRAL HEMORRHAGE	-1,236	1,890	0.51
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	381	701	0.59
HCC100	HEMIPLEGIA/HEMIPARESIS	-837	1,164	0.47
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	5,443	2,122	0.01
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	889	890	0.32
HCC105	VASCULAR DISEASE	-199	367	0.59
HCC107	CYSTIC FIBROSIS	4,218	9,091	0.64
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	1,083	435	0.01
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	2,710	1,718	0.11
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-5,868	3,023	0.05
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-642	746	0.39
HCC130	DIALYSIS STATUS	1,920	1,247	0.12
HCC131	RENAL FAILURE	244	508	0.63
HCC132	NEPHRITIS	-3,677	2,780	0.19
HCC148	DECUBITUS ULCER OF SKIN	3,794	1,066	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	3,042	772	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	0	.

Coef Name	Label	Coef Value	Std Error	P Value
HCC154	SEVERE HEAD INJURY	0	0	.
HCC155	MAJOR HEAD INJURY	-610	1,121	0.59
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	2,032	1,281	0.11
HCC158	HIP FRACTURE/DISLOCATION	1,630	1,380	0.24
HCC161	TRAUMATIC AMPUTATION	-7,531	4,542	0.10
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	526	723	0.47
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-617	1,838	0.74
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	1,383	1,532	0.37
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	-1,707	1,916	0.37
Age_Lt_35		-1,753	1,107	0.11
Age_Lt_45		-813	778	0.30
Age_Lt_55		-182	604	0.76
Age_Lt_60		-461	719	0.52
Age_Lt_65		613	649	0.35
Age_Lt_75		537	449	0.23
Age_Lt_80		1,284	453	0.00
Age_Lt_85		2,325	455	0.00
Age_Lt_90		3,278	480	0.00
Age_Lt_95		5,431	602	0.00
Age_Gt_94		3,099	948	0.00
ORIGDS		974	429	0.02
ESRD		4,134	797	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	-185	4,883	0.97
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	6,009	2,848	0.03
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	2,777	3,586	0.44
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-7,126	3,181	0.03
D_HCC107	DISABLED, CYSTIC FIBROSIS	0	0	.
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	1,330	1,003	0.18
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	-710	859	0.41
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	3,561	3,515	0.31
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	3,787	1,056	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	-660	859	0.44
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	216	1,266	0.86
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	113,992	4,014	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	100,915	4,053	0.00
DRG_CD=010	PANCREAS TRANSPLANT	21,720	4,113	0.00
DRG_CD=012	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W CC	14,115	8,930	0.11
DRG_CD=113	ORBITAL PROCEDURES W CC/MCC	12,133	561	0.00
DRG_CD=114	ORBITAL PROCEDURES W/O CC/MCC	1,386	726	0.06
DRG_CD=115	EXTRAOCULAR PROCEDURES EXCEPT ORBIT	3,623	504	0.00
DRG_CD=116	INTRAOCULAR PROCEDURES W CC/MCC	4,784	668	0.00
DRG_CD=117	INTRAOCULAR PROCEDURES W/O CC/MCC	-1,153	628	0.07
DRG_CD=121	ACUTE MAJOR EYE INFECTIONS W CC/MCC	2,740	518	0.00
DRG_CD=122	ACUTE MAJOR EYE INFECTIONS W/O CC/MCC	-1,644	622	0.01
DRG_CD=123	NEUROLOGICAL EYE DISORDERS	-1,409	318	0.00
DRG_CD=124	OTHER DISORDERS OF THE EYE W MCC	6,597	504	0.00
DRG_CD=125	OTHER DISORDERS OF THE EYE W/O MCC	0	0	.
LTI_Indicator		3,329	630	0.00

Table 23: Ear, Nose, Mouth and Throat

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		5,754	420	0.00
HCC1	HIV/AIDS	388	673	0.56
HCC2	SEPTICEMIA/SHOCK	1,275	502	0.01
HCC5	OPPORTUNISTIC INFECTIONS	1,126	1,049	0.28
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	3,286	291	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	2,439	434	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	2,209	219	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND	78	241	0.75

Coef Name	Label	Coef Value	Std Error	P Value
	OTHER CANCERS AND TUMORS			
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	808	299	0.01
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	515	289	0.07
HCC17	DIABETES WITH ACUTE COMPLICATIONS	2,291	1,539	0.14
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	-74	458	0.87
HCC19	DIABETES WITHOUT COMPLICATION	322	147	0.03
HCC21	PROTEIN-CALORIE MALNUTRITION	1,990	429	0.00
HCC25	END-STAGE LIVER DISEASE	1,762	886	0.05
HCC26	CIRRHOSIS OF LIVER	1,408	731	0.05
HCC27	CHRONIC HEPATITIS	664	873	0.45
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	2,014	545	0.00
HCC32	PANCREATIC DISEASE	-766	549	0.16
HCC33	INFLAMMATORY BOWEL DISEASE	134	733	0.85
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,045	525	0.05
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	727	257	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	2,549	492	0.00
HCC45	DISORDERS OF IMMUNITY	1,650	485	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	2,971	1,029	0.00
HCC52	DRUG/ALCOHOL DEPENDENCE	1,995	903	0.03
HCC54	SCHIZOPHRENIA	2,210	450	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,350	246	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	-196	1,034	0.85
HCC68	PARAPLEGIA	4,602	1,382	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	727	754	0.33
HCC70	MUSCULAR DYSTROPHY	5,655	2,329	0.02
HCC71	POLYNEUROPATHY	846	252	0.00
HCC72	MULTIPLE SCLEROSIS	3,915	857	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	3,028	408	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	609	301	0.04
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	1,561	1,204	0.20
HCC77	RESPIRATOR	1,267	630	0.04

Coef Name	Label	Coef Value	Std Error	P Value
	DEPENDENCE/TRACHEOSTOMY STATUS			
HCC78	RESPIRATORY ARREST	-622	2,620	0.81
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	949	296	0.00
HCC80	CONGESTIVE HEART FAILURE	546	237	0.02
HCC81	ACUTE MYOCARDIAL INFARCTION	782	618	0.21
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	93	424	0.83
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	248	266	0.35
HCC92	SPECIFIED HEART ARRHYTHMIAS	185	150	0.22
HCC95	CEREBRAL HEMORRHAGE	433	831	0.60
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,270	329	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	2,360	521	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	2,230	1,142	0.05
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,301	381	0.00
HCC105	VASCULAR DISEASE	978	157	0.00
HCC107	CYSTIC FIBROSIS	-4,809	6,004	0.42
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	571	173	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	-98	551	0.86
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-1,691	1,040	0.10
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	472	635	0.46
HCC130	DIALYSIS STATUS	1,104	668	0.10
HCC131	RENAL FAILURE	467	227	0.04
HCC132	NEPHRITIS	-787	1,363	0.56
HCC148	DECUBITUS ULCER OF SKIN	1,417	536	0.01
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	874	364	0.02
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	0	.
HCC154	SEVERE HEAD INJURY	6,530	3,999	0.10
HCC155	MAJOR HEAD INJURY	-74	625	0.91
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,251	553	0.02
HCC158	HIP FRACTURE/DISLOCATION	2,086	616	0.00
HCC161	TRAUMATIC AMPUTATION	4,047	1,683	0.02
HCC164	MAJOR COMPLICATIONS OF MEDICAL	1,447	357	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	CARE AND TRAUMA			
HCC174	MAJOR ORGAN TRANSPLANT STATUS	1,951	711	0.01
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-412	472	0.38
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	1,626	990	0.10
Age_Lt_35		-1,172	442	0.01
Age_Lt_45		-1,399	363	0.00
Age_Lt_55		-1,056	267	0.00
Age_Lt_60		-68	307	0.83
Age_Lt_65		-277	290	0.34
Age_Lt_75		338	186	0.07
Age_Lt_80		1,130	186	0.00
Age_Lt_85		1,868	188	0.00
Age_Lt_90		2,816	202	0.00
Age_Lt_95		3,239	255	0.00
Age_Gt_94		3,878	429	0.00
ORIGDS		667	177	0.00
ESRD		3,440	372	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	230	1,815	0.90
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	-942	1,029	0.36
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	2,451	1,628	0.13
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-3,181	1,147	0.01
D_HCC107	DISABLED, CYSTIC FIBROSIS	7,472	6,362	0.24
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	421	494	0.39
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	46	339	0.89
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	-293	1,239	0.81
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	1,134	474	0.02
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	130	355	0.72
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	966	499	0.05
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	116,017	1,226	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	98,379	1,672	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	65,313	10,443	0.00
DRG_CD=011	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W MCC	50,431	613	0.00
DRG_CD=012	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W CC	29,949	572	0.00
DRG_CD=013	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W/O CC/MCC	16,695	689	0.00
DRG_CD=129	MAJOR HEAD & NECK PROCEDURES W CC/MCC OR MAJOR DEVICE	14,743	567	0.00
DRG_CD=130	MAJOR HEAD & NECK PROCEDURES W/O CC/MCC	4,570	620	0.00
DRG_CD=131	CRANIAL/FACIAL PROCEDURES W CC/MCC	15,418	619	0.00
DRG_CD=132	CRANIAL/FACIAL PROCEDURES W/O CC/MCC	5,403	697	0.00
DRG_CD=133	OTHER EAR, NOSE, MOUTH & THROAT O.R. PROCEDURES W CC/MCC	11,359	519	0.00
DRG_CD=134	OTHER EAR, NOSE, MOUTH & THROAT O.R. PROCEDURES W/O CC/MCC	1,704	499	0.00
DRG_CD=135	SINUS & MASTOID PROCEDURES W CC/MCC	13,172	938	0.00
DRG_CD=136	SINUS & MASTOID PROCEDURES W/O CC/MCC	2,826	878	0.00
DRG_CD=137	MOUTH PROCEDURES W CC/MCC	6,363	628	0.00
DRG_CD=138	MOUTH PROCEDURES W/O CC/MCC	-309	662	0.64
DRG_CD=139	SALIVARY GLAND PROCEDURES	542	570	0.34
DRG_CD=146	EAR, NOSE, MOUTH & THROAT MALIGNANCY W MCC	23,832	842	0.00
DRG_CD=147	EAR, NOSE, MOUTH & THROAT MALIGNANCY W CC	15,609	663	0.00
DRG_CD=148	EAR, NOSE, MOUTH & THROAT MALIGNANCY W/O CC/MCC	13,527	845	0.00
DRG_CD=149	DYSEQUILIBRIUM	324	405	0.42
DRG_CD=150	EPISTAXIS W MCC	8,604	630	0.00
DRG_CD=151	EPISTAXIS W/O MCC	5	454	0.99
DRG_CD=152	OTITIS MEDIA & URI W MCC	4,167	515	0.00
DRG_CD=153	OTITIS MEDIA & URI W/O MCC	170	421	0.69
DRG_CD=154	OTHER EAR, NOSE, MOUTH & THROAT DIAGNOSES W MCC	10,241	517	0.00
DRG_CD=155	OTHER EAR, NOSE, MOUTH & THROAT DIAGNOSES W CC	4,501	449	0.00
DRG_CD=156	OTHER EAR, NOSE, MOUTH & THROAT DIAGNOSES W/O CC/MCC	808	474	0.09

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=157	DENTAL & ORAL DISEASES W MCC	11,539	577	0.00
DRG_CD=158	DENTAL & ORAL DISEASES W CC	4,351	471	0.00
DRG_CD=159	DENTAL & ORAL DISEASES W/O CC/MCC	0	0	.
LTI_Indicator		4,156	301	0.00

Table 24: Respiratory System

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		26,253	112	0.00
HCC1	HIV/AIDS	842	292	0.00
HCC2	SEPTICEMIA/SHOCK	1,557	115	0.00
HCC5	OPPORTUNISTIC INFECTIONS	1,435	231	0.00
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	2,122	106	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	698	85	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	987	115	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	268	82	0.00
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,081	93	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	836	93	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	1,253	460	0.01
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	471	156	0.00
HCC19	DIABETES WITHOUT COMPLICATION	284	49	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	2,695	104	0.00
HCC25	END-STAGE LIVER DISEASE	1,226	285	0.00
HCC26	CIRRHOSIS OF LIVER	652	239	0.01
HCC27	CHRONIC HEPATITIS	188	280	0.50
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,136	141	0.00
HCC32	PANCREATIC DISEASE	413	160	0.01
HCC33	INFLAMMATORY BOWEL DISEASE	299	216	0.17
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,026	191	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	509	80	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,667	157	0.00
HCC45	DISORDERS OF IMMUNITY	1,695	148	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	1,023	283	0.00
HCC52	DRUG/ALCOHOL DEPENDENCE	411	246	0.09
HCC54	SCHIZOPHRENIA	2,243	124	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,529	73	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	173	247	0.48
HCC68	PARAPLEGIA	2,822	347	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	1,572	241	0.00
HCC70	MUSCULAR DYSTROPHY	805	605	0.18
HCC71	POLYNEUROPATHY	797	79	0.00
HCC72	MULTIPLE SCLEROSIS	747	251	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,557	120	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	516	93	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	1,270	284	0.00
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	3,463	171	0.00
HCC78	RESPIRATORY ARREST	1,641	452	0.00
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	1,017	56	0.00
HCC80	CONGESTIVE HEART FAILURE	390	74	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	551	161	0.00
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	236	127	0.06
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-90	82	0.27
HCC92	SPECIFIED HEART ARRHYTHMIAS	418	47	0.00
HCC95	CEREBRAL HEMORRHAGE	2,409	278	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,384	109	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	2,065	149	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	729	308	0.02
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,347	104	0.00
HCC105	VASCULAR DISEASE	760	48	0.00
HCC107	CYSTIC FIBROSIS	-651	1,368	0.63
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	281	43	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	895	105	0.00
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	753	175	0.00
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-221	247	0.37
HCC130	DIALYSIS STATUS	1,698	199	0.00
HCC131	RENAL FAILURE	672	73	0.00
HCC132	NEPHRITIS	110	424	0.80
HCC148	DECUBITUS ULCER OF SKIN	2,184	118	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,428	114	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	-3,027	3,058	0.32
HCC154	SEVERE HEAD INJURY	1,418	1,524	0.35
HCC155	MAJOR HEAD INJURY	1,084	255	0.00
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	2,121	136	0.00
HCC158	HIP FRACTURE/DISLOCATION	2,240	154	0.00
HCC161	TRAUMATIC AMPUTATION	2,100	495	0.00
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	859	107	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	2,136	267	0.00
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-72	135	0.59
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	1,602	272	0.00
Age_Lt_35		-1,480	188	0.00
Age_Lt_45		-1,359	133	0.00
Age_Lt_55		-1,109	86	0.00
Age_Lt_60		-598	92	0.00
Age_Lt_65		-112	85	0.19
Age_Lt_75		508	61	0.00
Age_Lt_80		1,074	62	0.00
Age_Lt_85		1,764	63	0.00
Age_Lt_90		2,634	68	0.00
Age_Lt_95		3,242	85	0.00
Age_Gt_94		3,361	132	0.00
ORIGDS		422	51	0.00
ESRD		3,786	118	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	1,177	474	0.01
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	-207	371	0.58

Coef Name	Label	Coef Value	Std Error	P Value
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-961	435	0.03
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-286	320	0.37
D_HCC107	DISABLED, CYSTIC FIBROSIS	1,748	1,430	0.22
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	252	154	0.10
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	623	81	0.00
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	-560	284	0.05
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	716	127	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	153	94	0.10
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	194	130	0.14
DRG_CD=001	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W MCC	167,441	12,606	0.00
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	147,849	516	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	98,280	302	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	103,408	8,918	0.00
DRG_CD=007	LUNG TRANSPLANT	59,399	839	0.00
DRG_CD=011	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W MCC	26,035	2,689	0.00
DRG_CD=012	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W CC	5,910	3,639	0.10
DRG_CD=013	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W/O CC/MCC	-10,989	4,457	0.01
DRG_CD=163	MAJOR CHEST PROCEDURES W MCC	16,328	208	0.00
DRG_CD=164	MAJOR CHEST PROCEDURES W CC	-5,256	176	0.00
DRG_CD=165	MAJOR CHEST PROCEDURES W/O CC/MCC	-12,384	204	0.00
DRG_CD=166	OTHER RESP SYSTEM O.R. PROCEDURES W MCC	8,799	187	0.00
DRG_CD=167	OTHER RESP SYSTEM O.R. PROCEDURES W CC	-5,862	191	0.00
DRG_CD=168	OTHER RESP SYSTEM O.R. PROCEDURES W/O CC/MCC	-13,894	323	0.00
DRG_CD=175	PULMONARY EMBOLISM W MCC	-9,390	188	0.00
DRG_CD=176	PULMONARY EMBOLISM W/O MCC	-16,005	142	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=177	RESPIRATORY INFECTIONS & INFLAMMATIONS W MCC	-4,446	133	0.00
DRG_CD=178	RESPIRATORY INFECTIONS & INFLAMMATIONS W CC	-10,910	133	0.00
DRG_CD=179	RESPIRATORY INFECTIONS & INFLAMMATIONS W/O CC/MCC	-15,532	191	0.00
DRG_CD=180	RESPIRATORY NEOPLASMS W MCC	-4,298	213	0.00
DRG_CD=181	RESPIRATORY NEOPLASMS W CC	-9,046	191	0.00
DRG_CD=182	RESPIRATORY NEOPLASMS W/O CC/MCC	-12,380	430	0.00
DRG_CD=183	MAJOR CHEST TRAUMA W MCC	-6,147	371	0.00
DRG_CD=184	MAJOR CHEST TRAUMA W CC	-11,531	282	0.00
DRG_CD=185	MAJOR CHEST TRAUMA W/O CC/MCC	-15,738	424	0.00
DRG_CD=186	PLEURAL EFFUSION W MCC	-8,745	245	0.00
DRG_CD=187	PLEURAL EFFUSION W CC	-12,639	244	0.00
DRG_CD=188	PLEURAL EFFUSION W/O CC/MCC	-16,795	401	0.00
DRG_CD=189	PULMONARY EDEMA & RESPIRATORY FAILURE	-11,735	122	0.00
DRG_CD=190	CHRONIC OBSTRUCTIVE PULMONARY DISEASE W MCC	-14,252	112	0.00
DRG_CD=191	CHRONIC OBSTRUCTIVE PULMONARY DISEASE W CC	-16,165	112	0.00
DRG_CD=192	CHRONIC OBSTRUCTIVE PULMONARY DISEASE W/O CC/MCC	-19,224	114	0.00
DRG_CD=193	SIMPLE PNEUMONIA & PLEURISY W MCC	-10,903	115	0.00
DRG_CD=194	SIMPLE PNEUMONIA & PLEURISY W CC	-15,881	110	0.00
DRG_CD=195	SIMPLE PNEUMONIA & PLEURISY W/O CC/MCC	-19,358	120	0.00
DRG_CD=196	INTERSTITIAL LUNG DISEASE W MCC	-10,218	283	0.00
DRG_CD=197	INTERSTITIAL LUNG DISEASE W CC	-15,215	287	0.00
DRG_CD=198	INTERSTITIAL LUNG DISEASE W/O CC/MCC	-17,739	387	0.00
DRG_CD=199	PNEUMOTHORAX W MCC	-5,917	352	0.00
DRG_CD=200	PNEUMOTHORAX W CC	-13,587	234	0.00
DRG_CD=201	PNEUMOTHORAX W/O CC/MCC	-17,695	357	0.00
DRG_CD=202	BRONCHITIS & ASTHMA W CC/MCC	-17,729	141	0.00
DRG_CD=203	BRONCHITIS & ASTHMA W/O CC/MCC	-20,750	154	0.00
DRG_CD=204	RESPIRATORY SIGNS & SYMPTOMS	-19,228	166	0.00
DRG_CD=205	OTHER RESPIRATORY SYSTEM DIAGNOSES W MCC	-11,225	262	0.00
DRG_CD=206	OTHER RESPIRATORY SYSTEM DIAGNOSES W/O MCC	-17,279	174	0.00
DRG_CD=207	RESPIRATORY SYSTEM DIAGNOSIS W VENTILATOR SUPPORT 96+ HOURS	27,086	190	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=208	RESPIRATORY SYSTEM DIAGNOSIS W VENTILATOR SUPPORT <96 HOURS	0	0	.
LTI_Indicator		4,078	68	0.00

Table 25: Circulatory System

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		7,232	207	0.00
HCC1	HIV/AIDS	509	234	0.03
HCC2	SEPTICEMIA/SHOCK	2,069	98	0.00
HCC5	OPPORTUNISTIC INFECTIONS	844	275	0.00
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	2,398	117	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	998	119	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	1,004	102	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-29	58	0.62
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,306	61	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	1,136	66	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	942	335	0.00
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	689	103	0.00
HCC19	DIABETES WITHOUT COMPLICATION	465	38	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	2,279	102	0.00
HCC25	END-STAGE LIVER DISEASE	2,061	229	0.00
HCC26	CIRRHOSIS OF LIVER	829	184	0.00
HCC27	CHRONIC HEPATITIS	445	239	0.06
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,259	118	0.00
HCC32	PANCREATIC DISEASE	638	126	0.00
HCC33	INFLAMMATORY BOWEL DISEASE	333	171	0.05
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,043	119	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	491	66	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,560	121	0.00
HCC45	DISORDERS OF IMMUNITY	1,520	160	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	914	256	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC52	DRUG/ALCOHOL DEPENDENCE	883	233	0.00
HCC54	SCHIZOPHRENIA	2,297	138	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,517	67	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	910	378	0.02
HCC68	PARAPLEGIA	1,826	343	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	1,696	214	0.00
HCC70	MUSCULAR DYSTROPHY	2,544	710	0.00
HCC71	POLYNEUROPATHY	635	58	0.00
HCC72	MULTIPLE SCLEROSIS	1,308	265	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,031	107	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	872	86	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	2,462	299	0.00
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	4,043	245	0.00
HCC78	RESPIRATORY ARREST	2,114	472	0.00
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	1,093	58	0.00
HCC80	CONGESTIVE HEART FAILURE	669	46	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	11	85	0.89
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-250	67	0.00
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-411	47	0.00
HCC92	SPECIFIED HEART ARRHYTHMIAS	201	31	0.00
HCC95	CEREBRAL HEMORRHAGE	1,682	222	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,149	82	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	1,900	121	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	962	348	0.01
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,567	66	0.00
HCC105	VASCULAR DISEASE	401	34	0.00
HCC107	CYSTIC FIBROSIS	3,939	1,610	0.01
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	588	47	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	1,364	141	0.00
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	2	209	0.99

Coef Name	Label	Coef Value	Std Error	P Value
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	167	129	0.20
HCC130	DIALYSIS STATUS	242	104	0.02
HCC131	RENAL FAILURE	364	53	0.00
HCC132	NEPHRITIS	-673	305	0.03
HCC148	DECUBITUS ULCER OF SKIN	2,420	99	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,976	75	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	4,830	2,789	0.08
HCC154	SEVERE HEAD INJURY	5,826	1,506	0.00
HCC155	MAJOR HEAD INJURY	266	218	0.22
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,479	131	0.00
HCC158	HIP FRACTURE/DISLOCATION	1,728	130	0.00
HCC161	TRAUMATIC AMPUTATION	1,697	257	0.00
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	656	63	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	2,185	230	0.00
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	1,214	164	0.00
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	1,366	143	0.00
Age_Lt_35		-65	183	0.72
Age_Lt_45		-519	113	0.00
Age_Lt_55		-328	72	0.00
Age_Lt_60		-29	76	0.70
Age_Lt_65		398	69	0.00
Age_Lt_75		419	46	0.00
Age_Lt_80		914	46	0.00
Age_Lt_85		1,532	47	0.00
Age_Lt_90		2,281	50	0.00
Age_Lt_95		2,646	63	0.00
Age_Gt_94		2,814	103	0.00
ORIGDS		561	41	0.00
ESRD		3,841	73	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	843	641	0.19
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	1,321	337	0.00
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	57	423	0.89
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	149	314	0.63
D_HCC107	DISABLED, CYSTIC FIBROSIS	1,026	2,567	0.69

Coef Name	Label	Coef Value	Std Error	P Value
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	182	113	0.11
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	237	68	0.00
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	454	207	0.03
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	1,003	84	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	181	66	0.01
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	415	86	0.00
DRG_CD=001	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W MCC	189,042	704	0.00
DRG_CD=002	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W/O MCC	111,380	1,247	0.00
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	181,842	438	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	135,640	759	0.00
DRG_CD=007	LUNG TRANSPLANT	71,301	5,580	0.00
DRG_CD=009	BONE MARROW TRANSPLANT	37,637	5,582	0.00
DRG_CD=014	ALLOGENEIC BONE MARROW TRANSPLANT	74,347	12,475	0.00
DRG_CD=215	OTHER HEART ASSIST SYSTEM IMPLANT	88,506	2,214	0.00
DRG_CD=216	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W CARD CATH W MCC	70,874	295	0.00
DRG_CD=217	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W CARD CATH W CC	43,007	323	0.00
DRG_CD=218	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W CARD CATH W/O CC/MCC	32,288	586	0.00
DRG_CD=219	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W/O CARD CATH W MCC	58,308	262	0.00
DRG_CD=220	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W/O CARD CATH W CC	34,103	247	0.00
DRG_CD=221	CARDIAC VALVE & OTH MAJ CARDIOTHORACIC PROC W/O CARD	27,415	336	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	CATH W/O CC/MCC			
DRG_CD=222	CARDIAC DEFIB IMPLANT W CARDIAC CATH W AMI/HF/SHOCK W MCC	58,285	472	0.00
DRG_CD=223	CARDIAC DEFIB IMPLANT W CARDIAC CATH W AMI/HF/SHOCK W/O MCC	34,093	420	0.00
DRG_CD=224	CARDIAC DEFIB IMPLANT W CARDIAC CATH W/O AMI/HF/SHOCK W MCC	50,969	445	0.00
DRG_CD=225	CARDIAC DEFIB IMPLANT W CARDIAC CATH W/O AMI/HF/SHOCK W/O MCC	32,249	382	0.00
DRG_CD=226	CARDIAC DEFIBRILLATOR IMPLANT W/O CARDIAC CATH W MCC	39,908	325	0.00
DRG_CD=227	CARDIAC DEFIBRILLATOR IMPLANT W/O CARDIAC CATH W/O MCC	24,687	238	0.00
DRG_CD=228	OTHER CARDIOTHORACIC PROCEDURES W MCC	56,792	489	0.00
DRG_CD=229	OTHER CARDIOTHORACIC PROCEDURES W CC	29,759	441	0.00
DRG_CD=230	OTHER CARDIOTHORACIC PROCEDURES W/O CC/MCC	20,445	760	0.00
DRG_CD=231	CORONARY BYPASS W PTCA W MCC	59,375	600	0.00
DRG_CD=232	CORONARY BYPASS W PTCA W/O MCC	36,938	649	0.00
DRG_CD=233	CORONARY BYPASS W CARDIAC CATH W MCC	51,146	262	0.00
DRG_CD=234	CORONARY BYPASS W CARDIAC CATH W/O MCC	29,682	240	0.00
DRG_CD=235	CORONARY BYPASS W/O CARDIAC CATH W MCC	40,088	306	0.00
DRG_CD=236	CORONARY BYPASS W/O CARDIAC CATH W/O MCC	21,661	245	0.00
DRG_CD=237	MAJOR CARDIOVASC PROCEDURES W MCC OR THORACIC AORTIC ANEURYSM REPAIR	40,026	253	0.00
DRG_CD=238	MAJOR CARDIOVASC PROCEDURES W/O MCC	15,535	226	0.00
DRG_CD=239	AMPUTATION FOR CIRC SYS DISORDERS EXC UPPER LIMB & TOE W MCC	41,945	298	0.00
DRG_CD=240	AMPUTATION FOR CIRC SYS DISORDERS EXC UPPER LIMB & TOE W CC	23,886	300	0.00
DRG_CD=241	AMPUTATION FOR CIRC SYS DISORDERS EXC UPPER LIMB & TOE W/O CC/MCC	16,697	579	0.00
DRG_CD=242	PERMANENT CARDIAC PACEMAKER IMPLANT W MCC	22,139	244	0.00
DRG_CD=243	PERMANENT CARDIAC PACEMAKER	12,509	228	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	IMPLANT W CC			
	PERMANENT CARDIAC PACEMAKER			
DRG_CD=244	IMPLANT W/O CC/MCC	6,561	225	0.00
DRG_CD=245	AICD GENERATOR PROCEDURES	19,803	380	0.00
	PERC CARDIOVASC PROC W DRUG-ELUTING STENT W MCC OR 4+			
DRG_CD=246	VESSELS/STENTS	18,318	233	0.00
	PERC CARDIOVASC PROC W DRUG-			
DRG_CD=247	ELUTING STENT W/O MCC	6,921	212	0.00
	PERC CARDIOVASC PROC W NON-DRUG-ELUTING STENT W MCC OR 4+			
DRG_CD=248	VES/STENTS	19,188	270	0.00
	PERC CARDIOVASC PROC W NON-			
DRG_CD=249	DRUG-ELUTING STENT W/O MCC	6,605	229	0.00
	PERC CARDIOVASC PROC W/O			
DRG_CD=250	CORONARY ARTERY STENT W MCC	17,998	307	0.00
	PERC CARDIOVASC PROC W/O			
DRG_CD=251	CORONARY ARTERY STENT W/O MCC	6,268	230	0.00
	OTHER VASCULAR PROCEDURES W			
DRG_CD=252	MCC	22,686	230	0.00
DRG_CD=253	OTHER VASCULAR PROCEDURES W CC	14,883	226	0.00
	OTHER VASCULAR PROCEDURES W/O			
DRG_CD=254	CC/MCC	5,409	226	0.00
	UPPER LIMB & TOE AMPUTATION FOR			
DRG_CD=255	CIRC SYSTEM DISORDERS W MCC	21,525	442	0.00
	UPPER LIMB & TOE AMPUTATION FOR			
DRG_CD=256	CIRC SYSTEM DISORDERS W CC	11,934	427	0.00
	UPPER LIMB & TOE AMPUTATION FOR			
DRG_CD=257	CIRC SYSTEM DISORDERS W/O CC/MCC	5,331	1,036	0.00
	CARDIAC PACEMAKER DEVICE			
DRG_CD=258	REPLACEMENT W MCC	17,669	681	0.00
	CARDIAC PACEMAKER DEVICE			
DRG_CD=259	REPLACEMENT W/O MCC	5,064	357	0.00
	CARDIAC PACEMAKER REVISION			
DRG_CD=260	EXCEPT DEVICE REPLACEMENT W MCC	26,475	569	0.00
	CARDIAC PACEMAKER REVISION			
DRG_CD=261	EXCEPT DEVICE REPLACEMENT W CC	6,286	393	0.00
	CARDIAC PACEMAKER REVISION			
	EXCEPT DEVICE REPLACEMENT W/O			
DRG_CD=262	CC/MCC	1,711	471	0.00
DRG_CD=263	VEIN LIGATION & STRIPPING	8,315	894	0.00
	OTHER CIRCULATORY SYSTEM O.R.			
DRG_CD=264	PROCEDURES	17,610	248	0.00
DRG_CD=265	AICD LEAD PROCEDURES	9,002	541	0.00
	ACUTE MYOCARDIAL INFARCTION,			
DRG_CD=280	DISCHARGED ALIVE W MCC	13,523	220	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=281	ACUTE MYOCARDIAL INFARCTION, DISCHARGED ALIVE W CC	6,139	228	0.00
DRG_CD=282	ACUTE MYOCARDIAL INFARCTION, DISCHARGED ALIVE W/O CC/MCC	2,286	242	0.00
DRG_CD=286	CIRCULATORY DISORDERS EXCEPT AMI, W CARD CATH W MCC	13,431	238	0.00
DRG_CD=287	CIRCULATORY DISORDERS EXCEPT AMI, W CARD CATH W/O MCC	3,452	212	0.00
DRG_CD=288	ACUTE & SUBACUTE ENDOCARDITIS W MCC	31,282	535	0.00
DRG_CD=289	ACUTE & SUBACUTE ENDOCARDITIS W CC	18,603	660	0.00
DRG_CD=290	ACUTE & SUBACUTE ENDOCARDITIS W/O CC/MCC	9,843	1,375	0.00
DRG_CD=291	HEART FAILURE & SHOCK W MCC	8,797	210	0.00
DRG_CD=292	HEART FAILURE & SHOCK W CC	3,861	209	0.00
DRG_CD=293	HEART FAILURE & SHOCK W/O CC/MCC	187	213	0.38
DRG_CD=294	DEEP VEIN THROMBOPHLEBITIS W CC/MCC	3,871	609	0.00
DRG_CD=295	DEEP VEIN THROMBOPHLEBITIS W/O CC/MCC	-1,488	798	0.06
DRG_CD=296	CARDIAC ARREST, UNEXPLAINED W MCC	20,684	1,709	0.00
DRG_CD=297	CARDIAC ARREST, UNEXPLAINED W CC	10,387	3,338	0.00
DRG_CD=298	CARDIAC ARREST, UNEXPLAINED W/O CC/MCC	3,089	5,579	0.58
DRG_CD=299	PERIPHERAL VASCULAR DISORDERS W MCC	8,907	244	0.00
DRG_CD=300	PERIPHERAL VASCULAR DISORDERS W CC	4,343	225	0.00
DRG_CD=301	PERIPHERAL VASCULAR DISORDERS W/O CC/MCC	-62.32264193	233.3367644	0.79
DRG_CD=302	ATHEROSCLEROSIS W MCC	4254.214096	312.8383182	0.00
DRG_CD=303	ATHEROSCLEROSIS W/O MCC	-794.6603217	227.3189594	0.00
DRG_CD=304	HYPERTENSION W MCC	4516.704115	359.4977427	0.00
DRG_CD=305	HYPERTENSION W/O MCC	-1117.437431	226.3455061	0.00
DRG_CD=306	CARDIAC CONGENITAL & VALVULAR DISORDERS W MCC	10489.58191	453.5860595	0.00
DRG_CD=307	CARDIAC CONGENITAL & VALVULAR DISORDERS W/O MCC	5215.302854	348.241145	0.00
DRG_CD=308	CARDIAC ARRHYTHMIA & CONDUCTION DISORDERS W MCC	6517.824387	217.409231	0.00
DRG_CD=309	CARDIAC ARRHYTHMIA & CONDUCTION DISORDERS W CC	2249.183641	213.001002	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=310	CARDIAC ARRHYTHMIA & CONDUCTION DISORDERS W/O CC/MCC	-1583.757593	210.7337293	0.00
DRG_CD=311	ANGINA PECTORIS	-1191.18206	276.346083	0.00
DRG_CD=312	SYNCOPE & COLLAPSE	863.5896581	209.0187439	0.00
DRG_CD=313	CHEST PAIN	-1790.618251	209.5517069	0.00
DRG_CD=314	OTHER CIRCULATORY SYSTEM DIAGNOSES W MCC	12300.83657	225.4767387	0.00
DRG_CD=315	OTHER CIRCULATORY SYSTEM DIAGNOSES W CC	4161.506659	243.624188	0.00
DRG_CD=316	OTHER CIRCULATORY SYSTEM DIAGNOSES W/O CC/MCC	0	0	.
LTI_Indicator		3431.41953	72.26666923	0.00

Table 26: Digestive System

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		5,741	176	0.00
HCC1	HIV/AIDS	292	369	0.43
HCC2	SEPTICEMIA/SHOCK	1,542	161	0.00
HCC5	OPPORTUNISTIC INFECTIONS	813	387	0.04
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	3,572	135	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	2,072	150	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	1,388	159	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	52	83	0.53
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	820	130	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	880	130	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	645	616	0.29
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	500	214	0.02
HCC19	DIABETES WITHOUT COMPLICATION	464	66	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	2,437	141	0.00
HCC25	END-STAGE LIVER DISEASE	806	259	0.00
HCC26	CIRRHOSIS OF LIVER	423	253	0.09
HCC27	CHRONIC HEPATITIS	906	366	0.01
HCC31	INTESTINAL	381	103	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	OBSTRUCTION/PERFORATION			
HCC32	PANCREATIC DISEASE	735	148	0.00
HCC33	INFLAMMATORY BOWEL DISEASE	1,263	157	0.00
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,010	246	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	680	107	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,671	201	0.00
HCC45	DISORDERS OF IMMUNITY	1,870	216	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	1,649	401	0.00
HCC52	DRUG/ALCOHOL DEPENDENCE	990	359	0.01
HCC54	SCHIZOPHRENIA	2,130	203	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,265	104	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	642	396	0.10
HCC68	PARAPLEGIA	1,045	435	0.02
HCC69	SPINAL CORD DISORDERS/INJURIES	2,015	338	0.00
HCC70	MUSCULAR DYSTROPHY	2,660	966	0.01
HCC71	POLYNEUROPATHY	785	111	0.00
HCC72	MULTIPLE SCLEROSIS	1,641	340	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,729	178	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	564	136	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	3,116	492	0.00
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	4,471	367	0.00
HCC78	RESPIRATORY ARREST	889	1,023	0.38
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	1,183	124	0.00
HCC80	CONGESTIVE HEART FAILURE	818	103	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	785	234	0.00
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	340	178	0.06
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-101	114	0.37
HCC92	SPECIFIED HEART ARRHYTHMIAS	524	66	0.00
HCC95	CEREBRAL HEMORRHAGE	2,619	410	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,381	151	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	1,936	213	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	943	408	0.02
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,303	144	0.00
HCC105	VASCULAR DISEASE	876	67	0.00
HCC107	CYSTIC FIBROSIS	3,586	2,874	0.21
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	594	75	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	1,529	218	0.00
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	214	398	0.59
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-130	311	0.68
HCC130	DIALYSIS STATUS	1,425	252	0.00
HCC131	RENAL FAILURE	625	90	0.00
HCC132	NEPHRITIS	-463	579	0.42
HCC148	DECUBITUS ULCER OF SKIN	1,920	174	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,245	160	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	10,176	5,949	0.09
HCC154	SEVERE HEAD INJURY	3,480	2,595	0.18
HCC155	MAJOR HEAD INJURY	892	385	0.02
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	2,053	206	0.00
HCC158	HIP FRACTURE/DISLOCATION	2,579	219	0.00
HCC161	TRAUMATIC AMPUTATION	2,125	617	0.00
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	1,061	125	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	436	346	0.21
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	271	130	0.04
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	1,279	346	0.00
Age_Lt_35		-63	213	0.77
Age_Lt_45		-104	160	0.52
Age_Lt_55		-119	118	0.31
Age_Lt_60		547	134	0.00
Age_Lt_65		589	125	0.00
Age_Lt_75		455	81	0.00
Age_Lt_80		1,015	81	0.00
Age_Lt_85		1,769	83	0.00
Age_Lt_90		2,739	90	0.00

Coef Name	Label	Coef Value	Std Error	P Value
Age_Lt_95		3,178	115	0.00
Age_Gt_94		3,220	193	0.00
ORIGDS		765	77	0.00
ESRD		3,392	152	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	1,514	746	0.04
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	752	463	0.10
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-932	574	0.10
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-396	448	0.38
D_HCC107	DISABLED, CYSTIC FIBROSIS	-2,574	3,271	0.43
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-105	218	0.63
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	117	143	0.41
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	446	517	0.39
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	703	189	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	138	156	0.38
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	-120	192	0.53
DRG_CD=001	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W MCC	163,475	15,740	0.00
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	176,240	624	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	120,147	1,396	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	148,158	5,570	0.00
DRG_CD=009	BONE MARROW TRANSPLANT	139,190	15,744	0.00
DRG_CD=011	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W MCC	98,776	7,869	0.00
DRG_CD=012	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W CC	50,383	9,086	0.00
DRG_CD=013	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W/O CC/MCC	19,506	11,129	0.08
DRG_CD=326	STOMACH, ESOPHAGEAL & DUODENAL PROC W MCC	45,043	301	0.00
DRG_CD=327	STOMACH, ESOPHAGEAL & DUODENAL PROC W CC	17,282	286	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=328	STOMACH, ESOPHAGEAL & DUODENAL PROC W/O CC/MCC	5,152	281	0.00
DRG_CD=329	MAJOR SMALL & LARGE BOWEL PROCEDURES W MCC	41,532	205	0.00
DRG_CD=330	MAJOR SMALL & LARGE BOWEL PROCEDURES W CC	16,025	193	0.00
DRG_CD=331	MAJOR SMALL & LARGE BOWEL PROCEDURES W/O CC/MCC	7,029	219	0.00
DRG_CD=332	RECTAL RESECTION W MCC	36,226	620	0.00
DRG_CD=333	RECTAL RESECTION W CC	15,589	358	0.00
DRG_CD=334	RECTAL RESECTION W/O CC/MCC	7,110	423	0.00
DRG_CD=335	PERITONEAL ADHESIOLYSIS W MCC	31,578	325	0.00
DRG_CD=336	PERITONEAL ADHESIOLYSIS W CC	13,331	266	0.00
DRG_CD=337	PERITONEAL ADHESIOLYSIS W/O CC/MCC	5,825	305	0.00
DRG_CD=338	APPENDECTOMY W COMPLICATED PRINCIPAL DIAG W MCC	23,940	599	0.00
DRG_CD=339	APPENDECTOMY W COMPLICATED PRINCIPAL DIAG W CC	8,917	425	0.00
DRG_CD=340	APPENDECTOMY W COMPLICATED PRINCIPAL DIAG W/O CC/MCC	3,426	421	0.00
DRG_CD=341	APPENDECTOMY W/O COMPLICATED PRINCIPAL DIAG W MCC	15,444	743	0.00
DRG_CD=342	APPENDECTOMY W/O COMPLICATED PRINCIPAL DIAG W CC	4,704	454	0.00
DRG_CD=343	APPENDECTOMY W/O COMPLICATED PRINCIPAL DIAG W/O CC/MCC	1,329	324	0.00
DRG_CD=344	MINOR SMALL & LARGE BOWEL PROCEDURES W MCC	24,304	780	0.00
DRG_CD=345	MINOR SMALL & LARGE BOWEL PROCEDURES W CC	7,984	445	0.00
DRG_CD=346	MINOR SMALL & LARGE BOWEL PROCEDURES W/O CC/MCC	2,457	462	0.00
DRG_CD=347	ANAL & STOMAL PROCEDURES W MCC	17,387	607	0.00
DRG_CD=348	ANAL & STOMAL PROCEDURES W CC	6,773	396	0.00
DRG_CD=349	ANAL & STOMAL PROCEDURES W/O CC/MCC	1,106	401	0.01
DRG_CD=350	INGUINAL & FEMORAL HERNIA PROCEDURES W MCC	16,557	568	0.00
DRG_CD=351	INGUINAL & FEMORAL HERNIA PROCEDURES W CC	5,958	378	0.00
DRG_CD=352	INGUINAL & FEMORAL HERNIA PROCEDURES W/O CC/MCC	692	332	0.04
DRG_CD=353	HERNIA PROCEDURES EXCEPT INGUINAL & FEMORAL W MCC	19,289	414	0.00
DRG_CD=354	HERNIA PROCEDURES EXCEPT	6,724	282	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=355	INGUINAL & FEMORAL W CC HERNIA PROCEDURES EXCEPT INGUINAL & FEMORAL W/O CC/MCC	2,029	257	0.00
DRG_CD=356	OTHER DIGESTIVE SYSTEM O.R. PROCEDURES W MCC	31,462	362	0.00
DRG_CD=357	OTHER DIGESTIVE SYSTEM O.R. PROCEDURES W CC	13,053	352	0.00
DRG_CD=358	OTHER DIGESTIVE SYSTEM O.R. PROCEDURES W/O CC/MCC	5,403	559	0.00
DRG_CD=368	MAJOR ESOPHAGEAL DISORDERS W MCC	11,587	459	0.00
DRG_CD=369	MAJOR ESOPHAGEAL DISORDERS W CC	4,431	382	0.00
DRG_CD=370	MAJOR ESOPHAGEAL DISORDERS W/O CC/MCC	1,088	635	0.09
DRG_CD=371	MAJOR GASTROINTESTINAL DISORDERS & PERITONEAL INFECTIONS W MCC	14,801	243	0.00
DRG_CD=372	MAJOR GASTROINTESTINAL DISORDERS & PERITONEAL INFECTIONS W CC	7,510	225	0.00
DRG_CD=373	MAJOR GASTROINTESTINAL DISORDERS & PERITONEAL INFECTIONS W/O CC/MCC	2,776	290	0.00
DRG_CD=374	DIGESTIVE MALIGNANCY W MCC	18,423	387	0.00
DRG_CD=375	DIGESTIVE MALIGNANCY W CC	13,654	282	0.00
DRG_CD=376	DIGESTIVE MALIGNANCY W/O CC/MCC	9,567	531	0.00
DRG_CD=377	G.I. HEMORRHAGE W MCC	10,651	198	0.00
DRG_CD=378	G.I. HEMORRHAGE W CC	3,270	179	0.00
DRG_CD=379	G.I. HEMORRHAGE W/O CC/MCC	58	199	0.77
DRG_CD=380	COMPLICATED PEPTIC ULCER W MCC	12,569	477	0.00
DRG_CD=381	COMPLICATED PEPTIC ULCER W CC	4,925	374	0.00
DRG_CD=382	COMPLICATED PEPTIC ULCER W/O CC/MCC	1,782	511	0.00
DRG_CD=383	UNCOMPLICATED PEPTIC ULCER W MCC	7,933	643	0.00
DRG_CD=384	UNCOMPLICATED PEPTIC ULCER W/O MCC	1,913	318	0.00
DRG_CD=385	INFLAMMATORY BOWEL DISEASE W MCC	12,456	509	0.00
DRG_CD=386	INFLAMMATORY BOWEL DISEASE W CC	4,716	321	0.00
DRG_CD=387	INFLAMMATORY BOWEL DISEASE W/O CC/MCC	1,898	407	0.00
DRG_CD=388	G.I. OBSTRUCTION W MCC	10,058	239	0.00
DRG_CD=389	G.I. OBSTRUCTION W CC	3,492	198	0.00
DRG_CD=390	G.I. OBSTRUCTION W/O CC/MCC	-516	201	0.01

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=391	ESOPHAGITIS, GASTROENT & MISC DIGEST DISORDERS W MCC	6,190	196	0.00
DRG_CD=392	ESOPHAGITIS, GASTROENT & MISC DIGEST DISORDERS W/O MCC	1,064	172	0.00
DRG_CD=393	OTHER DIGESTIVE SYSTEM DIAGNOSES W MCC	10,777	238	0.00
DRG_CD=394	OTHER DIGESTIVE SYSTEM DIAGNOSES W CC	3,762	203	0.00
DRG_CD=395	OTHER DIGESTIVE SYSTEM DIAGNOSES W/O CC/MCC	0	0	.
LTI_Indicator		3,814	111	0.00

Table 27: Hepatobiliary System and Pancreas

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		8,856	197	0.00
HCC1	HIV/AIDS	1,475	447	0.00
HCC2	SEPTICEMIA/SHOCK	889	266	0.00
HCC5	OPPORTUNISTIC INFECTIONS	914	807	0.26
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	586	229	0.01
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	873	190	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	678	318	0.03
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	249	179	0.16
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,132	206	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	727	199	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	2,444	844	0.00
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	454	315	0.15
HCC19	DIABETES WITHOUT COMPLICATION	465	99	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	2,289	236	0.00
HCC25	END-STAGE LIVER DISEASE	784	189	0.00
HCC26	CIRRHOSIS OF LIVER	-462	204	0.02
HCC27	CHRONIC HEPATITIS	-445	390	0.25
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,068	218	0.00
HCC32	PANCREATIC DISEASE	734	133	0.00
HCC33	INFLAMMATORY BOWEL DISEASE	-16	374	0.97

Coef Name	Label	Coef Value	Std Error	P Value
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	685	438	0.12
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	682	193	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	566	286	0.05
HCC45	DISORDERS OF IMMUNITY	792	370	0.03
HCC51	DRUG/ALCOHOL PSYCHOSIS	618	649	0.34
HCC52	DRUG/ALCOHOL DEPENDENCE	1,202	392	0.00
HCC54	SCHIZOPHRENIA	1,116	310	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,152	168	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	1,504	909	0.10
HCC68	PARAPLEGIA	1,553	859	0.07
HCC69	SPINAL CORD DISORDERS/INJURIES	3,119	591	0.00
HCC70	MUSCULAR DYSTROPHY	-838	1,820	0.65
HCC71	POLYNEUROPATHY	576	185	0.00
HCC72	MULTIPLE SCLEROSIS	1,786	648	0.01
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,284	362	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	1,414	226	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	-992	844	0.24
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	2,675	754	0.00
HCC78	RESPIRATORY ARREST	2,093	1,771	0.24
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	1,421	214	0.00
HCC80	CONGESTIVE HEART FAILURE	990	185	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	505	444	0.26
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	314	307	0.31
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	168	196	0.39
HCC92	SPECIFIED HEART ARRHYTHMIAS	489	120	0.00
HCC95	CEREBRAL HEMORRHAGE	981	695	0.16
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,983	297	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	1,626	421	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	1,674	786	0.03
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,368	276	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC105	VASCULAR DISEASE	664	119	0.00
HCC107	CYSTIC FIBROSIS	-97	3,940	0.98
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	428	130	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	842	443	0.06
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	1,289	715	0.07
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	182	478	0.70
HCC130	DIALYSIS STATUS	1,452	422	0.00
HCC131	RENAL FAILURE	612	145	0.00
HCC132	NEPHRITIS	-1,250	934	0.18
HCC148	DECUBITUS ULCER OF SKIN	3,592	381	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,347	284	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	0	.
HCC154	SEVERE HEAD INJURY	2,415	3,365	0.47
HCC155	MAJOR HEAD INJURY	824	612	0.18
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	2,103	391	0.00
HCC158	HIP FRACTURE/DISLOCATION	2,822	409	0.00
HCC161	TRAUMATIC AMPUTATION	2,207	1,189	0.06
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	346	222	0.12
HCC174	MAJOR ORGAN TRANSPLANT STATUS	2,925	383	0.00
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	817	347	0.02
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	1,361	597	0.02
Age_Lt_35		233	302	0.44
Age_Lt_45		-760	219	0.00
Age_Lt_55		-767	162	0.00
Age_Lt_60		-432	182	0.02
Age_Lt_65		105	185	0.57
Age_Lt_75		188	127	0.14
Age_Lt_80		703	132	0.00
Age_Lt_85		1,516	138	0.00
Age_Lt_90		2,270	157	0.00
Age_Lt_95		3,107	218	0.00
Age_Gt_94		3,072	390	0.00
ORIGDS		535	133	0.00
ESRD		3,581	241	0.00

Coef Name	Label	Coef Value	Std Error	P Value
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	1,413	1,232	0.25
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	1,062	432	0.01
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-239	759	0.75
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-925	461	0.04
D_HCC107	DISABLED, CYSTIC FIBROSIS	-194	4,318	0.96
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-405	405	0.32
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	64	257	0.80
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	169	1,006	0.87
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	381	314	0.23
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	-77	265	0.77
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	347	347	0.32
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	202,270	1,265	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	150,444	1,604	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	79,127	802	0.00
DRG_CD=006	LIVER TRANSPLANT W/O MCC	38,886	1,143	0.00
DRG_CD=008	SIMULTANEOUS PANCREAS/KIDNEY TRANSPLANT	100,247	12,464	0.00
DRG_CD=009	BONE MARROW TRANSPLANT	364,621	12,488	0.00
DRG_CD=010	PANCREAS TRANSPLANT	42,766	3,766	0.00
DRG_CD=405	PANCREAS, LIVER & SHUNT PROCEDURES W MCC	40,145	379	0.00
DRG_CD=406	PANCREAS, LIVER & SHUNT PROCEDURES W CC	15,083	332	0.00
DRG_CD=407	PANCREAS, LIVER & SHUNT PROCEDURES W/O CC/MCC	6,835	445	0.00
DRG_CD=408	BILIARY TRACT PROC EXCEPT ONLY CHOLECYST W OR W/O C.D.E. W MCC	29,186	576	0.00
DRG_CD=409	BILIARY TRACT PROC EXCEPT ONLY CHOLECYST W OR W/O C.D.E. W CC	12,314	563	0.00
DRG_CD=410	BILIARY TRACT PROC EXCEPT ONLY CHOLECYST W OR W/O C.D.E. W/O	6,223	911	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	CC/MCC			
DRG_CD=411	CHOLECYSTECTOMY W C.D.E. W MCC	25,728	728	0.00
DRG_CD=412	CHOLECYSTECTOMY W C.D.E. W CC	13,267	725	0.00
DRG_CD=413	CHOLECYSTECTOMY W C.D.E. W/O CC/MCC	5,186	814	0.00
DRG_CD=414	CHOLECYSTECTOMY EXCEPT BY LAPAROSCOPE W/O C.D.E. W MCC	23,014	332	0.00
DRG_CD=415	CHOLECYSTECTOMY EXCEPT BY LAPAROSCOPE W/O C.D.E. W CC	8,436	311	0.00
DRG_CD=416	CHOLECYSTECTOMY EXCEPT BY LAPAROSCOPE W/O C.D.E. W/O CC/MCC	1,672	338	0.00
DRG_CD=417	LAPAROSCOPIC CHOLECYSTECTOMY W/O C.D.E. W MCC	13,334	218	0.00
DRG_CD=418	LAPAROSCOPIC CHOLECYSTECTOMY W/O C.D.E. W CC	5,312	206	0.00
DRG_CD=419	LAPAROSCOPIC CHOLECYSTECTOMY W/O C.D.E. W/O CC/MCC	239	204	0.24
DRG_CD=420	HEPATOBILIARY DIAGNOSTIC PROCEDURES W MCC	28,841	940	0.00
DRG_CD=421	HEPATOBILIARY DIAGNOSTIC PROCEDURES W CC	9,461	752	0.00
DRG_CD=422	HEPATOBILIARY DIAGNOSTIC PROCEDURES W/O CC/MCC	3,590	1,423	0.01
DRG_CD=423	OTHER HEPATOBILIARY OR PANCREAS O.R. PROCEDURES W MCC	33,520	696	0.00
DRG_CD=424	OTHER HEPATOBILIARY OR PANCREAS O.R. PROCEDURES W CC	15,299	936	0.00
DRG_CD=425	OTHER HEPATOBILIARY OR PANCREAS O.R. PROCEDURES W/O CC/MCC	6,277	1,977	0.00
DRG_CD=432	CIRRHOSIS & ALCOHOLIC HEPATITIS W MCC	9,501	287	0.00
DRG_CD=433	CIRRHOSIS & ALCOHOLIC HEPATITIS W CC	2,755	315	0.00
DRG_CD=434	CIRRHOSIS & ALCOHOLIC HEPATITIS W/O CC/MCC	1,258	1,096	0.25
DRG_CD=435	MALIGNANCY OF HEPATOBILIARY SYSTEM OR PANCREAS W MCC	14,058	304	0.00
DRG_CD=436	MALIGNANCY OF HEPATOBILIARY SYSTEM OR PANCREAS W CC	8,040	309	0.00
DRG_CD=437	MALIGNANCY OF HEPATOBILIARY SYSTEM OR PANCREAS W/O CC/MCC	5,288	533	0.00
DRG_CD=438	DISORDERS OF PANCREAS EXCEPT MALIGNANCY W MCC	9,598	236	0.00
DRG_CD=439	DISORDERS OF PANCREAS EXCEPT MALIGNANCY W CC	1,246	213	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=440	DISORDERS OF PANCREAS EXCEPT MALIGNANCY W/O CC/MCC	-2,198	218	0.00
DRG_CD=441	DISORDERS OF LIVER EXCEPT MALIG,CIRR,ALC HEPA W MCC	12,118	268	0.00
DRG_CD=442	DISORDERS OF LIVER EXCEPT MALIG,CIRR,ALC HEPA W CC	3,735	258	0.00
DRG_CD=443	DISORDERS OF LIVER EXCEPT MALIG,CIRR,ALC HEPA W/O CC/MCC	-303	346	0.38
DRG_CD=444	DISORDERS OF THE BILIARY TRACT W MCC	8,213	246	0.00
DRG_CD=445	DISORDERS OF THE BILIARY TRACT W CC	3,018	228	0.00
DRG_CD=446	DISORDERS OF THE BILIARY TRACT W/O CC/MCC	0	0	.
LTI_Indicator		5,531	229	0.00

Table 28: Musculoskeletal System and Connective Tissue

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		7,096	467	0.00
HCC1	HIV/AIDS	1,566	316	0.00
HCC2	SEPTICEMIA/SHOCK	1,412	165	0.00
HCC5	OPPORTUNISTIC INFECTIONS	853	409	0.04
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	2,333	143	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	964	173	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	426	124	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-170	68	0.01
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	2,432	95	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	2,251	90	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	2,875	529	0.00
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	1,514	152	0.00
HCC19	DIABETES WITHOUT COMPLICATION	1,003	43	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	1,378	158	0.00
HCC25	END-STAGE LIVER DISEASE	1,920	340	0.00
HCC26	CIRRHOSIS OF LIVER	1,319	253	0.00
HCC27	CHRONIC HEPATITIS	905	294	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	701	178	0.00
HCC32	PANCREATIC DISEASE	711	180	0.00
HCC33	INFLAMMATORY BOWEL DISEASE	-218	204	0.29
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	340	92	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	768	62	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,435	183	0.00
HCC45	DISORDERS OF IMMUNITY	1,172	215	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	1,241	317	0.00
HCC52	DRUG/ALCOHOL DEPENDENCE	1,297	268	0.00
HCC54	SCHIZOPHRENIA	3,512	174	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,965	74	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	2,837	366	0.00
HCC68	PARAPLEGIA	3,981	318	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	1,936	166	0.00
HCC70	MUSCULAR DYSTROPHY	1,431	879	0.10
HCC71	POLYNEUROPATHY	968	71	0.00
HCC72	MULTIPLE SCLEROSIS	3,100	244	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	4,035	117	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	1,362	112	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	582	508	0.25
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	4,577	498	0.00
HCC78	RESPIRATORY ARREST	2,661	960	0.01
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	1,016	111	0.00
HCC80	CONGESTIVE HEART FAILURE	985	75	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	327	254	0.20
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-76	150	0.61
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-225	82	0.01
HCC92	SPECIFIED HEART ARRHYTHMIAS	448	47	0.00
HCC95	CEREBRAL HEMORRHAGE	973	313	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,756	119	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC100	HEMIPLEGIA/HEMIPARESIS	2,553	189	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	3,560	359	0.00
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,501	115	0.00
HCC105	VASCULAR DISEASE	831	48	0.00
HCC107	CYSTIC FIBROSIS	-801	2,090	0.70
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	811	53	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	-199	252	0.43
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-793	380	0.04
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	1,054	242	0.00
HCC130	DIALYSIS STATUS	2,012	250	0.00
HCC131	RENAL FAILURE	738	69	0.00
HCC132	NEPHRITIS	469	414	0.26
HCC148	DECUBITUS ULCER OF SKIN	1,663	141	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,538	103	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	-1,179	5,287	0.82
HCC154	SEVERE HEAD INJURY	1,775	1,683	0.29
HCC155	MAJOR HEAD INJURY	563	261	0.03
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	771	99	0.00
HCC158	HIP FRACTURE/DISLOCATION	682	95	0.00
HCC161	TRAUMATIC AMPUTATION	-828	324	0.01
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	91	79	0.25
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-633	359	0.08
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-66	248	0.79
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	-1,031	219	0.00
Age_Lt_35		-1,555	211	0.00
Age_Lt_45		-1,615	133	0.00
Age_Lt_55		-495	85	0.00
Age_Lt_60		480	92	0.00
Age_Lt_65		1,246	84	0.00
Age_Lt_75		1,269	49	0.00
Age_Lt_80		3,012	50	0.00
Age_Lt_85		5,439	53	0.00

Coef Name	Label	Coef Value	Std Error	P Value
Age_Lt_90		7,616	60	0.00
Age_Lt_95		8,428	78	0.00
Age_Gt_94		8,056	125	0.00
ORIGDS		1,861	54	0.00
ESRD		4,336	147	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	132	933	0.89
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	5,891	461	0.00
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-239	514	0.64
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-1,104	353	0.00
D_HCC107	DISABLED, CYSTIC FIBROSIS	1,453	3,321	0.66
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-257	185	0.16
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	199	118	0.09
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	-1,089	516	0.03
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	61	165	0.71
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	-35	120	0.77
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	-315	169	0.06
DRG_CD=001	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W MCC	246,241	11,827	0.00
DRG_CD=002	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W/O MCC	171,996	8,369	0.00
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	147,147	770	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	118,741	1,595	0.00
DRG_CD=007	LUNG TRANSPLANT	131,001	8,372	0.00
DRG_CD=009	BONE MARROW TRANSPLANT	34,544	3,595	0.00
DRG_CD=011	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W MCC	59,781	2,509	0.00
DRG_CD=012	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W CC	43,495	2,564	0.00
DRG_CD=013	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W/O CC/MCC	20,043	3,444	0.00
DRG_CD=014	ALLOGENEIC BONE MARROW TRANSPLANT	64,566	11,826	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=015	AUTOLOGOUS BONE MARROW TRANSPLANT	26,187	4,492	0.00
DRG_CD=453	COMBINED ANTERIOR/POSTERIOR SPINAL FUSION W MCC	86,605	682	0.00
DRG_CD=454	COMBINED ANTERIOR/POSTERIOR SPINAL FUSION W CC	56,711	546	0.00
DRG_CD=455	COMBINED ANTERIOR/POSTERIOR SPINAL FUSION W/O CC/MCC	37,114	550	0.00
DRG_CD=456	SPINAL FUS EXC CERV W SPINAL CURV/MALIG/INFEC OR 9+ FUS W MCC	80,619	700	0.00
DRG_CD=457	SPINAL FUS EXC CERV W SPINAL CURV/MALIG/INFEC OR 9+ FUS W CC	51,160	549	0.00
DRG_CD=458	SPINAL FUS EXC CERV W SPINAL CURV/MALIG/INFEC OR 9+ FUS W/O CC/MCC	34,484	618	0.00
DRG_CD=459	SPINAL FUSION EXCEPT CERVICAL W MCC	47,741	527	0.00
DRG_CD=460	SPINAL FUSION EXCEPT CERVICAL W/O MCC	24,517	470	0.00
DRG_CD=461	BILATERAL OR MULTIPLE MAJOR JOINT PROCS OF LOWER EXTREMITY W MCC	39,811	789	0.00
DRG_CD=462	BILATERAL OR MULTIPLE MAJOR JOINT PROCS OF LOWER EXTREMITY W/O MCC	25,598	492	0.00
DRG_CD=463	WND DEBRID & SKN GRFT EXC HAND, FOR MUSCULO-CONN TISS DIS W MCC	40,743	543	0.00
DRG_CD=464	WND DEBRID & SKN GRFT EXC HAND, FOR MUSCULO-CONN TISS DIS W CC	23,233	509	0.00
DRG_CD=465	WND DEBRID & SKN GRFT EXC HAND, FOR MUSCULO-CONN TISS DIS W/O CC/MCC	13,513	588	0.00
DRG_CD=466	REVISION OF HIP OR KNEE REPLACEMENT W MCC	34,886	544	0.00
DRG_CD=467	REVISION OF HIP OR KNEE REPLACEMENT W CC	20,976	483	0.00
DRG_CD=468	REVISION OF HIP OR KNEE REPLACEMENT W/O CC/MCC	14,427	486	0.00
DRG_CD=469	MAJOR JOINT REPLACEMENT OR REATTACHMENT OF LOWER EXTREMITY W MCC	26,390	476	0.00
DRG_CD=470	MAJOR JOINT REPLACEMENT OR REATTACHMENT OF LOWER EXTREMITY W/O MCC	12,515	466	0.00
DRG_CD=471	CERVICAL SPINAL FUSION W MCC	41,976	574	0.00
DRG_CD=472	CERVICAL SPINAL FUSION W CC	19,046	498	0.00
DRG_CD=473	CERVICAL SPINAL FUSION W/O	10,344	477	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	CC/MCC			
DRG_CD=474	AMPUTATION FOR MUSCULOSKELETAL SYS & CONN TISSUE DIS W MCC	28,613	606	0.00
DRG_CD=475	AMPUTATION FOR MUSCULOSKELETAL SYS & CONN TISSUE DIS W CC	14,518	570	0.00
DRG_CD=476	AMPUTATION FOR MUSCULOSKELETAL SYS & CONN TISSUE DIS W/O CC/MCC	5,152	695	0.00
DRG_CD=477	BIOPSIES OF MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W MCC	26,384	582	0.00
DRG_CD=478	BIOPSIES OF MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W CC	16,152	510	0.00
DRG_CD=479	BIOPSIES OF MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W/O CC/MCC	6,347	539	0.00
DRG_CD=480	HIP & FEMUR PROCEDURES EXCEPT MAJOR JOINT W MCC	29,332	478	0.00
DRG_CD=481	HIP & FEMUR PROCEDURES EXCEPT MAJOR JOINT W CC	20,456	470	0.00
DRG_CD=482	HIP & FEMUR PROCEDURES EXCEPT MAJOR JOINT W/O CC/MCC	16,137	475	0.00
DRG_CD=483	MAJOR JOINT & LIMB REATTACHMENT PROC OF UPPER EXTREMITY W CC/MCC	12,600	489	0.00
DRG_CD=484	MAJOR JOINT & LIMB REATTACHMENT PROC OF UPPER EXTREMITY W/O CC/MCC	6,340	479	0.00
DRG_CD=485	KNEE PROCEDURES W PDX OF INFECTION W MCC	31,927	708	0.00
DRG_CD=486	KNEE PROCEDURES W PDX OF INFECTION W CC	18,283	616	0.00
DRG_CD=487	KNEE PROCEDURES W PDX OF INFECTION W/O CC/MCC	11,420	727	0.00
DRG_CD=488	KNEE PROCEDURES W/O PDX OF INFECTION W CC/MCC	10,664	553	0.00
DRG_CD=489	KNEE PROCEDURES W/O PDX OF INFECTION W/O CC/MCC	4,185	529	0.00
DRG_CD=490	BACK & NECK PROC EXC SPINAL FUSION W CC/MCC OR DISC DEVICE/NEUROSTIM	9,796	480	0.00
DRG_CD=491	BACK & NECK PROC EXC SPINAL FUSION W/O CC/MCC	272	472	0.57
DRG_CD=492	LOWER EXTREM & HUMER PROC EXCEPT HIP,FOOT,FEMUR W MCC	27,626	519	0.00
DRG_CD=493	LOWER EXTREM & HUMER PROC EXCEPT HIP,FOOT,FEMUR W CC	15,626	482	0.00
DRG_CD=494	LOWER EXTREM & HUMER PROC	8,236	479	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	EXCEPT HIP,FOOT,FEMUR W/O CC/MCC			
DRG_CD=495	LOCAL EXCISION & REMOVAL INT FIX DEVICES EXC HIP & FEMUR W MCC	24,698	634	0.00
DRG_CD=496	LOCAL EXCISION & REMOVAL INT FIX DEVICES EXC HIP & FEMUR W CC	10,619	529	0.00
DRG_CD=497	LOCAL EXCISION & REMOVAL INT FIX DEVICES EXC HIP & FEMUR W/O CC/MCC	2,378	529	0.00
DRG_CD=498	LOCAL EXCISION & REMOVAL INT FIX DEVICES OF HIP & FEMUR W CC/MCC	16,636	672	0.00
DRG_CD=499	LOCAL EXCISION & REMOVAL INT FIX DEVICES OF HIP & FEMUR W/O CC/MCC	2,337	767	0.00
DRG_CD=500	SOFT TISSUE PROCEDURES W MCC	25,626	615	0.00
DRG_CD=501	SOFT TISSUE PROCEDURES W CC	9,184	527	0.00
DRG_CD=502	SOFT TISSUE PROCEDURES W/O CC/MCC	2,801	519	0.00
DRG_CD=503	FOOT PROCEDURES W MCC	17,525	728	0.00
DRG_CD=504	FOOT PROCEDURES W CC	9,314	572	0.00
DRG_CD=505	FOOT PROCEDURES W/O CC/MCC	3,086	590	0.00
DRG_CD=506	MAJOR THUMB OR JOINT PROCEDURES	2,408	800	0.00
DRG_CD=507	MAJOR SHOULDER OR ELBOW JOINT PROCEDURES W CC/MCC	11,048	842	0.00
DRG_CD=508	MAJOR SHOULDER OR ELBOW JOINT PROCEDURES W/O CC/MCC	3,227	749	0.00
DRG_CD=509	ARTHROSCOPY	5,484	1,119	0.00
DRG_CD=510	SHOULDER,ELBOW OR FOREARM PROC,EXC MAJOR JOINT PROC W MCC	17,117	676	0.00
DRG_CD=511	SHOULDER,ELBOW OR FOREARM PROC,EXC MAJOR JOINT PROC W CC	9,370	534	0.00
DRG_CD=512	SHOULDER,ELBOW OR FOREARM PROC,EXC MAJOR JOINT PROC W/O CC/MCC	1,504	506	0.00
DRG_CD=513	HAND OR WRIST PROC, EXCEPT MAJOR THUMB OR JOINT PROC W CC/MCC	4,690	661	0.00
DRG_CD=514	HAND OR WRIST PROC, EXCEPT MAJOR THUMB OR JOINT PROC W/O CC/MCC	-1,190	740	0.11
DRG_CD=515	OTHER MUSCULOSKELET SYS & CONN TISS O.R. PROC W MCC	23,201	549	0.00
DRG_CD=516	OTHER MUSCULOSKELET SYS & CONN TISS O.R. PROC W CC	11,687	497	0.00
DRG_CD=517	OTHER MUSCULOSKELET SYS & CONN TISS O.R. PROC W/O CC/MCC	5,011	501	0.00
DRG_CD=533	FRACTURES OF FEMUR W MCC	14757.47088	802.1869997	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=534	FRACTURES OF FEMUR W/O MCC	8633.316449	569.2283871	0.00
DRG_CD=535	FRACTURES OF HIP & PELVIS W MCC	13327.36563	510.2385048	0.00
DRG_CD=536	FRACTURES OF HIP & PELVIS W/O MCC	7788.858298	475.9888608	0.00
DRG_CD=537	SPRAINS, STRAINS, & DISLOCATIONS OF HIP, PELVIS & THIGH W CC/MCC	3755.407309	759.4378681	0.00
DRG_CD=538	SPRAINS, STRAINS, & DISLOCATIONS OF HIP, PELVIS & THIGH W/O CC/MCC	1441.147844	856.7586666	0.09
DRG_CD=539	OSTEOMYELITIS W MCC	19182.6928	585.0651191	0.00
DRG_CD=540	OSTEOMYELITIS W CC	10136.45728	554.4590722	0.00
DRG_CD=541	OSTEOMYELITIS W/O CC/MCC	4367.484569	716.8184395	0.00
DRG_CD=542	PATHOLOGICAL FRACTURES & MUSCULOSKELET & CONN TISS MALIG W MCC	14137.20465	546.8653368	0.00
DRG_CD=543	PATHOLOGICAL FRACTURES & MUSCULOSKELET & CONN TISS MALIG W CC	7968.886082	493.0058034	0.00
DRG_CD=544	PATHOLOGICAL FRACTURES & MUSCULOSKELET & CONN TISS MALIG W/O CC/MCC	3915.954669	522.1203938	0.00
DRG_CD=545	CONNECTIVE TISSUE DISORDERS W MCC	16110.2298	563.1131162	0.00
DRG_CD=546	CONNECTIVE TISSUE DISORDERS W CC	4100.0829	527.1072293	0.00
DRG_CD=547	CONNECTIVE TISSUE DISORDERS W/O CC/MCC	-486.5333419	559.1027043	0.38
DRG_CD=548	SEPTIC ARTHRITIS W MCC	16317.12368	950.0557261	0.00
DRG_CD=549	SEPTIC ARTHRITIS W CC	7430.996023	720.8966085	0.00
DRG_CD=550	SEPTIC ARTHRITIS W/O CC/MCC	61.44208355	956.5441064	0.95
DRG_CD=551	MEDICAL BACK PROBLEMS W MCC	12378.37038	492.1410252	0.00
DRG_CD=552	MEDICAL BACK PROBLEMS W/O MCC	3882.082683	470.1119064	0.00
DRG_CD=553	BONE DISEASES & ARTHROPATHIES W MCC	6807.465873	548.8848471	0.00
DRG_CD=554	BONE DISEASES & ARTHROPATHIES W/O MCC	605.5844174	484.4828865	0.21
DRG_CD=555	SIGNS & SYMPTOMS OF MUSCULOSKELETAL SYSTEM & CONN TISSUE W MCC	5584.361674	568.8978192	0.00
DRG_CD=556	SIGNS & SYMPTOMS OF MUSCULOSKELETAL SYSTEM & CONN TISSUE W/O MCC	-135.0191887	484.2125311	0.78
DRG_CD=557	TENDONITIS, MYOSITIS & BURSITIS W MCC	11443.54574	515.1732016	0.00
DRG_CD=558	TENDONITIS, MYOSITIS & BURSITIS W/O MCC	3670.652309	484.4946674	0.00
DRG_CD=559	AFTERCARE, MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W MCC	16078.15491	674.7646014	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=560	AFTERCARE, MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W CC	8333.962319	554.7244791	0.00
DRG_CD=561	AFTERCARE, MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE W/O CC/MCC	2510.935807	541.6357637	0.00
DRG_CD=562	FX, SPRN, STRN & DISL EXCEPT FEMUR, HIP, PELVIS & THIGH W MCC	13672.49085	513.4871794	0.00
DRG_CD=563	FX, SPRN, STRN & DISL EXCEPT FEMUR, HIP, PELVIS & THIGH W/O MCC	6633.049281	475.8022772	0.00
DRG_CD=564	OTHER MUSCULOSKELETAL SYS & CONNECTIVE TISSUE DIAGNOSES W MCC	12024.32475	637.6099178	0.00
DRG_CD=565	OTHER MUSCULOSKELETAL SYS & CONNECTIVE TISSUE DIAGNOSES W CC	4503.242779	551.4113033	0.00
DRG_CD=566	OTHER MUSCULOSKELETAL SYS & CONNECTIVE TISSUE DIAGNOSES W/O CC/MCC	0	0	.
LTI_Indicator		-141.4882007	101.4101182	0.16

Table 29: Skin, Subcutaneous Tissue and Breast

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		7,706	238	0.00
HCC1	HIV/AIDS	-1,107	428	0.01
HCC2	SEPTICEMIA/SHOCK	882	217	0.00
HCC5	OPPORTUNISTIC INFECTIONS	-606	751	0.42
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	987	212	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	591	330	0.07
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	617	217	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-1,099	126	0.00
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,011	152	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	782	146	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	-1,468	818	0.07
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	127	276	0.64
HCC19	DIABETES WITHOUT COMPLICATION	314	90	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	3,107	223	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC25	END-STAGE LIVER DISEASE	1,297	421	0.00
HCC26	CIRRHOSIS OF LIVER	1,187	361	0.00
HCC27	CHRONIC HEPATITIS	1,236	470	0.01
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,159	288	0.00
HCC32	PANCREATIC DISEASE	1,141	325	0.00
HCC33	INFLAMMATORY BOWEL DISEASE	-399	388	0.30
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	716	202	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	313	144	0.03
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,050	294	0.00
HCC45	DISORDERS OF IMMUNITY	1,109	292	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	663	654	0.31
HCC52	DRUG/ALCOHOL DEPENDENCE	998	547	0.07
HCC54	SCHIZOPHRENIA	2,242	230	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,286	138	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	1,387	408	0.00
HCC68	PARAPLEGIA	3,360	307	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	963	412	0.02
HCC70	MUSCULAR DYSTROPHY	1,153	1,267	0.36
HCC71	POLYNEUROPATHY	456	133	0.00
HCC72	MULTIPLE SCLEROSIS	2,104	358	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,057	238	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	462	188	0.01
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	2,661	749	0.00
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	2,041	610	0.00
HCC78	RESPIRATORY ARREST	0	1,672	1.00
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	980	175	0.00
HCC80	CONGESTIVE HEART FAILURE	570	141	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	1,050	404	0.01
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	26	294	0.93
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-372	177	0.04

Coef Name	Label	Coef Value	Std Error	P Value
HCC92	SPECIFIED HEART ARRHYTHMIAS	187	93	0.04
HCC95	CEREBRAL HEMORRHAGE	1,674	589	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	993	231	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	2,110	302	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	2,013	519	0.00
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,547	171	0.00
HCC105	VASCULAR DISEASE	741	89	0.00
HCC107	CYSTIC FIBROSIS	5,968	4,125	0.15
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	404	113	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	704	359	0.05
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	954	580	0.10
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-359	367	0.33
HCC130	DIALYSIS STATUS	1,112	354	0.00
HCC131	RENAL FAILURE	441	130	0.00
HCC132	NEPHRITIS	-944	711	0.18
HCC148	DECUBITUS ULCER OF SKIN	3,557	152	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,469	118	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	3,193	3,690	0.39
HCC154	SEVERE HEAD INJURY	6,229	3,532	0.08
HCC155	MAJOR HEAD INJURY	448	496	0.37
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	864	312	0.01
HCC158	HIP FRACTURE/DISLOCATION	1,801	285	0.00
HCC161	TRAUMATIC AMPUTATION	1,967	613	0.00
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	861	177	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-540	551	0.33
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	262	298	0.38
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	1,527	317	0.00
Age_Lt_35		-1,301	251	0.00
Age_Lt_45		-1,566	189	0.00
Age_Lt_55		-915	148	0.00
Age_Lt_60		-237	169	0.16
Age_Lt_65		578	165	0.00

Coef Name	Label	Coef Value	Std Error	P Value
Age_Lt_75		528	123	0.00
Age_Lt_80		1,283	125	0.00
Age_Lt_85		2,073	125	0.00
Age_Lt_90		2,997	132	0.00
Age_Lt_95		3,494	162	0.00
Age_Gt_94		3,466	241	0.00
ORIGDS		663	107	0.00
ESRD		3,122	212	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	2,587	1,303	0.05
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	-22	590	0.97
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-314	843	0.71
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-761	634	0.23
D_HCC107	DISABLED, CYSTIC FIBROSIS	-9,329	5,246	0.08
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-23	307	0.94
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	63	193	0.74
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	866	842	0.30
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	906	245	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	822	197	0.00
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	700	272	0.01
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	138,463	1,753	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	105,300	2,297	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	93,314	11,667	0.00
DRG_CD=011	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W MCC	23,780	8,245	0.00
DRG_CD=012	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W CC	15,039	8,246	0.07
DRG_CD=013	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W/O CC/MCC	2,613	11,660	0.82
DRG_CD=573	SKIN GRAFT &/OR DEBRID FOR SKN ULCER OR CELLULITIS W MCC	26,782	360	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=574	SKIN GRAFT &/OR DEBRID FOR SKN ULCER OR CELLULITIS W CC	13,644	294	0.00
DRG_CD=575	SKIN GRAFT &/OR DEBRID FOR SKN ULCER OR CELLULITIS W/O CC/MCC	4,781	366	0.00
DRG_CD=576	SKIN GRAFT &/OR DEBRID EXC FOR SKIN ULCER OR CELLULITIS W MCC	31,536	713	0.00
DRG_CD=577	SKIN GRAFT &/OR DEBRID EXC FOR SKIN ULCER OR CELLULITIS W CC	10,910	412	0.00
DRG_CD=578	SKIN GRAFT &/OR DEBRID EXC FOR SKIN ULCER OR CELLULITIS W/O CC/MCC	3,295	411	0.00
DRG_CD=579	OTHER SKIN, SUBCUT TISS & BREAST PROC W MCC	25,007	345	0.00
DRG_CD=580	OTHER SKIN, SUBCUT TISS & BREAST PROC W CC	8,908	273	0.00
DRG_CD=581	OTHER SKIN, SUBCUT TISS & BREAST PROC W/O CC/MCC	2,418	279	0.00
DRG_CD=582	MASTECTOMY FOR MALIGNANCY W CC/MCC	4,277	338	0.00
DRG_CD=583	MASTECTOMY FOR MALIGNANCY W/O CC/MCC	1,296	310	0.00
DRG_CD=584	BREAST BIOPSY, LOCAL EXCISION & OTHER BREAST PROCEDURES W CC/MCC	8,761	648	0.00
DRG_CD=585	BREAST BIOPSY, LOCAL EXCISION & OTHER BREAST PROCEDURES W/O CC/MCC	1,915	501	0.00
DRG_CD=592	SKIN ULCERS W MCC	16,795	378	0.00
DRG_CD=593	SKIN ULCERS W CC	7,521	289	0.00
DRG_CD=594	SKIN ULCERS W/O CC/MCC	4,988	517	0.00
DRG_CD=595	MAJOR SKIN DISORDERS W MCC	12,001	546	0.00
DRG_CD=596	MAJOR SKIN DISORDERS W/O MCC	1,852	337	0.00
DRG_CD=597	MALIGNANT BREAST DISORDERS W MCC	15,797	1,022	0.00
DRG_CD=598	MALIGNANT BREAST DISORDERS W CC	8,788	621	0.00
DRG_CD=599	MALIGNANT BREAST DISORDERS W/O CC/MCC	4,094	1,356	0.00
DRG_CD=600	NON-MALIGNANT BREAST DISORDERS W CC/MCC	3,394	552	0.00
DRG_CD=601	NON-MALIGNANT BREAST DISORDERS W/O CC/MCC	-1,236	600	0.04
DRG_CD=602	CELLULITIS W MCC	8,957	241	0.00
DRG_CD=603	CELLULITIS W/O MCC	1,367	223	0.00
DRG_CD=604	TRAUMA TO THE SKIN, SUBCUT TISS & BREAST W MCC	10,425	387	0.00
DRG_CD=605	TRAUMA TO THE SKIN, SUBCUT TISS &	3,654	253	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	BREAST W/O MCC			
DRG_CD=606	MINOR SKIN DISORDERS W MCC	8,277	483	0.00
DRG_CD=607	MINOR SKIN DISORDERS W/O MCC	0	0	.
LTI_Indicator		3,441	143	0.00

Table 30: Endocrine, Nutritional and Metabolic System

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		7,951	226	0.00
HCC1	HIV/AIDS	757	396	0.06
HCC2	SEPTICEMIA/SHOCK	1,731	181	0.00
HCC5	OPPORTUNISTIC INFECTIONS	1,375	510	0.01
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	3,043	167	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	2,481	219	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	1,911	195	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	320	123	0.01
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	912	119	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	369	115	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	559	355	0.12
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	-95	197	0.63
HCC19	DIABETES WITHOUT COMPLICATION	-132	77	0.09
HCC21	PROTEIN-CALORIE MALNUTRITION	2,446	165	0.00
HCC25	END-STAGE LIVER DISEASE	1,786	343	0.00
HCC26	CIRRHOSIS OF LIVER	90	310	0.77
HCC27	CHRONIC HEPATITIS	225	384	0.56
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	703	204	0.00
HCC32	PANCREATIC DISEASE	715	193	0.00
HCC33	INFLAMMATORY BOWEL DISEASE	604	312	0.05
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	818	182	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	407	136	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,620	261	0.00
HCC45	DISORDERS OF IMMUNITY	1,090	267	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC51	DRUG/ALCOHOL PSYCHOSIS	826	439	0.06
HCC52	DRUG/ALCOHOL DEPENDENCE	614	386	0.11
HCC54	SCHIZOPHRENIA	2,307	182	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,428	112	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	1,280	566	0.02
HCC68	PARAPLEGIA	2,164	540	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	1,511	390	0.00
HCC70	MUSCULAR DYSTROPHY	2,130	1,275	0.09
HCC71	POLYNEUROPATHY	294	106	0.01
HCC72	MULTIPLE SCLEROSIS	1,100	432	0.01
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	3,117	202	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	557	141	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	1,972	486	0.00
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	4,001	479	0.00
HCC78	RESPIRATORY ARREST	59	1,087	0.96
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	932	139	0.00
HCC80	CONGESTIVE HEART FAILURE	429	135	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	343	264	0.19
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	320	213	0.13
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-180	138	0.19
HCC92	SPECIFIED HEART ARRHYTHMIAS	447	84	0.00
HCC95	CEREBRAL HEMORRHAGE	2,345	439	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,238	186	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	2,037	240	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	2,070	555	0.00
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	2,407	158	0.00
HCC105	VASCULAR DISEASE	568	81	0.00
HCC107	CYSTIC FIBROSIS	-2,705	3,454	0.43
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	475	98	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	1,173	269	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-213	484	0.66
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	573	216	0.01
HCC130	DIALYSIS STATUS	588	206	0.00
HCC131	RENAL FAILURE	-106	96	0.27
HCC132	NEPHRITIS	334	529	0.53
HCC148	DECUBITUS ULCER OF SKIN	2,851	168	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,744	135	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	-2,431	5,729	0.67
HCC154	SEVERE HEAD INJURY	12,548	3,328	0.00
HCC155	MAJOR HEAD INJURY	229	401	0.57
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,976	245	0.00
HCC158	HIP FRACTURE/DISLOCATION	1,672	245	0.00
HCC161	TRAUMATIC AMPUTATION	625	466	0.18
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	1,241	148	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-232	409	0.57
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	505	241	0.04
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	927	242	0.00
Age_Lt_35		-751	199	0.00
Age_Lt_45		-930	161	0.00
Age_Lt_55		-951	128	0.00
Age_Lt_60		-344	145	0.02
Age_Lt_65		233	141	0.10
Age_Lt_75		601	108	0.00
Age_Lt_80		1,351	109	0.00
Age_Lt_85		2,054	110	0.00
Age_Lt_90		3,065	117	0.00
Age_Lt_95		3,543	144	0.00
Age_Gt_94		4,009	223	0.00
ORIGDS		637	93	0.00
ESRD		3,548	135	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	-2,505	919	0.01
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	-115	551	0.84
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	423	642	0.51
D_HCC52	DISABLED, DRUG/ALCOHOL	-20	482	0.97

Coef Name	Label	Coef Value	Std Error	P Value
	DEPENDENCE			
D_HCC107	DISABLED, CYSTIC FIBROSIS	10,381	3,777	0.01
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	339	232	0.14
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	-12	166	0.94
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	-451	577	0.43
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	1,261	194	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	358	173	0.04
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	316	234	0.18
DRG_CD=001	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W MCC	176,476	8,116	0.00
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	153,617	1,532	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	125,317	1,470	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	109,049	5,735	0.00
DRG_CD=007	LUNG TRANSPLANT	62,334	4,850	0.00
DRG_CD=008	SIMULTANEOUS PANCREAS/KIDNEY TRANSPLANT	35,975	6,618	0.00
DRG_CD=010	PANCREAS TRANSPLANT	26,307	2,968	0.00
DRG_CD=011	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W MCC	40,161	2,570	0.00
DRG_CD=012	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W CC	30,516	2,787	0.00
DRG_CD=013	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W/O CC/MCC	13,916	3,460	0.00
DRG_CD=614	ADRENAL & PITUITARY PROCEDURES W CC/MCC	13,918	470	0.00
DRG_CD=615	ADRENAL & PITUITARY PROCEDURES W/O CC/MCC	3,600	481	0.00
DRG_CD=616	AMPUTAT OF LOWER LIMB FOR ENDOCRINE,NUTRIT,& METABOL DIS W MCC	36,392	495	0.00
DRG_CD=617	AMPUTAT OF LOWER LIMB FOR ENDOCRINE,NUTRIT,& METABOL DIS W CC	14,126	301	0.00
DRG_CD=618	AMPUTAT OF LOWER LIMB FOR	4,798	1,428	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	ENDOCRINE,NUTRIT,& METABOL DIS W/O CC/MCC			
DRG_CD=619	O.R. PROCEDURES FOR OBESITY W MCC	24,102	601	0.00
DRG_CD=620	O.R. PROCEDURES FOR OBESITY W CC	7,400	367	0.00
DRG_CD=621	O.R. PROCEDURES FOR OBESITY W/O CC/MCC	3,566	266	0.00
DRG_CD=622	SKIN GRAFTS & WOUND DEBRID FOR ENDOC, NUTRIT & METAB DIS W MCC	32,592	596	0.00
DRG_CD=623	SKIN GRAFTS & WOUND DEBRID FOR ENDOC, NUTRIT & METAB DIS W CC	14,694	403	0.00
DRG_CD=624	SKIN GRAFTS & WOUND DEBRID FOR ENDOC, NUTRIT & METAB DIS W/O CC/MCC	2,780	1,196	0.02
DRG_CD=625	THYROID, PARATHYROID & THYROGLOSSAL PROCEDURES W MCC	13,126	500	0.00
DRG_CD=626	THYROID, PARATHYROID & THYROGLOSSAL PROCEDURES W CC	1,348	369	0.00
DRG_CD=627	THYROID, PARATHYROID & THYROGLOSSAL PROCEDURES W/O CC/MCC	-2,052	260	0.00
DRG_CD=628	OTHER ENDOCRINE, NUTRIT & METAB O.R. PROC W MCC	27,038	361	0.00
DRG_CD=629	OTHER ENDOCRINE, NUTRIT & METAB O.R. PROC W CC	16,958	327	0.00
DRG_CD=630	OTHER ENDOCRINE, NUTRIT & METAB O.R. PROC W/O CC/MCC	7,920	858	0.00
DRG_CD=637	DIABETES W MCC	7,689	244	0.00
DRG_CD=638	DIABETES W CC	2,384	228	0.00
DRG_CD=639	DIABETES W/O CC/MCC	-1,592	242	0.00
DRG_CD=640	NUTRITIONAL & MISC METABOLIC DISORDERS W MCC	5,645	225	0.00
DRG_CD=641	NUTRITIONAL & MISC METABOLIC DISORDERS W/O MCC	975	215	0.00
DRG_CD=642	INBORN ERRORS OF METABOLISM	4,595	541	0.00
DRG_CD=643	ENDOCRINE DISORDERS W MCC	11,012	297	0.00
DRG_CD=644	ENDOCRINE DISORDERS W CC	4,834	263	0.00
DRG_CD=645	ENDOCRINE DISORDERS W/O CC/MCC	0	0	.
LTI_Indicator		3,046	130	0.00

Table 31: Kidney and Urinary Tract

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		7,922	225	0.00
HCC1	HIV/AIDS	757	338	0.03
HCC2	SEPTICEMIA/SHOCK	656	115	0.00
HCC5	OPPORTUNISTIC INFECTIONS	629	390	0.11
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	2,314	145	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	984	202	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	1,564	160	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	114	79	0.15
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	720	94	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	657	106	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	290	489	0.55
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	319	174	0.07
HCC19	DIABETES WITHOUT COMPLICATION	234	60	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	2,487	127	0.00
HCC25	END-STAGE LIVER DISEASE	1,318	306	0.00
HCC26	CIRRHOSIS OF LIVER	292	284	0.30
HCC27	CHRONIC HEPATITIS	502	335	0.13
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,224	142	0.00
HCC32	PANCREATIC DISEASE	458	178	0.01
HCC33	INFLAMMATORY BOWEL DISEASE	476	239	0.05
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,406	194	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	587	108	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	884	187	0.00
HCC45	DISORDERS OF IMMUNITY	1,525	216	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	1,089	350	0.00
HCC52	DRUG/ALCOHOL DEPENDENCE	509	355	0.15
HCC54	SCHIZOPHRENIA	2,568	176	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,799	93	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	266	234	0.26

Coef Name	Label	Coef Value	Std Error	P Value
HCC68	PARAPLEGIA	1,263	223	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	1,067	242	0.00
HCC70	MUSCULAR DYSTROPHY	930	924	0.31
HCC71	POLYNEUROPATHY	790	94	0.00
HCC72	MULTIPLE SCLEROSIS	1,345	201	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,415	128	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	724	111	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	2,474	361	0.00
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	4,173	328	0.00
HCC78	RESPIRATORY ARREST	345	799	0.67
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	1,108	106	0.00
HCC80	CONGESTIVE HEART FAILURE	479	97	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	417	198	0.03
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	117	169	0.49
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-143	107	0.18
HCC92	SPECIFIED HEART ARRHYTHMIAS	291	61	0.00
HCC95	CEREBRAL HEMORRHAGE	2,227	299	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,212	119	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	1,863	153	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	749	348	0.03
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,486	131	0.00
HCC105	VASCULAR DISEASE	663	58	0.00
HCC107	CYSTIC FIBROSIS	-2,521	2,837	0.37
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	356	78	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	1,104	184	0.00
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	55	370	0.88
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-115	210	0.59
HCC130	DIALYSIS STATUS	143	166	0.39
HCC131	RENAL FAILURE	69	66	0.29
HCC132	NEPHRITIS	-439	422	0.30

Coef Name	Label	Coef Value	Std Error	P Value
HCC148	DECUBITUS ULCER OF SKIN	1,611	112	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,544	125	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	14,354	4,255	0.00
HCC154	SEVERE HEAD INJURY	1,844	1,936	0.34
HCC155	MAJOR HEAD INJURY	1,414	293	0.00
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,979	193	0.00
HCC158	HIP FRACTURE/DISLOCATION	2,226	173	0.00
HCC161	TRAUMATIC AMPUTATION	484	473	0.31
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	509	97	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-513	287	0.07
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	115	131	0.38
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	948	251	0.00
Age_Lt_35		-1,002	178	0.00
Age_Lt_45		-1,442	152	0.00
Age_Lt_55		-1,377	118	0.00
Age_Lt_60		-570	131	0.00
Age_Lt_65		-37	122	0.76
Age_Lt_75		622	86	0.00
Age_Lt_80		1,525	85	0.00
Age_Lt_85		2,280	84	0.00
Age_Lt_90		3,037	88	0.00
Age_Lt_95		3,384	103	0.00
Age_Gt_94		3,384	149	0.00
ORIGDS		585	69	0.00
ESRD		2,539	98	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	2,127	825	0.01
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	1,287	451	0.00
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-98	635	0.88
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-178	501	0.72
D_HCC107	DISABLED, CYSTIC FIBROSIS	1,541	3,692	0.68
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	13	159	0.93
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	51	127	0.69
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY	295	415	0.48

Coef Name	Label	Coef Value	Std Error	P Value
	DISEASE *CEBROVASCULAR DISEASE*CORONARY			
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	887	143	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	406	138	0.00
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	444	147	0.00
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	196,086	1,308	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	134,234	1,183	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	86,221	4,263	0.00
DRG_CD=006	LIVER TRANSPLANT W/O MCC	64,057	12,050	0.00
DRG_CD=008	SIMULTANEOUS PANCREAS/KIDNEY TRANSPLANT	44,111	907	0.00
DRG_CD=010	PANCREAS TRANSPLANT	29,411	5,387	0.00
DRG_CD=652	KIDNEY TRANSPLANT	23,491	285	0.00
DRG_CD=653	MAJOR BLADDER PROCEDURES W MCC	42,701	481	0.00
DRG_CD=654	MAJOR BLADDER PROCEDURES W CC	18,793	364	0.00
DRG_CD=655	MAJOR BLADDER PROCEDURES W/O CC/MCC	9,789	523	0.00
DRG_CD=656	KIDNEY & URETER PROCEDURES FOR NEOPLASM W MCC	23,325	349	0.00
DRG_CD=657	KIDNEY & URETER PROCEDURES FOR NEOPLASM W CC	8,257	293	0.00
DRG_CD=658	KIDNEY & URETER PROCEDURES FOR NEOPLASM W/O CC/MCC	2,624	301	0.00
DRG_CD=659	KIDNEY & URETER PROCEDURES FOR NON-NEOPLASM W MCC	24,683	350	0.00
DRG_CD=660	KIDNEY & URETER PROCEDURES FOR NON-NEOPLASM W CC	9,230	300	0.00
DRG_CD=661	KIDNEY & URETER PROCEDURES FOR NON-NEOPLASM W/O CC/MCC	2,629	348	0.00
DRG_CD=662	MINOR BLADDER PROCEDURES W MCC	20,366	666	0.00
DRG_CD=663	MINOR BLADDER PROCEDURES W CC	5,317	477	0.00
DRG_CD=664	MINOR BLADDER PROCEDURES W/O CC/MCC	-358	389	0.36
DRG_CD=665	PROSTATECTOMY W MCC	20,717	763	0.00
DRG_CD=666	PROSTATECTOMY W CC	6,819	478	0.00
DRG_CD=667	PROSTATECTOMY W/O CC/MCC	-2,135	427	0.00
DRG_CD=668	TRANSURETHRAL PROCEDURES W MCC	14,757	342	0.00
DRG_CD=669	TRANSURETHRAL PROCEDURES W CC	3,868	262	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=670	TRANSURETHRAL PROCEDURES W/O CC/MCC	-1,273	290	0.00
DRG_CD=671	URETHRAL PROCEDURES W CC/MCC	6,803	670	0.00
DRG_CD=672	URETHRAL PROCEDURES W/O CC/MCC	-1,608	692	0.02
DRG_CD=673	OTHER KIDNEY & URINARY TRACT PROCEDURES W MCC	22,948	285	0.00
DRG_CD=674	OTHER KIDNEY & URINARY TRACT PROCEDURES W CC	13,691	300	0.00
DRG_CD=675	OTHER KIDNEY & URINARY TRACT PROCEDURES W/O CC/MCC	2,183	443	0.00
DRG_CD=682	RENAL FAILURE W MCC	11,849	224	0.00
DRG_CD=683	RENAL FAILURE W CC	4,946	220	0.00
DRG_CD=684	RENAL FAILURE W/O CC/MCC	-76	239	0.75
DRG_CD=685	ADMIT FOR RENAL DIALYSIS	4,942	428	0.00
DRG_CD=686	KIDNEY & URINARY TRACT NEOPLASMS W MCC	13,798	638	0.00
DRG_CD=687	KIDNEY & URINARY TRACT NEOPLASMS W CC	7,010	458	0.00
DRG_CD=688	KIDNEY & URINARY TRACT NEOPLASMS W/O CC/MCC	1,604	806	0.05
DRG_CD=689	KIDNEY & URINARY TRACT INFECTIONS W MCC	6,835	223	0.00
DRG_CD=690	KIDNEY & URINARY TRACT INFECTIONS W/O MCC	2,006	217	0.00
DRG_CD=691	URINARY STONES W ESW LITHOTRIPSY W CC/MCC	5,655	617	0.00
DRG_CD=692	URINARY STONES W ESW LITHOTRIPSY W/O CC/MCC	1,637	966	0.09
DRG_CD=693	URINARY STONES W/O ESW LITHOTRIPSY W MCC	4,796	355	0.00
DRG_CD=694	URINARY STONES W/O ESW LITHOTRIPSY W/O MCC	-173	253	0.49
DRG_CD=695	KIDNEY & URINARY TRACT SIGNS & SYMPTOMS W MCC	8,320	558	0.00
DRG_CD=696	KIDNEY & URINARY TRACT SIGNS & SYMPTOMS W/O MCC	-665	280	0.02
DRG_CD=697	URETHRAL STRICTURE	186	767	0.81
DRG_CD=698	OTHER KIDNEY & URINARY TRACT DIAGNOSES W MCC	8,938	241	0.00
DRG_CD=699	OTHER KIDNEY & URINARY TRACT DIAGNOSES W CC	3,618	244	0.00
DRG_CD=700	OTHER KIDNEY & URINARY TRACT DIAGNOSES W/O CC/MCC	0	0	.
LTI_Indicator		2,800	75	0.00

Table 32: Male Reproductive System

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		7,005	673	0.00
HCC1	HIV/AIDS	-496	718	0.49
HCC2	SEPTICEMIA/SHOCK	1,963	323	0.00
HCC5	OPPORTUNISTIC INFECTIONS	-86	1,293	0.95
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	1,646	306	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	1,390	457	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	417	348	0.23
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	187	127	0.14
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,343	276	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	944	273	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	358	1,534	0.82
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	891	434	0.04
HCC19	DIABETES WITHOUT COMPLICATION	235	119	0.05
HCC21	PROTEIN-CALORIE MALNUTRITION	2,043	431	0.00
HCC25	END-STAGE LIVER DISEASE	270	877	0.76
HCC26	CIRRHOSIS OF LIVER	388	723	0.59
HCC27	CHRONIC HEPATITIS	1,919	941	0.04
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,131	367	0.00
HCC32	PANCREATIC DISEASE	11	439	0.98
HCC33	INFLAMMATORY BOWEL DISEASE	587	552	0.29
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,669	583	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	609	315	0.05
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,671	493	0.00
HCC45	DISORDERS OF IMMUNITY	2,918	571	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	822	967	0.40
HCC52	DRUG/ALCOHOL DEPENDENCE	843	836	0.31
HCC54	SCHIZOPHRENIA	1,515	445	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	805	271	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	-1,862	916	0.04

Coef Name	Label	Coef Value	Std Error	P Value
HCC68	PARAPLEGIA	-61	790	0.94
HCC69	SPINAL CORD DISORDERS/INJURIES	364	611	0.55
HCC70	MUSCULAR DYSTROPHY	1,963	2,096	0.35
HCC71	POLYNEUROPATHY	422	247	0.09
HCC72	MULTIPLE SCLEROSIS	4,499	865	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,515	336	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	785	325	0.02
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	-1,435	1,293	0.27
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	3,640	1,050	0.00
HCC78	RESPIRATORY ARREST	2,839	3,084	0.36
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	977	304	0.00
HCC80	CONGESTIVE HEART FAILURE	220	220	0.32
HCC81	ACUTE MYOCARDIAL INFARCTION	1,266	578	0.03
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	789	373	0.03
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-29	199	0.88
HCC92	SPECIFIED HEART ARRHYTHMIAS	413	130	0.00
HCC95	CEREBRAL HEMORRHAGE	-786	842	0.35
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	833	322	0.01
HCC100	HEMIPLEGIA/HEMIPARESIS	2,607	467	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	884	1,037	0.39
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,740	377	0.00
HCC105	VASCULAR DISEASE	405	140	0.00
HCC107	CYSTIC FIBROSIS	-1,281	7,528	0.86
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	150	151	0.32
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	1,115	629	0.08
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-341	953	0.72
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-746	696	0.28
HCC130	DIALYSIS STATUS	4,121	733	0.00
HCC131	RENAL FAILURE	-2	166	0.99
HCC132	NEPHRITIS	-86	1,044	0.93

Coef Name	Label	Coef Value	Std Error	P Value
HCC148	DECUBITUS ULCER OF SKIN	4,222	433	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	824	372	0.03
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	0	.
HCC154	SEVERE HEAD INJURY	-3,043	5,299	0.57
HCC155	MAJOR HEAD INJURY	112	856	0.90
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,388	550	0.01
HCC158	HIP FRACTURE/DISLOCATION	2,845	586	0.00
HCC161	TRAUMATIC AMPUTATION	-1,715	1,227	0.16
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	-181	196	0.36
HCC174	MAJOR ORGAN TRANSPLANT STATUS	311	965	0.75
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	896	413	0.03
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	4,081	738	0.00
Age_Lt_35		-711	639	0.27
Age_Lt_45		-320	495	0.52
Age_Lt_55		-145	295	0.62
Age_Lt_60		692	287	0.02
Age_Lt_65		201	238	0.40
Age_Lt_75		378	118	0.00
Age_Lt_80		641	138	0.00
Age_Lt_85		1,329	153	0.00
Age_Lt_90		2,223	182	0.00
Age_Lt_95		3,918	271	0.00
Age_Gt_94		3,296	594	0.00
ORIGDS		592	150	0.00
ESRD		4,234	400	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	-5,337	3,164	0.09
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	3,002	1,524	0.05
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-184	1,822	0.92
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	146	1,216	0.90
D_HCC107	DISABLED, CYSTIC FIBROSIS	-1,013	10,633	0.92
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	2,032	477	0.00
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	470	329	0.15
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY	-3,429	1,175	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	DISEASE *CEBROVASCULAR DISEASE*CORONARY			
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	1,463	425	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	1,152	347	0.00
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	554	407	0.17
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	180,442	3,410	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	102,542	4,371	0.00
DRG_CD=707	MAJOR MALE PELVIC PROCEDURES W CC/MCC	7,692	688	0.00
DRG_CD=708	MAJOR MALE PELVIC PROCEDURES W/O CC/MCC	3,024	679	0.00
DRG_CD=709	PENIS PROCEDURES W CC/MCC	11,677	776	0.00
DRG_CD=710	PENIS PROCEDURES W/O CC/MCC	2,464	725	0.00
DRG_CD=711	TESTES PROCEDURES W CC/MCC	9,814	802	0.00
DRG_CD=712	TESTES PROCEDURES W/O CC/MCC	176	868	0.84
DRG_CD=713	TRANSURETHRAL PROSTATECTOMY W CC/MCC	3,298	676	0.00
DRG_CD=714	TRANSURETHRAL PROSTATECTOMY W/O CC/MCC	-2,190	670	0.00
DRG_CD=715	OTHER MALE REPRODUCTIVE SYSTEM O.R. PROC FOR MALIGNANCY W CC/MCC	11,956	867	0.00
DRG_CD=716	OTHER MALE REPRODUCTIVE SYSTEM O.R. PROC FOR MALIGNANCY W/O CC/MCC	4,342	823	0.00
DRG_CD=717	OTHER MALE REPRODUCTIVE SYSTEM O.R. PROC EXC MALIGNANCY W CC/MCC	10,190	774	0.00
DRG_CD=718	OTHER MALE REPRODUCTIVE SYSTEM O.R. PROC EXC MALIGNANCY W/O CC/MCC	-325	836	0.70
DRG_CD=722	MALIGNANCY, MALE REPRODUCTIVE SYSTEM W MCC	11,261	844	0.00
DRG_CD=723	MALIGNANCY, MALE REPRODUCTIVE SYSTEM W CC	6,619	751	0.00
DRG_CD=724	MALIGNANCY, MALE REPRODUCTIVE SYSTEM W/O CC/MCC	2,936	1,024	0.00
DRG_CD=725	BENIGN PROSTATIC HYPERTROPHY W MCC	7,160	741	0.00
DRG_CD=726	BENIGN PROSTATIC HYPERTROPHY	2,309	693	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=727	INFLAMMATION OF THE MALE REPRODUCTIVE SYSTEM W MCC	8,466	715	0.00
DRG_CD=728	INFLAMMATION OF THE MALE REPRODUCTIVE SYSTEM W/O MCC	910	680	0.18
DRG_CD=729	OTHER MALE REPRODUCTIVE SYSTEM DIAGNOSES W CC/MCC	5,410	798	0.00
DRG_CD=730	OTHER MALE REPRODUCTIVE SYSTEM DIAGNOSES W/O CC/MCC	0	0	.
LTI_Indicator		5,061	320	0.00

Table 33: Female Reproductive System

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		7,264	362	0.00
HCC1	HIV/AIDS	91	728	0.90
HCC2	SEPTICEMIA/SHOCK	438	441	0.32
HCC5	OPPORTUNISTIC INFECTIONS	-695	1,176	0.55
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	199	241	0.41
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	704	419	0.09
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	751	203	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-295	133	0.03
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	751	286	0.01
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	941	273	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	2,204	1,186	0.06
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	-193	384	0.61
HCC19	DIABETES WITHOUT COMPLICATION	376	107	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	2,798	454	0.00
HCC25	END-STAGE LIVER DISEASE	2,427	1,010	0.02
HCC26	CIRRHOSIS OF LIVER	3	670	1.00
HCC27	CHRONIC HEPATITIS	-1,191	691	0.08
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	742	338	0.03
HCC32	PANCREATIC DISEASE	437	368	0.23
HCC33	INFLAMMATORY BOWEL DISEASE	-698	488	0.15
HCC37	BONE/JOINT/MUSCLE	907	602	0.13

Coef Name	Label	Coef Value	Std Error	P Value
HCC38	INFECTIONS/NECROSIS RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	458	187	0.01
HCC44	SEVERE HEMATOLOGICAL DISORDERS	465	555	0.40
HCC45	DISORDERS OF IMMUNITY	-442	385	0.25
HCC51	DRUG/ALCOHOL PSYCHOSIS	-1,142	1,248	0.36
HCC52	DRUG/ALCOHOL DEPENDENCE	1,255	1,260	0.32
HCC54	SCHIZOPHRENIA	2,038	341	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	459	164	0.01
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	676	1,224	0.58
HCC68	PARAPLEGIA	3,983	923	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	711	710	0.32
HCC70	MUSCULAR DYSTROPHY	-1,615	2,178	0.46
HCC71	POLYNEUROPATHY	543	229	0.02
HCC72	MULTIPLE SCLEROSIS	1,424	469	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,369	466	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	218	273	0.43
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	1,213	1,211	0.32
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	7,443	1,397	0.00
HCC78	RESPIRATORY ARREST	-3,049	3,220	0.34
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	1,340	319	0.00
HCC80	CONGESTIVE HEART FAILURE	0	224	1.00
HCC81	ACUTE MYOCARDIAL INFARCTION	3,869	801	0.00
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	49	433	0.91
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	190	239	0.43
HCC92	SPECIFIED HEART ARRHYTHMIAS	287	148	0.05
HCC95	CEREBRAL HEMORRHAGE	2,751	1,141	0.02
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	-114	363	0.75
HCC100	HEMIPLEGIA/HEMIPARESIS	1,542	564	0.01
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	1,432	847	0.09
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,492	348	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC105	VASCULAR DISEASE	606	144	0.00
HCC107	CYSTIC FIBROSIS	-72	7,843	0.99
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	383	146	0.01
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	674	730	0.36
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	2,765	1,177	0.02
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-473	622	0.45
HCC130	DIALYSIS STATUS	2,975	710	0.00
HCC131	RENAL FAILURE	1,213	204	0.00
HCC132	NEPHRITIS	-1,047	1,011	0.30
HCC148	DECUBITUS ULCER OF SKIN	1,342	473	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,160	382	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	0	.
HCC154	SEVERE HEAD INJURY	0	0	.
HCC155	MAJOR HEAD INJURY	798	972	0.41
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	385	508	0.45
HCC158	HIP FRACTURE/DISLOCATION	1,226	576	0.03
HCC161	TRAUMATIC AMPUTATION	1,172	1,482	0.43
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	481	312	0.12
HCC174	MAJOR ORGAN TRANSPLANT STATUS	86	901	0.92
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	1,014	481	0.04
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	2,913	936	0.00
Age_Lt_35		-827	259	0.00
Age_Lt_45		-867	173	0.00
Age_Lt_55		-297	161	0.06
Age_Lt_60		-2	228	0.99
Age_Lt_65		638	217	0.00
Age_Lt_75		299	109	0.01
Age_Lt_80		635	120	0.00
Age_Lt_85		1,301	141	0.00
Age_Lt_90		2,137	187	0.00
Age_Lt_95		2,728	322	0.00
Age_Gt_94		3,172	648	0.00
ORIGDS		710	161	0.00
ESRD		2,876	391	0.00

Coef Name	Label	Coef Value	Std Error	P Value
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	-2,086	2,479	0.40
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	308	1,094	0.78
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	1,423	1,724	0.41
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	78	1,366	0.95
D_HCC107	DISABLED, CYSTIC FIBROSIS	8,057	8,777	0.36
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	583	540	0.28
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	502	363	0.17
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	-4,831	1,586	0.00
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	1,093	500	0.03
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	691	350	0.05
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	68	559	0.90
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	177,553	1,676	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	125,285	7,849	0.00
DRG_CD=734	PELVIC EVISCERATION, RAD HYSTERECTOMY & RAD VULVECTOMY W CC/MCC	17,763	459	0.00
DRG_CD=735	PELVIC EVISCERATION, RAD HYSTERECTOMY & RAD VULVECTOMY W/O CC/MCC	3,425	487	0.00
DRG_CD=736	UTERINE & ADNEXA PROC FOR OVARIAN OR ADNEXAL MALIGNANCY W MCC	37,134	551	0.00
DRG_CD=737	UTERINE & ADNEXA PROC FOR OVARIAN OR ADNEXAL MALIGNANCY W CC	13,430	416	0.00
DRG_CD=738	UTERINE & ADNEXA PROC FOR OVARIAN OR ADNEXAL MALIGNANCY W/O CC/MCC	4,535	548	0.00
DRG_CD=739	UTERINE,ADNEXA PROC FOR NON-OVARIAN/ADNEXAL MALIG W MCC	24,228	513	0.00
DRG_CD=740	UTERINE,ADNEXA PROC FOR NON-OVARIAN/ADNEXAL MALIG W CC	8,001	402	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=741	UTERINE,ADNEXA PROC FOR NON-OVARIAN/ADNEXAL MALIG W/O CC/MCC	2,491	396	0.00
DRG_CD=742	UTERINE & ADNEXA PROC FOR NON-MALIGNANCY W CC/MCC	5,113	368	0.00
DRG_CD=743	UTERINE & ADNEXA PROC FOR NON-MALIGNANCY W/O CC/MCC	124	359	0.73
DRG_CD=744	D&C, CONIZATION, LAPAROSCOPY & TUBAL INTERRUPTION W CC/MCC	9,549	463	0.00
DRG_CD=745	D&C, CONIZATION, LAPAROSCOPY & TUBAL INTERRUPTION W/O CC/MCC	1,388	498	0.01
DRG_CD=746	VAGINA, CERVIX & VULVA PROCEDURES W CC/MCC	5,588	418	0.00
DRG_CD=747	VAGINA, CERVIX & VULVA PROCEDURES W/O CC/MCC	-317	378	0.40
DRG_CD=748	FEMALE REPRODUCTIVE SYSTEM RECONSTRUCTIVE PROCEDURES	-376	364	0.30
DRG_CD=749	OTHER FEMALE REPRODUCTIVE SYSTEM O.R. PROCEDURES W CC/MCC	18,254	539	0.00
DRG_CD=750	OTHER FEMALE REPRODUCTIVE SYSTEM O.R. PROCEDURES W/O CC/MCC	1,847	761	0.02
DRG_CD=754	MALIGNANCY, FEMALE REPRODUCTIVE SYSTEM W MCC	18,572	592	0.00
DRG_CD=755	MALIGNANCY, FEMALE REPRODUCTIVE SYSTEM W CC	11,151	445	0.00
DRG_CD=756	MALIGNANCY, FEMALE REPRODUCTIVE SYSTEM W/O CC/MCC	5,986	863	0.00
DRG_CD=757	INFECTIONS, FEMALE REPRODUCTIVE SYSTEM W MCC	13,052	501	0.00
DRG_CD=758	INFECTIONS, FEMALE REPRODUCTIVE SYSTEM W CC	6,964	456	0.00
DRG_CD=759	INFECTIONS, FEMALE REPRODUCTIVE SYSTEM W/O CC/MCC	2,541	528	0.00
DRG_CD=760	MENSTRUAL & OTHER FEMALE REPRODUCTIVE SYSTEM DISORDERS W CC/MCC	3,770	436	0.00
DRG_CD=761	MENSTRUAL & OTHER FEMALE REPRODUCTIVE SYSTEM DISORDERS W/O CC/MCC	0	0	.
LTI_Indicator		3,410	325	0.00

Table 34: Pregnancy, Childbirth and Puerperium

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		6,275	4,761	0.19
HCC1	HIV/AIDS	1,283	515	0.01
HCC2	SEPTICEMIA/SHOCK	2,409	1,177	0.04
HCC5	OPPORTUNISTIC INFECTIONS	-3,300	3,560	0.35
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	5,780	1,481	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	-414	4,739	0.93
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	1,199	1,016	0.24
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	118	795	0.88
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	5,390	843	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	1,296	497	0.01
HCC17	DIABETES WITH ACUTE COMPLICATIONS	1,641	1,066	0.12
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	-1,303	731	0.07
HCC19	DIABETES WITHOUT COMPLICATION	-5	217	0.98
HCC21	PROTEIN-CALORIE MALNUTRITION	5,624	1,028	0.00
HCC25	END-STAGE LIVER DISEASE	1,516	4,727	0.75
HCC26	CIRRHOSIS OF LIVER	-943	1,880	0.62
HCC27	CHRONIC HEPATITIS	-144	769	0.85
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	-193	1,247	0.88
HCC32	PANCREATIC DISEASE	187	641	0.77
HCC33	INFLAMMATORY BOWEL DISEASE	1,458	578	0.01
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	426	797	0.59
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	173	310	0.58
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,978	335	0.00
HCC45	DISORDERS OF IMMUNITY	2,054	1,062	0.05
HCC51	DRUG/ALCOHOL PSYCHOSIS	-1,373	710	0.05
HCC52	DRUG/ALCOHOL DEPENDENCE	596	275	0.03
HCC54	SCHIZOPHRENIA	2,021	266	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	410	146	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	511	1,591	0.75

Coef Name	Label	Coef Value	Std Error	P Value
HCC68	PARAPLEGIA	1,119	976	0.25
HCC69	SPINAL CORD DISORDERS/INJURIES	1,821	692	0.01
HCC70	MUSCULAR DYSTROPHY	13,532	1,334	0.00
HCC71	POLYNEUROPATHY	1,403	505	0.01
HCC72	MULTIPLE SCLEROSIS	271	548	0.62
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	-1,624	4,803	0.74
HCC74	SEIZURE DISORDERS AND CONVULSIONS	150	234	0.52
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	1,335	1,627	0.41
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	14,518	3,468	0.00
HCC78	RESPIRATORY ARREST	-1,019	4,758	0.83
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	3,778	715	0.00
HCC80	CONGESTIVE HEART FAILURE	118	558	0.83
HCC81	ACUTE MYOCARDIAL INFARCTION	-45,404	5,225	0.00
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-1,686	1,589	0.29
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	1,257	1,106	0.26
HCC92	SPECIFIED HEART ARRHYTHMIAS	-533	673	0.43
HCC95	CEREBRAL HEMORRHAGE	-2,942	2,223	0.19
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	-1,909	1,070	0.07
HCC100	HEMIPLEGIA/HEMIPARESIS	3,575	1,053	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	70	728	0.92
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	-180	833	0.83
HCC105	VASCULAR DISEASE	1,269	588	0.03
HCC107	CYSTIC FIBROSIS	7,884	1,191	0.00
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	-263	531	0.62
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	-2,743	1,649	0.10
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	18,996	2,377	0.00
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-2,871	1,219	0.02
HCC130	DIALYSIS STATUS	4,555	1,253	0.00
HCC131	RENAL FAILURE	1,979	588	0.00
HCC132	NEPHRITIS	397	1,055	0.71

Coef Name	Label	Coef Value	Std Error	P Value
HCC148	DECUBITUS ULCER OF SKIN	-1,994	1,545	0.20
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	449	1,041	0.67
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	0	.
HCC154	SEVERE HEAD INJURY	0	0	.
HCC155	MAJOR HEAD INJURY	1,076	1,722	0.53
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	-1,040	2,816	0.71
HCC158	HIP FRACTURE/DISLOCATION	-2,080	2,474	0.40
HCC161	TRAUMATIC AMPUTATION	-316	2,037	0.88
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	4,906	683	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-3,334	1,960	0.09
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-2,243	1,295	0.08
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	-2,215	1,413	0.12
Age_Lt_35		819	4,733	0.86
Age_Lt_45		1,024	4,734	0.83
Age_Lt_55		-2,316	4,814	0.63
Age_Lt_60		0	0	.
Age_Lt_65		0	0	.
Age_Lt_75		0	0	.
Age_Lt_80		0	0	.
Age_Lt_85		0	0	.
Age_Lt_90		0	0	.
Age_Lt_95		0	0	.
Age_Gt_94		0	0	.
ORIGDS		-1,080	1,470	0.46
ESRD		3,545	682	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	0	0	.
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	0	0	.
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	0	0	.
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	0	0	.
D_HCC107	DISABLED, CYSTIC FIBROSIS	0	0	.
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	441	1,602	0.78
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	42,359	2,132	0.00
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY	28,723	7,087	0.00

Coef Name	Label	Coef Value	Std Error	P Value
RF_CHF_DM	DISEASE *CEBROVASCULAR DISEASE*CORONARY DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	-11,396	2,578	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	9,130	1,150	0.00
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	-963	1,543	0.53
DRG_CD=765	CESAREAN SECTION W CC/MCC	2,027	528	0.00
DRG_CD=766	CESAREAN SECTION W/O CC/MCC	-500	529	0.34
DRG_CD=767	VAGINAL DELIVERY W STERILIZATION &/OR D&C	-197	612	0.75
DRG_CD=768	VAGINAL DELIVERY W O.R. PROC EXCEPT STERIL &/OR D&C	4,872	2,456	0.05
DRG_CD=769	POSTPARTUM & POST ABORTION DIAGNOSES W O.R. PROCEDURE	7,276	1,298	0.00
DRG_CD=770	ABORTION W D&C, ASPIRATION CURETTAGE OR HYSTEROTOMY	-1,647	729	0.02
DRG_CD=774	VAGINAL DELIVERY W COMPLICATING DIAGNOSES	-1,037	540	0.05
DRG_CD=775	VAGINAL DELIVERY W/O COMPLICATING DIAGNOSES	-2,365	522	0.00
DRG_CD=776	POSTPARTUM & POST ABORTION DIAGNOSES W/O O.R. PROCEDURE	-1,949	665	0.00
DRG_CD=777	ECTOPIC PREGNANCY	-686	746	0.36
DRG_CD=778	THREATENED ABORTION	286	623	0.65
DRG_CD=779	ABORTION W/O D&C	-3,170	873	0.00
DRG_CD=780	FALSE LABOR	223	1,228	0.86
DRG_CD=781	OTHER ANTEPARTUM DIAGNOSES W MEDICAL COMPLICATIONS	1,074	534	0.04
DRG_CD=782	OTHER ANTEPARTUM DIAGNOSES W/O MEDICAL COMPLICATIONS	0	0	.
LTI_Indicator		0	0	.

Table 35: Newborn and Other Neonates (Perinatal Period)

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		18,306	.	.
HCC1	HIV/AIDS	0	.	.
HCC2	SEPTICEMIA/SHOCK	0	.	.
HCC5	OPPORTUNISTIC INFECTIONS	0	.	.
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	0	.	.
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND	0	.	.

Coef Name	Label	Coef Value	Std Error	P Value
	OTHER SEVERE CANCERS			
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	0	.	.
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	0	.	.
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	0	.	.
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	0	.	.
HCC17	DIABETES WITH ACUTE COMPLICATIONS	0	.	.
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	0	.	.
HCC19	DIABETES WITHOUT COMPLICATION	0	.	.
HCC21	PROTEIN-CALORIE MALNUTRITION	0	.	.
HCC25	END-STAGE LIVER DISEASE	0	.	.
HCC26	CIRRHOSIS OF LIVER	0	.	.
HCC27	CHRONIC HEPATITIS	0	.	.
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	0	.	.
HCC32	PANCREATIC DISEASE	0	.	.
HCC33	INFLAMMATORY BOWEL DISEASE	0	.	.
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	0	.	.
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	0	.	.
HCC44	SEVERE HEMATOLOGICAL DISORDERS	0	.	.
HCC45	DISORDERS OF IMMUNITY	0	.	.
HCC51	DRUG/ALCOHOL PSYCHOSIS	0	.	.
HCC52	DRUG/ALCOHOL DEPENDENCE	0	.	.
HCC54	SCHIZOPHRENIA	0	.	.
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	0	.	.
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	0	.	.
HCC68	PARAPLEGIA	0	.	.
HCC69	SPINAL CORD DISORDERS/INJURIES	0	.	.
HCC70	MUSCULAR DYSTROPHY	0	.	.
HCC71	POLYNEUROPATHY	0	.	.
HCC72	MULTIPLE SCLEROSIS	0	.	.
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	0	.	.
HCC74	SEIZURE DISORDERS AND	0	.	.

Coef Name	Label	Coef Value	Std Error	P Value
	CONVULSIONS			
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	0	.	.
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	0	.	.
HCC78	RESPIRATORY ARREST	0	.	.
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	0	.	.
HCC80	CONGESTIVE HEART FAILURE	0	.	.
HCC81	ACUTE MYOCARDIAL INFARCTION	0	.	.
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	0	.	.
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	0	.	.
HCC92	SPECIFIED HEART ARRHYTHMIAS	0	.	.
HCC95	CEREBRAL HEMORRHAGE	0	.	.
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	0	.	.
HCC100	HEMIPLEGIA/HEMIPARESIS	0	.	.
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	0	.	.
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	0	.	.
HCC105	VASCULAR DISEASE	0	.	.
HCC107	CYSTIC FIBROSIS	0	.	.
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	0	.	.
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	0	.	.
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	0	.	.
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	0	.	.
HCC130	DIALYSIS STATUS	0	.	.
HCC131	RENAL FAILURE	0	.	.
HCC132	NEPHRITIS	0	.	.
HCC148	DECUBITUS ULCER OF SKIN	0	.	.
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	0	.	.
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	.	.
HCC154	SEVERE HEAD INJURY	0	.	.
HCC155	MAJOR HEAD INJURY	0	.	.
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	0	.	.

Coef Name	Label	Coef Value	Std Error	P Value
HCC158	HIP FRACTURE/DISLOCATION	0	.	.
HCC161	TRAUMATIC AMPUTATION	0	.	.
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	0	.	.
HCC174	MAJOR ORGAN TRANSPLANT STATUS	0	.	.
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	0	.	.
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	0	.	.
Age_Lt_35		0	.	.
Age_Lt_45		0	.	.
Age_Lt_55		0	.	.
Age_Lt_60		0	.	.
Age_Lt_65		0	.	.
Age_Lt_75		0	.	.
Age_Lt_80		0	.	.
Age_Lt_85		0	.	.
Age_Lt_90		0	.	.
Age_Lt_95		0	.	.
Age_Gt_94		0	.	.
ORIGDS		0	.	.
ESRD		0	.	.
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	0	.	.
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	0	.	.
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	0	.	.
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	0	.	.
D_HCC107	DISABLED, CYSTIC FIBROSIS	0	.	.
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	0	.	.
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	0	.	.
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	0	.	.
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	0	.	.
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	0	.	.
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	0	.	.

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=794	NEONATE W OTHER SIGNIFICANT PROBLEMS	0	.	.
LTI_Indicator		0	.	.

Table 36: Blood and Blood Forming Organs and Immunological Disorders

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		8,946	593	0.00
HCC1	HIV/AIDS	2,452	818	0.00
HCC2	SEPTICEMIA/SHOCK	1,923	294	0.00
HCC5	OPPORTUNISTIC INFECTIONS	1,978	694	0.00
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	3,085	212	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	1,764	277	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	2,591	228	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	809	221	0.00
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	959	273	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	665	290	0.02
HCC17	DIABETES WITH ACUTE COMPLICATIONS	2,740	1,277	0.03
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	113	464	0.81
HCC19	DIABETES WITHOUT COMPLICATION	225	155	0.15
HCC21	PROTEIN-CALORIE MALNUTRITION	2,784	284	0.00
HCC25	END-STAGE LIVER DISEASE	-665	460	0.15
HCC26	CIRRHOSIS OF LIVER	-779	479	0.10
HCC27	CHRONIC HEPATITIS	2,644	656	0.00
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,369	363	0.00
HCC32	PANCREATIC DISEASE	431	377	0.25
HCC33	INFLAMMATORY BOWEL DISEASE	740	530	0.16
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	669	345	0.05
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	542	242	0.03
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,968	181	0.00
HCC45	DISORDERS OF IMMUNITY	1,565	227	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC51	DRUG/ALCOHOL PSYCHOSIS	287	920	0.76
HCC52	DRUG/ALCOHOL DEPENDENCE	519	815	0.52
HCC54	SCHIZOPHRENIA	2,145	485	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,378	258	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	3,165	1,190	0.01
HCC68	PARAPLEGIA	3,453	936	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	1,307	490	0.01
HCC70	MUSCULAR DYSTROPHY	104	2,566	0.97
HCC71	POLYNEUROPATHY	937	245	0.00
HCC72	MULTIPLE SCLEROSIS	2,032	848	0.02
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	1,714	457	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	724	299	0.02
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	3,132	1,019	0.00
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	4,221	740	0.00
HCC78	RESPIRATORY ARREST	397	1,860	0.83
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	615	229	0.01
HCC80	CONGESTIVE HEART FAILURE	698	205	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	1,039	434	0.02
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	917	378	0.02
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	325	250	0.19
HCC92	SPECIFIED HEART ARRHYTHMIAS	289	144	0.04
HCC95	CEREBRAL HEMORRHAGE	126	838	0.88
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,243	330	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	1,366	458	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	-165	1,137	0.88
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,384	287	0.00
HCC105	VASCULAR DISEASE	727	145	0.00
HCC107	CYSTIC FIBROSIS	5,658	9,587	0.56
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	-173	175	0.32
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	835	459	0.07

Coef Name	Label	Coef Value	Std Error	P Value
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-131	688	0.85
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-108	632	0.86
HCC130	DIALYSIS STATUS	1,136	508	0.03
HCC131	RENAL FAILURE	292	177	0.10
HCC132	NEPHRITIS	-131	1,238	0.92
HCC148	DECUBITUS ULCER OF SKIN	2,981	332	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,071	313	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	39,102	7,830	0.00
HCC154	SEVERE HEAD INJURY	1,698	5,565	0.76
HCC155	MAJOR HEAD INJURY	2,394	815	0.00
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,322	445	0.00
HCC158	HIP FRACTURE/DISLOCATION	2,930	452	0.00
HCC161	TRAUMATIC AMPUTATION	2,425	1,218	0.05
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	1,909	256	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	4,687	535	0.00
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	216	423	0.61
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	4,968	701	0.00
Age_Lt_35		-1,079	341	0.00
Age_Lt_45		-2,032	347	0.00
Age_Lt_55		-1,545	296	0.00
Age_Lt_60		-897	344	0.01
Age_Lt_65		-531	313	0.09
Age_Lt_75		81	201	0.69
Age_Lt_80		178	201	0.38
Age_Lt_85		456	202	0.02
Age_Lt_90		765	216	0.00
Age_Lt_95		1,137	259	0.00
Age_Gt_94		787	383	0.04
ORIGDS		245	179	0.17
ESRD		3,805	314	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	9,620	1,517	0.00
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	-1,202	317	0.00
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	178	1,413	0.90
D_HCC52	DISABLED, DRUG/ALCOHOL	945	982	0.34

Coef Name	Label	Coef Value	Std Error	P Value
	DEPENDENCE			
D_HCC107	DISABLED, CYSTIC FIBROSIS	-9,776	12,384	0.43
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	575	466	0.22
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	756	286	0.01
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	-786	1,024	0.44
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	373	356	0.29
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	-663	319	0.04
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	-402	341	0.24
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	138,466	2,949	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	134,150	3,165	0.00
DRG_CD=006	LIVER TRANSPLANT W/O MCC	31,668	13,577	0.02
DRG_CD=009	BONE MARROW TRANSPLANT	62,749	3,347	0.00
DRG_CD=014	ALLOGENEIC BONE MARROW TRANSPLANT	58,734	6,830	0.00
DRG_CD=015	AUTOLOGOUS BONE MARROW TRANSPLANT	32,621	6,810	0.00
DRG_CD=799	SPLENECTOMY W MCC	42,281	1,188	0.00
DRG_CD=800	SPLENECTOMY W CC	13,960	1,055	0.00
DRG_CD=801	SPLENECTOMY W/O CC/MCC	4,295	1,137	0.00
DRG_CD=802	OTHER O.R. PROC OF THE BLOOD & BLOOD FORMING ORGANS W MCC	28,033	975	0.00
DRG_CD=803	OTHER O.R. PROC OF THE BLOOD & BLOOD FORMING ORGANS W CC	9,103	875	0.00
DRG_CD=804	OTHER O.R. PROC OF THE BLOOD & BLOOD FORMING ORGANS W/O CC/MCC	933	970	0.34
DRG_CD=808	MAJOR HEMATOL/IMMUN DIAG EXC SICKLE CELL CRISIS & COAGUL W MCC	12,606	636	0.00
DRG_CD=809	MAJOR HEMATOL/IMMUN DIAG EXC SICKLE CELL CRISIS & COAGUL W CC	5,065	616	0.00
DRG_CD=810	MAJOR HEMATOL/IMMUN DIAG EXC SICKLE CELL CRISIS & COAGUL W/O CC/MCC	2,704	740	0.00
DRG_CD=811	RED BLOOD CELL DISORDERS W MCC	6,005	587	0.00
DRG_CD=812	RED BLOOD CELL DISORDERS W/O	653	578	0.26

Coef Name	Label	Coef Value	Std Error	P Value
	MCC			
DRG_CD=813	COAGULATION DISORDERS	10,573	617	0.00
	RETICULOENDOTHELIAL & IMMUNITY			
DRG_CD=814	DISORDERS W MCC	10,684	804	0.00
	RETICULOENDOTHELIAL & IMMUNITY			
DRG_CD=815	DISORDERS W CC	3,679	691	0.00
	RETICULOENDOTHELIAL & IMMUNITY			
DRG_CD=816	DISORDERS W/O CC/MCC	0	0	.
LTI_Indicator		2,225	228	0.00

Table 37: Myeloproliferative DDs (Poorly Differentiated Neoplasms)

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		23,042	1,556	0.00
HCC1	HIV/AIDS	-1,860	1,836	0.31
HCC2	SEPTICEMIA/SHOCK	2,933	828	0.00
HCC5	OPPORTUNISTIC INFECTIONS	1,787	1,755	0.31
	METASTATIC CANCER AND ACUTE			
HCC7	LEUKEMIA	-3,353	467	0.00
	LUNG, UPPER DIGESTIVE TRACT, AND			
HCC8	OTHER SEVERE CANCERS	-2,934	650	0.00
	LYMPHATIC, HEAD AND NECK, BRAIN,			
HCC9	AND OTHER MAJOR CANCERS	-1,386	445	0.00
	BREAST, PROSTATE, COLORECTAL AND			
HCC10	OTHER CANCERS AND TUMORS	-2,615	677	0.00
	DIABETES WITH RENAL OR PERIPHERAL			
HCC15	CIRCULATORY MANIFESTATION	883	1,054	0.40
	DIABETES WITH NEUROLOGIC OR			
HCC16	OTHER SPECIFIED MANIFESTATION	148	910	0.87
	DIABETES WITH ACUTE			
HCC17	COMPLICATIONS	-2,638	4,499	0.56
	DIABETES WITH OPHTHALMOLOGIC OR			
HCC18	UNSPECIFIED MANIFESTATION	-386	1,424	0.79
HCC19	DIABETES WITHOUT COMPLICATION	719	426	0.09
HCC21	PROTEIN-CALORIE MALNUTRITION	322	770	0.68
HCC25	END-STAGE LIVER DISEASE	-2,821	1,516	0.06
HCC26	CIRRHOSIS OF LIVER	-3,873	1,290	0.00
HCC27	CHRONIC HEPATITIS	-630	1,830	0.73
	INTESTINAL			
HCC31	OBSTRUCTION/PERFORATION	3,566	870	0.00
HCC32	PANCREATIC DISEASE	-446	979	0.65
HCC33	INFLAMMATORY BOWEL DISEASE	-181	1,668	0.91
	BONE/JOINT/MUSCLE			
HCC37	INFECTIONS/NECROSIS	961	1,753	0.58

Coef Name	Label	Coef Value	Std Error	P Value
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	1,576	789	0.05
HCC44	SEVERE HEMATOLOGICAL DISORDERS	320	520	0.54
HCC45	DISORDERS OF IMMUNITY	1,230	456	0.01
HCC51	DRUG/ALCOHOL PSYCHOSIS	-861	2,461	0.73
HCC52	DRUG/ALCOHOL DEPENDENCE	147	2,676	0.96
HCC54	SCHIZOPHRENIA	-412	1,591	0.80
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	257	848	0.76
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	2,899	4,225	0.49
HCC68	PARAPLEGIA	8,409	2,849	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	940	1,377	0.49
HCC70	MUSCULAR DYSTROPHY	-2,057	7,588	0.79
HCC71	POLYNEUROPATHY	1,630	642	0.01
HCC72	MULTIPLE SCLEROSIS	2,019	2,326	0.39
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	996	1,728	0.56
HCC74	SEIZURE DISORDERS AND CONVULSIONS	919	968	0.34
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	4,652	1,528	0.00
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	2,621	2,335	0.26
HCC78	RESPIRATORY ARREST	5,295	10,190	0.60
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	-627	754	0.41
HCC80	CONGESTIVE HEART FAILURE	-611	699	0.38
HCC81	ACUTE MYOCARDIAL INFARCTION	-817	1,949	0.67
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	3,373	1,288	0.01
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	432	720	0.55
HCC92	SPECIFIED HEART ARRHYTHMIAS	-38	468	0.94
HCC95	CEREBRAL HEMORRHAGE	1,754	2,213	0.43
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	131	1,136	0.91
HCC100	HEMIPLEGIA/HEMIPARESIS	-256	1,543	0.87
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	8,359	3,280	0.01
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	344	896	0.70
HCC105	VASCULAR DISEASE	391	448	0.38

Coef Name	Label	Coef Value	Std Error	P Value
HCC107	CYSTIC FIBROSIS	-6,360	13,199	0.63
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	208	490	0.67
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	-1,501	1,480	0.31
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	12,200	1,800	0.00
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	2,763	2,449	0.26
HCC130	DIALYSIS STATUS	242	2,423	0.92
HCC131	RENAL FAILURE	-703	520	0.18
HCC132	NEPHRITIS	1,109	3,305	0.74
HCC148	DECUBITUS ULCER OF SKIN	3,301	1,448	0.02
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,951	1,173	0.10
HCC150	EXTENSIVE THIRD-DEGREE BURNS	-10,206	22,674	0.65
HCC154	SEVERE HEAD INJURY	-54	13,238	1.00
HCC155	MAJOR HEAD INJURY	698	2,502	0.78
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	3,620	976	0.00
HCC158	HIP FRACTURE/DISLOCATION	1,517	1,528	0.32
HCC161	TRAUMATIC AMPUTATION	3,609	5,371	0.50
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	2,547	686	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	4,642	945	0.00
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	241	1,015	0.81
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	1,351	2,595	0.60
Age_Lt_35		-2,207	1,526	0.15
Age_Lt_45		-1,833	1,247	0.14
Age_Lt_55		-1,195	816	0.14
Age_Lt_60		-1,456	870	0.09
Age_Lt_65		-678	764	0.37
Age_Lt_75		-1,113	436	0.01
Age_Lt_80		-1,479	478	0.00
Age_Lt_85		-2,998	530	0.00
Age_Lt_90		-3,060	645	0.00
Age_Lt_95		-4,586	1,023	0.00
Age_Gt_94		-6,275	2,238	0.01
ORIGDS		-1,300	550	0.02
ESRD		2,972	1,237	0.02
D_HCC5	DISABLED, OPPORTUNISTISTIC	-4,115	3,670	0.26

Coef Name	Label	Coef Value	Std Error	P Value
	INFECTIONS			
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	5,413	1,141	0.00
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-1,350	4,625	0.77
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	1,339	3,537	0.70
D_HCC107	DISABLED, CYSTIC FIBROSIS	-4,728	26,233	0.86
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-695	1,688	0.68
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	174	1,036	0.87
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	3,546	4,250	0.40
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	2,005	1,405	0.15
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	338	1,099	0.76
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	1,006	1,318	0.45
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	113,495	4,535	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	77,267	4,686	0.00
DRG_CD=009	BONE MARROW TRANSPLANT	29,949	1,832	0.00
DRG_CD=011	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W MCC	27,871	8,145	0.00
DRG_CD=012	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W CC	16,491	11,431	0.15
DRG_CD=013	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W/O CC/MCC	16,818	8,692	0.05
DRG_CD=014	ALLOGENEIC BONE MARROW TRANSPLANT	61,546	3,090	0.00
DRG_CD=015	AUTOLOGOUS BONE MARROW TRANSPLANT	18,437	2,006	0.00
DRG_CD=820	LYMPHOMA & LEUKEMIA W MAJOR O.R. PROCEDURE W MCC	35,261	1,905	0.00
DRG_CD=821	LYMPHOMA & LEUKEMIA W MAJOR O.R. PROCEDURE W CC	6,935	1,679	0.00
DRG_CD=822	LYMPHOMA & LEUKEMIA W MAJOR O.R. PROCEDURE W/O CC/MCC	-5,480	1,698	0.00
DRG_CD=823	LYMPHOMA & NON-ACUTE LEUKEMIA W OTHER O.R. PROC W MCC	29,102	1,760	0.00
DRG_CD=824	LYMPHOMA & NON-ACUTE LEUKEMIA	9,780	1,652	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	W OTHER O.R. PROC W CC LYMPHOMA & NON-ACUTE LEUKEMIA			
DRG_CD=825	W OTHER O.R. PROC W/O CC/MCC	-936	1,764	0.60
DRG_CD=826	MYELOPROLIF DISORD OR POORLY DIFF NEOPL W MAJ O.R. PROC W MCC	27,652	2,112	0.00
DRG_CD=827	MYELOPROLIF DISORD OR POORLY DIFF NEOPL W MAJ O.R. PROC W CC	2,491	1,741	0.15
DRG_CD=828	MYELOPROLIF DISORD OR POORLY DIFF NEOPL W MAJ O.R. PROC W/O CC/MCC	-6,258	1,843	0.00
DRG_CD=829	MYELOPROLIF DISORD OR POORLY DIFF NEOPL W OTHER O.R. PROC W CC/MCC	12,007	1,797	0.00
DRG_CD=830	MYELOPROLIF DISORD OR POORLY DIFF NEOPL W OTHER O.R. PROC W/O CC/MCC	-5,952	2,204	0.01
DRG_CD=834	ACUTE LEUKEMIA W/O MAJOR O.R. PROCEDURE W MCC	40,987	1,812	0.00
DRG_CD=835	ACUTE LEUKEMIA W/O MAJOR O.R. PROCEDURE W CC	18,273	1,784	0.00
DRG_CD=836	ACUTE LEUKEMIA W/O MAJOR O.R. PROCEDURE W/O CC/MCC	11,640	2,139	0.00
DRG_CD=837	CHEMO W ACUTE LEUKEMIA AS SDX OR W HIGH DOSE CHEMO AGENT W MCC	44,088	1,882	0.00
DRG_CD=838	CHEMO W ACUTE LEUKEMIA AS SDX W CC OR HIGH DOSE CHEMO AGENT	18,305	1,857	0.00
DRG_CD=839	CHEMO W ACUTE LEUKEMIA AS SDX W/O CC/MCC	7,414	1,904	0.00
DRG_CD=840	LYMPHOMA & NON-ACUTE LEUKEMIA W MCC	15,297	1,578	0.00
DRG_CD=841	LYMPHOMA & NON-ACUTE LEUKEMIA W CC	4,623	1,555	0.00
DRG_CD=842	LYMPHOMA & NON-ACUTE LEUKEMIA W/O CC/MCC	-1,152	1,630	0.48
DRG_CD=843	OTHER MYELOPROLIF DIS OR POORLY DIFF NEOPL DIAG W MCC	4,387	1,973	0.03
DRG_CD=844	OTHER MYELOPROLIF DIS OR POORLY DIFF NEOPL DIAG W CC	-344	1,709	0.84
DRG_CD=845	OTHER MYELOPROLIF DIS OR POORLY DIFF NEOPL DIAG W/O CC/MCC	-3,345	2,084	0.11
DRG_CD=846	CHEMOTHERAPY W/O ACUTE LEUKEMIA AS SECONDARY DIAGNOSIS W MCC	9,351	1,706	0.00
DRG_CD=847	CHEMOTHERAPY W/O ACUTE LEUKEMIA AS SECONDARY DIAGNOSIS	-3,324	1,509	0.03

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=848	W CC CHEMOTHERAPY W/O ACUTE LEUKEMIA AS SECONDARY DIAGNOSIS W/O CC/MCC	-7,645	1,970	0.00
DRG_CD=849	RADIOTHERAPY	0	0	.
LTI_Indicator		36	1,410	0.98

Table 38: Infectious and Parasitic DDs

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		12,548	192	0.00
HCC1	HIV/AIDS	1,610	1,056	0.13
HCC2	SEPTICEMIA/SHOCK	32	205	0.87
HCC5	OPPORTUNISTIC INFECTIONS	3,341	688	0.00
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	2,910	298	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	832	373	0.03
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	1,634	312	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-69	221	0.76
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,721	234	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	1,017	246	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	1,135	1,074	0.29
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	728	425	0.09
HCC19	DIABETES WITHOUT COMPLICATION	616	145	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	3,496	236	0.00
HCC25	END-STAGE LIVER DISEASE	3,046	582	0.00
HCC26	CIRRHOSIS OF LIVER	1,133	580	0.05
HCC27	CHRONIC HEPATITIS	1,030	795	0.20
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,871	288	0.00
HCC32	PANCREATIC DISEASE	358	390	0.36
HCC33	INFLAMMATORY BOWEL DISEASE	1,254	510	0.01
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,343	315	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	876	232	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC44	SEVERE HEMATOLOGICAL DISORDERS	2,098	380	0.00
HCC45	DISORDERS OF IMMUNITY	1,410	386	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	1,591	784	0.04
HCC52	DRUG/ALCOHOL DEPENDENCE	159	832	0.85
HCC54	SCHIZOPHRENIA	2,373	363	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,514	213	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	358	464	0.44
HCC68	PARAPLEGIA	2,278	488	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	3,219	566	0.00
HCC70	MUSCULAR DYSTROPHY	-2,335	1,796	0.19
HCC71	POLYNEUROPATHY	1,148	212	0.00
HCC72	MULTIPLE SCLEROSIS	-57	439	0.90
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	1,899	295	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	655	231	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	870	593	0.14
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	3,302	448	0.00
HCC78	RESPIRATORY ARREST	-902	1,407	0.52
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	883	207	0.00
HCC80	CONGESTIVE HEART FAILURE	989	226	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	304	426	0.48
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-526	399	0.19
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-535	270	0.05
HCC92	SPECIFIED HEART ARRHYTHMIAS	834	143	0.00
HCC95	CEREBRAL HEMORRHAGE	2,499	611	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	2,123	273	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	1,062	338	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	1,349	705	0.06
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	2,266	259	0.00
HCC105	VASCULAR DISEASE	1,143	138	0.00
HCC107	CYSTIC FIBROSIS	-4,813	5,625	0.39
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	-120	163	0.46

Coef Name	Label	Coef Value	Std Error	P Value
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	2,232	294	0.00
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-458	637	0.47
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-311	565	0.58
HCC130	DIALYSIS STATUS	2,373	416	0.00
HCC131	RENAL FAILURE	1,053	178	0.00
HCC132	NEPHRITIS	1,886	1,157	0.10
HCC148	DECUBITUS ULCER OF SKIN	2,411	215	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,646	258	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	-3,975	10,890	0.72
HCC154	SEVERE HEAD INJURY	1,244	2,970	0.68
HCC155	MAJOR HEAD INJURY	578	618	0.35
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	2,356	446	0.00
HCC158	HIP FRACTURE/DISLOCATION	2,976	363	0.00
HCC161	TRAUMATIC AMPUTATION	1,198	836	0.15
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	976	213	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	119	641	0.85
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-308	270	0.25
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	-337	481	0.48
Age_Lt_35		-2,002	477	0.00
Age_Lt_45		-1,699	358	0.00
Age_Lt_55		-963	262	0.00
Age_Lt_60		-23	284	0.94
Age_Lt_65		992	268	0.00
Age_Lt_75		70	195	0.72
Age_Lt_80		706	196	0.00
Age_Lt_85		1,344	197	0.00
Age_Lt_90		1,946	209	0.00
Age_Lt_95		2,118	256	0.00
Age_Gt_94		2,080	393	0.00
ORIGDS		449	162	0.01
ESRD		4,168	256	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	-840	1,324	0.53
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	-606	851	0.48

Coef Name	Label	Coef Value	Std Error	P Value
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-1,513	1,280	0.24
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-570	1,098	0.60
D_HCC107	DISABLED, CYSTIC FIBROSIS	3,700	6,562	0.57
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-10	357	0.98
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	1,189	277	0.00
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	1,625	831	0.05
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	1,697	349	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	148	312	0.63
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	-53	374	0.89
DRG_CD=001	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W MCC	159,703	15,398	0.00
DRG_CD=002	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W/O MCC	192,598	15,405	0.00
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	170,788	1,048	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	123,943	666	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	167,167	21,775	0.00
DRG_CD=853	INFECTIOUS & PARASITIC DISEASES W O.R. PROCEDURE W MCC	39,659	221	0.00
DRG_CD=854	INFECTIOUS & PARASITIC DISEASES W O.R. PROCEDURE W CC	14,279	407	0.00
DRG_CD=855	INFECTIOUS & PARASITIC DISEASES W O.R. PROCEDURE W/O CC/MCC	3,438	1,720	0.05
DRG_CD=856	POSTOPERATIVE OR POST-TRAUMATIC INFECTIONS W O.R. PROC W MCC	31,875	568	0.00
DRG_CD=857	POSTOPERATIVE OR POST-TRAUMATIC INFECTIONS W O.R. PROC W CC	8,486	434	0.00
DRG_CD=858	POSTOPERATIVE OR POST-TRAUMATIC INFECTIONS W O.R. PROC W/O CC/MCC	1,218	873	0.16
DRG_CD=862	POSTOPERATIVE & POST-TRAUMATIC INFECTIONS W MCC	6,999	450	0.00
DRG_CD=863	POSTOPERATIVE & POST-TRAUMATIC INFECTIONS W/O MCC	-2,284	315	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=864	FEVER	-3,568	269	0.00
DRG_CD=865	VIRAL ILLNESS W MCC	2,155	702	0.00
DRG_CD=866	VIRAL ILLNESS W/O MCC	-5,445	409	0.00
DRG_CD=867	OTHER INFECTIOUS & PARASITIC DISEASES DIAGNOSES W MCC	10,653	543	0.00
DRG_CD=868	OTHER INFECTIOUS & PARASITIC DISEASES DIAGNOSES W CC	-2,357	694	0.00
DRG_CD=869	OTHER INFECTIOUS & PARASITIC DISEASES DIAGNOSES W/O CC/MCC	-6,143	1,210	0.00
DRG_CD=870	SEPTICEMIA OR SEVERE SEPSIS W MV 96+ HOURS	47,911	343	0.00
DRG_CD=871	SEPTICEMIA OR SEVERE SEPSIS W/O MV 96+ HOURS W MCC	8,404	131	0.00
DRG_CD=872	SEPTICEMIA OR SEVERE SEPSIS W/O MV 96+ HOURS W/O MCC	0	0	.
LTI_Indicator		2,165	153	0.00

Table 39: Mental Diseases and Disorders

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		9,664	680	0.00
HCC1	HIV/AIDS	2,485	385	0.00
HCC2	SEPTICEMIA/SHOCK	2,375	469	0.00
HCC5	OPPORTUNISTIC INFECTIONS	-1,943	1,626	0.23
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	2,615	610	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	-783	616	0.20
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	538	481	0.26
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	674	281	0.02
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,330	322	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	1,172	259	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	2,366	940	0.01
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	968	451	0.03
HCC19	DIABETES WITHOUT COMPLICATION	548	121	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	1,264	340	0.00
HCC25	END-STAGE LIVER DISEASE	2,498	634	0.00
HCC26	CIRRHOSIS OF LIVER	1,252	502	0.01

Coef Name	Label	Coef Value	Std Error	P Value
HCC27	CHRONIC HEPATITIS	448	379	0.24
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	846	443	0.06
HCC32	PANCREATIC DISEASE	1,010	418	0.02
HCC33	INFLAMMATORY BOWEL DISEASE	746	551	0.18
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	-184	606	0.76
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	-100	266	0.71
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,037	765	0.18
HCC45	DISORDERS OF IMMUNITY	981	624	0.12
HCC51	DRUG/ALCOHOL PSYCHOSIS	1,390	639	0.03
HCC52	DRUG/ALCOHOL DEPENDENCE	-766	602	0.20
HCC54	SCHIZOPHRENIA	1,517	116	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	607	115	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	3,922	1,272	0.00
HCC68	PARAPLEGIA	824	1,001	0.41
HCC69	SPINAL CORD DISORDERS/INJURIES	1,806	604	0.00
HCC70	MUSCULAR DYSTROPHY	-1,275	1,986	0.52
HCC71	POLYNEUROPATHY	605	229	0.01
HCC72	MULTIPLE SCLEROSIS	1,814	613	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	1,905	313	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	655	149	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	1,294	821	0.11
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	7,898	1,066	0.00
HCC78	RESPIRATORY ARREST	1,220	2,100	0.56
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	551	298	0.06
HCC80	CONGESTIVE HEART FAILURE	1,076	262	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	1,219	662	0.07
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-52	396	0.90
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	250	266	0.35
HCC92	SPECIFIED HEART ARRHYTHMIAS	535	186	0.00
HCC95	CEREBRAL HEMORRHAGE	1,207	683	0.08

Coef Name	Label	Coef Value	Std Error	P Value
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,195	290	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	1,818	422	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	1,393	727	0.06
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,153	428	0.01
HCC105	VASCULAR DISEASE	203	163	0.21
HCC107	CYSTIC FIBROSIS	4,548	6,619	0.49
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	988	132	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	-111	581	0.85
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-1,569	1,026	0.13
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	414	807	0.61
HCC130	DIALYSIS STATUS	2,780	798	0.00
HCC131	RENAL FAILURE	1,388	221	0.00
HCC132	NEPHRITIS	93	1,182	0.94
HCC148	DECUBITUS ULCER OF SKIN	2,716	477	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	971	360	0.01
HCC150	EXTENSIVE THIRD-DEGREE BURNS	3,913	9,300	0.67
HCC154	SEVERE HEAD INJURY	2,551	2,825	0.37
HCC155	MAJOR HEAD INJURY	769	447	0.09
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,186	491	0.02
HCC158	HIP FRACTURE/DISLOCATION	895	537	0.10
HCC161	TRAUMATIC AMPUTATION	-356	1,485	0.81
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	865	367	0.02
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-1,148	1,107	0.30
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	3,423	637	0.00
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	-238	753	0.75
Age_Lt_35		-2,768	225	0.00
Age_Lt_45		-2,991	220	0.00
Age_Lt_55		-2,637	212	0.00
Age_Lt_60		-2,058	239	0.00
Age_Lt_65		-904	260	0.00
Age_Lt_75		940	239	0.00
Age_Lt_80		2,079	244	0.00

Coef Name	Label	Coef Value	Std Error	P Value
Age_Lt_85		2,950	246	0.00
Age_Lt_90		3,111	257	0.00
Age_Lt_95		3,491	312	0.00
Age_Gt_94		3,434	483	0.00
ORIGDS		261	192	0.17
ESRD		5,612	463	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	2,290	2,253	0.31
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	1,086	1,046	0.30
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	194	691	0.78
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	1,332	623	0.03
D_HCC107	DISABLED, CYSTIC FIBROSIS	-6,725	7,309	0.36
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	182	423	0.67
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	-464	339	0.17
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	604	977	0.54
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	-1,561	510	0.00
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	-180	370	0.63
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	-624	566	0.27
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	83,359	6,651	0.00
DRG_CD=876	O.R. PROCEDURE W PRINCIPAL DIAGNOSES OF MENTAL ILLNESS	21,051	873	0.00
DRG_CD=880	ACUTE ADJUSTMENT REACTION & PSYCHOSOCIAL DYSFUNCTION	-1,535	675	0.02
DRG_CD=881	DEPRESSIVE NEUROSES	-935	690	0.18
DRG_CD=882	NEUROSES EXCEPT DEPRESSIVE	-235	751	0.75
DRG_CD=883	DISORDERS OF PERSONALITY & IMPULSE CONTROL	4,871	823	0.00
DRG_CD=884	ORGANIC DISTURBANCES & MENTAL RETARDATION	4,935	666	0.00
DRG_CD=885	PSYCHOSES	2,067	660	0.00
DRG_CD=886	BEHAVIORAL & DEVELOPMENTAL DISORDERS	2,496	887	0.00
DRG_CD=887	OTHER MENTAL DISORDER DIAGNOSES	0	0	.
LTI_Indicator		2,123	188	0.00

Table 40: Alcohol/Drug Use or Induced Mental Disorders

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		8,937	191	0.00
HCC1	HIV/AIDS	80	370	0.83
HCC2	SEPTICEMIA/SHOCK	22	588	0.97
HCC5	OPPORTUNISTIC INFECTIONS	-2,542	1,947	0.19
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	2,178	714	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	740	650	0.25
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	219	575	0.70
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	24	389	0.95
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,355	534	0.01
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	189	380	0.62
HCC17	DIABETES WITH ACUTE COMPLICATIONS	1,631	1,240	0.19
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	842	727	0.25
HCC19	DIABETES WITHOUT COMPLICATION	712	188	0.00
HCC21	PROTEIN-CALORIE MALNUTRITION	711	390	0.07
HCC25	END-STAGE LIVER DISEASE	1,362	455	0.00
HCC26	CIRRHOSIS OF LIVER	142	303	0.64
HCC27	CHRONIC HEPATITIS	342	316	0.28
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,478	590	0.01
HCC32	PANCREATIC DISEASE	850	315	0.01
HCC33	INFLAMMATORY BOWEL DISEASE	2,178	671	0.00
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	936	587	0.11
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	414	325	0.20
HCC44	SEVERE HEMATOLOGICAL DISORDERS	2,110	811	0.01
HCC45	DISORDERS OF IMMUNITY	1,112	758	0.14
HCC51	DRUG/ALCOHOL PSYCHOSIS	-75	314	0.81
HCC52	DRUG/ALCOHOL DEPENDENCE	-160	316	0.61
HCC54	SCHIZOPHRENIA	1,897	214	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,009	139	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	2,880	1,340	0.03

Coef Name	Label	Coef Value	Std Error	P Value
HCC68	PARAPLEGIA	2,798	1,019	0.01
HCC69	SPINAL CORD DISORDERS/INJURIES	-58	721	0.94
HCC70	MUSCULAR DYSTROPHY	717	2,735	0.79
HCC71	POLYNEUROPATHY	625	264	0.02
HCC72	MULTIPLE SCLEROSIS	575	800	0.47
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	3,828	525	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	878	194	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	451	1,077	0.68
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	2,193	1,470	0.14
HCC78	RESPIRATORY ARREST	-2,784	2,173	0.20
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	767	348	0.03
HCC80	CONGESTIVE HEART FAILURE	1,014	354	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	-647	819	0.43
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-281	510	0.58
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	590	328	0.07
HCC92	SPECIFIED HEART ARRHYTHMIAS	720	249	0.00
HCC95	CEREBRAL HEMORRHAGE	-334	877	0.70
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,161	466	0.01
HCC100	HEMIPLEGIA/HEMIPARESIS	1,798	687	0.01
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	-495	1,353	0.71
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,991	529	0.00
HCC105	VASCULAR DISEASE	1,045	237	0.00
HCC107	CYSTIC FIBROSIS	1,497	4,334	0.73
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	532	168	0.00
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	-659	620	0.29
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-10	1,205	0.99
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-908	1,281	0.48
HCC130	DIALYSIS STATUS	6,390	1,119	0.00
HCC131	RENAL FAILURE	436	309	0.16
HCC132	NEPHRITIS	3,361	2,041	0.10

Coef Name	Label	Coef Value	Std Error	P Value
HCC148	DECUBITUS ULCER OF SKIN	1,113	627	0.08
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,027	492	0.04
HCC150	EXTENSIVE THIRD-DEGREE BURNS	-1,582	6,124	0.80
HCC154	SEVERE HEAD INJURY	-1,106	3,126	0.72
HCC155	MAJOR HEAD INJURY	504	493	0.31
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	2,072	477	0.00
HCC158	HIP FRACTURE/DISLOCATION	372	621	0.55
HCC161	TRAUMATIC AMPUTATION	-947	1,471	0.52
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	-31	428	0.94
HCC174	MAJOR ORGAN TRANSPLANT STATUS	948	1,243	0.45
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	3	778	1.00
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	792	770	0.30
Age_Lt_35		-2,322	283	0.00
Age_Lt_45		-2,093	245	0.00
Age_Lt_55		-1,913	222	0.00
Age_Lt_60		-1,415	251	0.00
Age_Lt_65		-828	278	0.00
Age_Lt_75		1,061	252	0.00
Age_Lt_80		1,847	293	0.00
Age_Lt_85		2,123	343	0.00
Age_Lt_90		3,371	413	0.00
Age_Lt_95		4,378	608	0.00
Age_Gt_94		1,632	1,160	0.16
ORIGDS		170	252	0.50
ESRD		1,550	647	0.02
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	3,062	2,329	0.19
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	-525	971	0.59
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	867	348	0.01
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	498	357	0.16
D_HCC107	DISABLED, CYSTIC FIBROSIS	0	0	.
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-700	731	0.34
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	333	457	0.47
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY	2,216	1,623	0.17

Coef Name	Label	Coef Value	Std Error	P Value
RF_CHF_DM	DISEASE *CEBROVASCULAR DISEASE*CORONARY DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	760	767	0.32
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	-271	547	0.62
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	216	719	0.76
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	127,360	2,725	0.00
DRG_CD=894	ALCOHOL/DRUG ABUSE OR DEPENDENCE, LEFT AMA	-1,968	209	0.00
DRG_CD=895	ALCOHOL/DRUG ABUSE OR DEPENDENCE W REHABILITATION THERAPY	1,234	158	0.00
DRG_CD=896	ALCOHOL/DRUG ABUSE OR DEPENDENCE W/O REHABILITATION THERAPY W MCC	8,105	171	0.00
DRG_CD=897	ALCOHOL/DRUG ABUSE OR DEPENDENCE W/O REHABILITATION THERAPY W/O MCC	0	0	.
LTI_Indicator		2,878	561	0.00

Table 41: Injuries, Poison and Toxic Effect of Drugs

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		8,010	370	0.00
HCC1	HIV/AIDS	619	597	0.30
HCC2	SEPTICEMIA/SHOCK	1,511	361	0.00
HCC5	OPPORTUNISTIC INFECTIONS	2,593	1,269	0.04
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	2,394	407	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	967	425	0.02
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	396	407	0.33
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-264	249	0.29
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	860	300	0.00
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	573	284	0.04
HCC17	DIABETES WITH ACUTE COMPLICATIONS	-887	1,256	0.48
HCC18	DIABETES WITH OPHTHALMOLOGIC OR	390	513	0.45

Coef Name	Label	Coef Value	Std Error	P Value
	UNSPECIFIED MANIFESTATION			
HCC19	DIABETES WITHOUT COMPLICATION	168	164	0.30
HCC21	PROTEIN-CALORIE MALNUTRITION	3,035	354	0.00
HCC25	END-STAGE LIVER DISEASE	1,196	647	0.06
HCC26	CIRRHOSIS OF LIVER	-1,016	568	0.07
HCC27	CHRONIC HEPATITIS	541	526	0.30
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	2,693	326	0.00
HCC32	PANCREATIC DISEASE	1,284	366	0.00
HCC33	INFLAMMATORY BOWEL DISEASE	690	561	0.22
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	2,489	390	0.00
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	850	252	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	1,111	583	0.06
HCC45	DISORDERS OF IMMUNITY	309	584	0.60
HCC51	DRUG/ALCOHOL PSYCHOSIS	1,048	777	0.18
HCC52	DRUG/ALCOHOL DEPENDENCE	306	629	0.63
HCC54	SCHIZOPHRENIA	3,510	281	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,893	178	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	-275	968	0.78
HCC68	PARAPLEGIA	1,497	810	0.06
HCC69	SPINAL CORD DISORDERS/INJURIES	2,657	726	0.00
HCC70	MUSCULAR DYSTROPHY	4,181	2,448	0.09
HCC71	POLYNEUROPATHY	566	238	0.02
HCC72	MULTIPLE SCLEROSIS	2,228	633	0.00
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	1,870	468	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	156	244	0.52
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	1,267	969	0.19
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	2,306	770	0.00
HCC78	RESPIRATORY ARREST	-1,061	1,744	0.54
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	955	272	0.00
HCC80	CONGESTIVE HEART FAILURE	910	277	0.00
HCC81	ACUTE MYOCARDIAL INFARCTION	2,078	543	0.00
HCC82	UNSTABLE ANGINA AND OTHER ACUTE	-375	414	0.37

Coef Name	Label	Coef Value	Std Error	P Value
	ISCHEMIC HEART DISEASE ANGINA PECTORIS/OLD MYOCARDIAL			
HCC83	INFARCTION	-376	277	0.17
HCC92	SPECIFIED HEART ARRHYTHMIAS	321	179	0.07
HCC95	CEREBRAL HEMORRHAGE	1,611	883	0.07
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	1,590	384	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	2,761	542	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	312	1,031	0.76
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,948	311	0.00
HCC105	VASCULAR DISEASE	790	180	0.00
HCC107	CYSTIC FIBROSIS	-7,936	5,374	0.14
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	373	178	0.04
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	-7	537	0.99
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	-1,399	906	0.12
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-405	652	0.53
HCC130	DIALYSIS STATUS	-341	467	0.47
HCC131	RENAL FAILURE	824	229	0.00
HCC132	NEPHRITIS	-1,169	1,230	0.34
HCC148	DECUBITUS ULCER OF SKIN	3,370	400	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	825	327	0.01
HCC150	EXTENSIVE THIRD-DEGREE BURNS	8,888	7,601	0.24
HCC154	SEVERE HEAD INJURY	-6,372	5,012	0.20
HCC155	MAJOR HEAD INJURY	557	667	0.40
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,832	509	0.00
HCC158	HIP FRACTURE/DISLOCATION	2,062	494	0.00
HCC161	TRAUMATIC AMPUTATION	-197	967	0.84
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	1,060	228	0.00
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-1,954	813	0.02
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	317	432	0.46
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	2,135	581	0.00
Age_Lt_35		-658	318	0.04
Age_Lt_45		-1,236	269	0.00

Coef Name	Label	Coef Value	Std Error	P Value
Age_Lt_55		-833	230	0.00
Age_Lt_60		-363	266	0.17
Age_Lt_65		212	274	0.44
Age_Lt_75		349	216	0.11
Age_Lt_80		1,011	228	0.00
Age_Lt_85		1,608	240	0.00
Age_Lt_90		2,719	274	0.00
Age_Lt_95		2,923	382	0.00
Age_Gt_94		3,629	668	0.00
ORIGDS		812	201	0.00
ESRD		2,323	325	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	144	1,911	0.94
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	2,797	1,058	0.01
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	358	893	0.69
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	123	693	0.86
D_HCC107	DISABLED, CYSTIC FIBROSIS	10,049	6,588	0.13
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-438	540	0.42
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	219	346	0.53
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	300	1,137	0.79
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	477	459	0.30
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	110	386	0.78
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	-747	486	0.12
DRG_CD=001	HEART TRANSPLANT OR IMPLANT OF HEART ASSIST SYSTEM W MCC	133,052	13,170	0.00
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	133,259	1,608	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	86,529	1,184	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	61,520	13,183	0.00
DRG_CD=012	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W CC	24,814	13,157	0.06
DRG_CD=901	WOUND DEBRIDEMENTS FOR INJURIES	33,489	906	0.00

Coef Name	Label	Coef Value	Std Error	P Value
	W MCC			
DRG_CD=902	WOUND DEBRIDEMENTS FOR INJURIES W CC	11,384	673	0.00
DRG_CD=903	WOUND DEBRIDEMENTS FOR INJURIES W/O CC/MCC	3,732	837	0.00
DRG_CD=904	SKIN GRAFTS FOR INJURIES W CC/MCC	21,153	598	0.00
DRG_CD=905	SKIN GRAFTS FOR INJURIES W/O CC/MCC	2,104	766	0.01
DRG_CD=906	HAND PROCEDURES FOR INJURIES	3,245	784	0.00
DRG_CD=907	OTHER O.R. PROCEDURES FOR INJURIES W MCC	28,510	425	0.00
DRG_CD=908	OTHER O.R. PROCEDURES FOR INJURIES W CC	10,715	408	0.00
DRG_CD=909	OTHER O.R. PROCEDURES FOR INJURIES W/O CC/MCC	2,812	456	0.00
DRG_CD=913	TRAUMATIC INJURY W MCC	10,509	674	0.00
DRG_CD=914	TRAUMATIC INJURY W/O MCC	2,562	422	0.00
DRG_CD=915	ALLERGIC REACTIONS W MCC	6,108	569	0.00
DRG_CD=916	ALLERGIC REACTIONS W/O MCC	-3,702	415	0.00
DRG_CD=917	POISONING & TOXIC EFFECTS OF DRUGS W MCC	7,622	361	0.00
DRG_CD=918	POISONING & TOXIC EFFECTS OF DRUGS W/O MCC	-3	351	0.99
DRG_CD=919	COMPLICATIONS OF TREATMENT W MCC	10,507	416	0.00
DRG_CD=920	COMPLICATIONS OF TREATMENT W CC	2,717	388	0.00
DRG_CD=921	COMPLICATIONS OF TREATMENT W/O CC/MCC	-1,090	438	0.01
DRG_CD=922	OTHER INJURY, POISONING & TOXIC EFFECT DIAG W MCC	7,556	588	0.00
DRG_CD=923	OTHER INJURY, POISONING & TOXIC EFFECT DIAG W/O MCC	0	0	.
LTI_Indicator		2,607	365	0.00

Table 42: Burns

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		16,577	2,135	0.00
HCC1	HIV/AIDS	1,133	7,193	0.87
HCC2	SEPTICEMIA/SHOCK	3,529	8,925	0.69
HCC5	OPPORTUNISTIC INFECTIONS	-8,633	27,522	0.75
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	1,845	5,410	0.73
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND	-2,169	7,417	0.77

Coef Name	Label	Coef Value	Std Error	P Value
	OTHER SEVERE CANCERS			
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	-4,001	5,885	0.50
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-2,791	3,926	0.48
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	3,120	4,138	0.45
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	-4,162	3,803	0.27
HCC17	DIABETES WITH ACUTE COMPLICATIONS	0	0	.
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	-5,280	6,142	0.39
HCC19	DIABETES WITHOUT COMPLICATION	3,697	2,097	0.08
HCC21	PROTEIN-CALORIE MALNUTRITION	6,092	5,476	0.27
HCC25	END-STAGE LIVER DISEASE	6,909	17,475	0.69
HCC26	CIRRHOSIS OF LIVER	3,438	7,693	0.66
HCC27	CHRONIC HEPATITIS	-3,633	8,378	0.66
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	6,205	7,157	0.39
HCC32	PANCREATIC DISEASE	-4,003	8,582	0.64
HCC33	INFLAMMATORY BOWEL DISEASE	-2,829	10,162	0.78
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	7,633	6,096	0.21
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	-3,124	4,271	0.46
HCC44	SEVERE HEMATOLOGICAL DISORDERS	-5,172	11,861	0.66
HCC45	DISORDERS OF IMMUNITY	-4,082	8,166	0.62
HCC51	DRUG/ALCOHOL PSYCHOSIS	-5,445	10,012	0.59
HCC52	DRUG/ALCOHOL DEPENDENCE	4,144	8,183	0.61
HCC54	SCHIZOPHRENIA	-905	4,202	0.83
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	4,011	2,790	0.15
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	-11,799	9,619	0.22
HCC68	PARAPLEGIA	-1,069	6,691	0.87
HCC69	SPINAL CORD DISORDERS/INJURIES	13,991	8,350	0.09
HCC70	MUSCULAR DYSTROPHY	46,038	27,353	0.09
HCC71	POLYNEUROPATHY	-4,527	3,285	0.17
HCC72	MULTIPLE SCLEROSIS	-6,646	6,657	0.32
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	124	8,201	0.99
HCC74	SEIZURE DISORDERS AND	1,687	3,340	0.61

Coef Name	Label	Coef Value	Std Error	P Value
	CONVULSIONS			
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	0	0	.
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	-4,225	15,060	0.78
HCC78	RESPIRATORY ARREST	89,173	39,158	0.02
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	5,555	3,983	0.16
HCC80	CONGESTIVE HEART FAILURE	1,952	4,473	0.66
HCC81	ACUTE MYOCARDIAL INFARCTION	-2,953	7,645	0.70
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	1,180	7,050	0.87
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-6,950	4,107	0.09
HCC92	SPECIFIED HEART ARRHYTHMIAS	-723	2,869	0.80
HCC95	CEREBRAL HEMORRHAGE	4,467	15,428	0.77
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	-4,228	6,277	0.50
HCC100	HEMIPLEGIA/HEMIPARESIS	8,949	6,989	0.20
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	17,316	9,570	0.07
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	92	4,735	0.98
HCC105	VASCULAR DISEASE	-1,697	2,532	0.50
HCC107	CYSTIC FIBROSIS	0	0	.
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	-264	2,238	0.91
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	13,340	11,694	0.25
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	2,920	18,210	0.87
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-9,907	7,405	0.18
HCC130	DIALYSIS STATUS	-4,376	9,584	0.65
HCC131	RENAL FAILURE	4,601	3,562	0.20
HCC132	NEPHRITIS	-4,813	16,774	0.77
HCC148	DECUBITUS ULCER OF SKIN	24,936	5,045	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	1,916	3,921	0.63
HCC150	EXTENSIVE THIRD-DEGREE BURNS	-2,331	5,758	0.69
HCC154	SEVERE HEAD INJURY	0	0	.
HCC155	MAJOR HEAD INJURY	965	10,508	0.93
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	-956	8,716	0.91

Coef Name	Label	Coef Value	Std Error	P Value
HCC158	HIP FRACTURE/DISLOCATION	731	8,867	0.93
HCC161	TRAUMATIC AMPUTATION	-21,986	16,454	0.18
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	-4,940	4,150	0.23
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-4,157	27,206	0.88
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-6,557	9,787	0.50
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	3,173	6,623	0.63
Age_Lt_35		-7,285	4,283	0.09
Age_Lt_45		-4,238	3,092	0.17
Age_Lt_55		-4,152	2,724	0.13
Age_Lt_60		-2,928	3,163	0.35
Age_Lt_65		-2,012	3,243	0.54
Age_Lt_75		1,917	2,592	0.46
Age_Lt_80		698	2,796	0.80
Age_Lt_85		4,605	3,023	0.13
Age_Lt_90		4,130	3,570	0.25
Age_Lt_95		8,592	4,810	0.07
Age_Gt_94		-3,930	7,700	0.61
ORIGDS		-2,831	2,468	0.25
ESRD		13,598	5,454	0.01
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	10,430	34,193	0.76
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	8,633	18,544	0.64
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	6,623	12,173	0.59
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-3,028	9,387	0.75
D_HCC107	DISABLED, CYSTIC FIBROSIS	0	0	.
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-8,268	9,060	0.36
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	-5,258	5,038	0.30
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	-1,921	20,930	0.93
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	11,288	6,962	0.11
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	926	5,473	0.87
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	-3,555	10,677	0.74

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	220,965	5,716	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	52,899	27,385	0.05
DRG_CD=927	EXTENSIVE BURNS OR FULL THICKNESS BURNS W MV 96+ HRS W SKIN GRAFT	113,516	6,514	0.00
DRG_CD=928	FULL THICKNESS BURN W SKIN GRAFT OR INHAL INJ W CC/MCC	33,866	1,897	0.00
DRG_CD=929	FULL THICKNESS BURN W SKIN GRAFT OR INHAL INJ W/O CC/MCC	4,158	2,494	0.10
DRG_CD=933	EXTENSIVE BURNS OR FULL THICKNESS BURNS W MV 96+ HRS W/O SKIN GRAFT	32,356	21,807	0.14
DRG_CD=934	FULL THICKNESS BURN W/O SKIN GRFT OR INHAL INJ	2,411	2,058	0.24
DRG_CD=935	NON-EXTENSIVE BURNS	0	0	.
LTI_Indicator		-1,968	7,999	0.81

Table 43: Factors Influencing Health Status

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		9,084	674	0.00
HCC1	HIV/AIDS	1,403	980	0.15
HCC2	SEPTICEMIA/SHOCK	1,092	429	0.01
HCC5	OPPORTUNISTIC INFECTIONS	-871	1,228	0.48
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	3,541	290	0.00
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	1,684	458	0.00
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	2,040	443	0.00
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	154	290	0.59
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	470	343	0.17
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	667	337	0.05
HCC17	DIABETES WITH ACUTE COMPLICATIONS	3,744	1,535	0.01
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	266	592	0.65
HCC19	DIABETES WITHOUT COMPLICATION	191	193	0.32
HCC21	PROTEIN-CALORIE MALNUTRITION	1,955	411	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC25	END-STAGE LIVER DISEASE	703	604	0.24
HCC26	CIRRHOSIS OF LIVER	-162	619	0.79
HCC27	CHRONIC HEPATITIS	-1,573	1,002	0.12
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	1,060	462	0.02
HCC32	PANCREATIC DISEASE	415	503	0.41
HCC33	INFLAMMATORY BOWEL DISEASE	1,184	765	0.12
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,184	584	0.04
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	1,073	312	0.00
HCC44	SEVERE HEMATOLOGICAL DISORDERS	556	554	0.32
HCC45	DISORDERS OF IMMUNITY	2,075	573	0.00
HCC51	DRUG/ALCOHOL PSYCHOSIS	31	907	0.97
HCC52	DRUG/ALCOHOL DEPENDENCE	749	836	0.37
HCC54	SCHIZOPHRENIA	2,662	393	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	1,346	248	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	-689	1,142	0.55
HCC68	PARAPLEGIA	836	1,151	0.47
HCC69	SPINAL CORD DISORDERS/INJURIES	1,171	741	0.11
HCC70	MUSCULAR DYSTROPHY	7,236	2,753	0.01
HCC71	POLYNEUROPATHY	86	279	0.76
HCC72	MULTIPLE SCLEROSIS	353	786	0.65
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,999	362	0.00
HCC74	SEIZURE DISORDERS AND CONVULSIONS	905	272	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	2,488	998	0.01
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	3,434	1,053	0.00
HCC78	RESPIRATORY ARREST	497	2,341	0.83
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	529	322	0.10
HCC80	CONGESTIVE HEART FAILURE	140	277	0.61
HCC81	ACUTE MYOCARDIAL INFARCTION	728	648	0.26
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-1,035	509	0.04
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-218	317	0.49

Coef Name	Label	Coef Value	Std Error	P Value
HCC92	SPECIFIED HEART ARRHYTHMIAS	-635	179	0.00
HCC95	CEREBRAL HEMORRHAGE	2,718	773	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	628	339	0.06
HCC100	HEMIPLEGIA/HEMIPARESIS	1,855	442	0.00
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	2,613	1,057	0.01
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	664	378	0.08
HCC105	VASCULAR DISEASE	398	184	0.03
HCC107	CYSTIC FIBROSIS	-6,385	6,732	0.34
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	187	223	0.40
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	1,017	621	0.10
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	353	1,043	0.74
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-341	773	0.66
HCC130	DIALYSIS STATUS	467	620	0.45
HCC131	RENAL FAILURE	568	260	0.03
HCC132	NEPHRITIS	-586	1,739	0.74
HCC148	DECUBITUS ULCER OF SKIN	1,229	429	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	681	395	0.08
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	0	.
HCC154	SEVERE HEAD INJURY	11,677	4,775	0.01
HCC155	MAJOR HEAD INJURY	597	713	0.40
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	1,700	444	0.00
HCC158	HIP FRACTURE/DISLOCATION	2,000	503	0.00
HCC161	TRAUMATIC AMPUTATION	215	1,417	0.88
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	712	344	0.04
HCC174	MAJOR ORGAN TRANSPLANT STATUS	1,699	879	0.05
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	773	581	0.18
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	-172	840	0.84
Age_Lt_35		-2,560	672	0.00
Age_Lt_45		-2,823	481	0.00
Age_Lt_55		-2,034	350	0.00
Age_Lt_60		-1,332	376	0.00
Age_Lt_65		-252	362	0.49

Coef Name	Label	Coef Value	Std Error	P Value
Age_Lt_75		259	269	0.34
Age_Lt_80		1,393	268	0.00
Age_Lt_85		2,485	266	0.00
Age_Lt_90		2,936	279	0.00
Age_Lt_95		3,266	330	0.00
Age_Gt_94		3,824	474	0.00
ORIGDS		730	216	0.00
ESRD		4,929	406	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	4,681	2,131	0.03
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	-1,248	1,145	0.28
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	-1,032	1,347	0.44
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-790	1,067	0.46
D_HCC107	DISABLED, CYSTIC FIBROSIS	0	0	.
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	716	469	0.13
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	774	379	0.04
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	-705	1,066	0.51
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	589	483	0.22
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	439	406	0.28
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	286	511	0.57
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	173,148	11,685	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	108,680	5,238	0.00
DRG_CD=009	BONE MARROW TRANSPLANT	36,124	11,711	0.00
DRG_CD=011	TRACHEOSTOMY FOR FACE,MOUTH & NECK DIAGNOSES W MCC	19,095	11,689	0.10
DRG_CD=939	O.R. PROC W DIAGNOSES OF OTHER CONTACT W HEALTH SERVICES W MCC	24,080	957	0.00
DRG_CD=940	O.R. PROC W DIAGNOSES OF OTHER CONTACT W HEALTH SERVICES W CC	8,698	781	0.00
DRG_CD=941	O.R. PROC W DIAGNOSES OF OTHER CONTACT W HEALTH SERVICES W/O CC/MCC	1,739	806	0.03

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=945	REHABILITATION W CC/MCC	9,300	1,136	0.00
DRG_CD=946	REHABILITATION W/O CC/MCC	4,972	1,496	0.00
DRG_CD=947	SIGNS & SYMPTOMS W MCC	6,851	658	0.00
DRG_CD=948	SIGNS & SYMPTOMS W/O MCC	1,784	642	0.01
DRG_CD=949	AFTERCARE W CC/MCC	1,849	1,111	0.10
DRG_CD=950	AFTERCARE W/O CC/MCC	-3,438	1,311	0.01
DRG_CD=951	OTHER FACTORS INFLUENCING HEALTH STATUS	0	0	.
LTI_Indicator		1,339	275	0.00

Table 44: Multiple Significant Trauma

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		20,694	1,339	0.00
HCC1	HIV/AIDS	-740	8,061	0.93
HCC2	SEPTICEMIA/SHOCK	580	3,838	0.88
HCC5	OPPORTUNISTIC INFECTIONS	9,734	7,019	0.17
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	-533	3,275	0.87
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	2,483	2,963	0.40
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	468	2,437	0.85
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	1,014	1,351	0.45
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,311	2,091	0.53
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	5,850	1,808	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	11,219	9,097	0.22
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	602	3,274	0.85
HCC19	DIABETES WITHOUT COMPLICATION	108	973	0.91
HCC21	PROTEIN-CALORIE MALNUTRITION	1,126	2,549	0.66
HCC25	END-STAGE LIVER DISEASE	-5,951	5,112	0.24
HCC26	CIRRHOSIS OF LIVER	-1,594	4,064	0.69
HCC27	CHRONIC HEPATITIS	-4,146	4,910	0.40
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	41	3,540	0.99
HCC32	PANCREATIC DISEASE	-5,272	3,422	0.12
HCC33	INFLAMMATORY BOWEL DISEASE	-2,812	4,684	0.55
HCC37	BONE/JOINT/MUSCLE	153	3,564	0.97

Coef Name	Label	Coef Value	Std Error	P Value
	INFECTIONS/NECROSIS			
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	878	1,597	0.58
HCC44	SEVERE HEMATOLOGICAL DISORDERS	-211	2,963	0.94
HCC45	DISORDERS OF IMMUNITY	-2,456	4,664	0.60
HCC51	DRUG/ALCOHOL PSYCHOSIS	-5,496	5,568	0.32
HCC52	DRUG/ALCOHOL DEPENDENCE	4,098	4,893	0.40
HCC54	SCHIZOPHRENIA	1,005	2,492	0.69
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	262	1,350	0.85
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	-6,916	9,237	0.45
HCC68	PARAPLEGIA	-10,384	8,259	0.21
HCC69	SPINAL CORD DISORDERS/INJURIES	-696	3,970	0.86
HCC70	MUSCULAR DYSTROPHY	0	0	.
HCC71	POLYNEUROPATHY	-239	1,587	0.88
HCC72	MULTIPLE SCLEROSIS	-880	5,047	0.86
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	2,989	1,838	0.10
HCC74	SEIZURE DISORDERS AND CONVULSIONS	-1,457	1,808	0.42
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	-11,342	12,790	0.38
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	-29,625	18,543	0.11
HCC78	RESPIRATORY ARREST	0	0	.
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	1,204	1,989	0.54
HCC80	CONGESTIVE HEART FAILURE	-518	1,349	0.70
HCC81	ACUTE MYOCARDIAL INFARCTION	-1,897	4,591	0.68
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-4,594	3,489	0.19
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	927	1,828	0.61
HCC92	SPECIFIED HEART ARRHYTHMIAS	1,615	846	0.06
HCC95	CEREBRAL HEMORRHAGE	-633	3,155	0.84
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	2,273	1,798	0.21
HCC100	HEMIPLEGIA/HEMIPARESIS	1,947	3,019	0.52
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	-3,246	8,265	0.69
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	1,932	2,273	0.40

Coef Name	Label	Coef Value	Std Error	P Value
HCC105	VASCULAR DISEASE	292	908	0.75
HCC107	CYSTIC FIBROSIS	0	0	.
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	504	1,042	0.63
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	-2,831	3,642	0.44
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	2,019	6,911	0.77
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-9,402	4,778	0.05
HCC130	DIALYSIS STATUS	2,502	4,349	0.57
HCC131	RENAL FAILURE	247	1,340	0.85
HCC132	NEPHRITIS	-7,888	13,018	0.54
HCC148	DECUBITUS ULCER OF SKIN	-636	2,582	0.81
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	2,138	1,962	0.28
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	0	.
HCC154	SEVERE HEAD INJURY	0	0	.
HCC155	MAJOR HEAD INJURY	-1,546	3,063	0.61
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	-951	1,770	0.59
HCC158	HIP FRACTURE/DISLOCATION	-3,737	1,480	0.01
HCC161	TRAUMATIC AMPUTATION	-774	10,618	0.94
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	3,215	2,412	0.18
HCC174	MAJOR ORGAN TRANSPLANT STATUS	-2,643	12,798	0.84
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-1,537	5,075	0.76
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	-7,607	8,401	0.37
Age_Lt_35		-7,405	2,266	0.00
Age_Lt_45		-5,633	1,950	0.00
Age_Lt_55		-1,964	1,636	0.23
Age_Lt_60		-2,481	1,968	0.21
Age_Lt_65		4,912	1,981	0.01
Age_Lt_75		-327	1,254	0.79
Age_Lt_80		1,423	1,186	0.23
Age_Lt_85		2,167	1,132	0.06
Age_Lt_90		3,295	1,142	0.00
Age_Lt_95		3,194	1,270	0.01
Age_Gt_94		394	1,750	0.82
ORIGDS		910	1,174	0.44
ESRD		4,396	2,601	0.09

Coef Name	Label	Coef Value	Std Error	P Value
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	-18,307	19,897	0.36
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	-4,961	10,091	0.62
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	10,339	7,279	0.16
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-4,270	5,902	0.47
D_HCC107	DISABLED, CYSTIC FIBROSIS	0	0	.
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-3,947	2,998	0.19
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	-2,427	2,199	0.27
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	-1,795	7,353	0.81
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	2,021	3,427	0.56
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	2,148	2,327	0.36
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	-67	2,908	0.98
DRG_CD=955	CRANIOTOMY FOR MULTIPLE SIGNIFICANT TRAUMA	46,801	2,369	0.00
DRG_CD=956	LIMB REATTACHMENT, HIP & FEMUR PROC FOR MULTIPLE SIGNIFICANT TRAUMA	22,171	1,083	0.00
DRG_CD=957	OTHER O.R. PROCEDURES FOR MULTIPLE SIGNIFICANT TRAUMA W MCC	50,890	1,438	0.00
DRG_CD=958	OTHER O.R. PROCEDURES FOR MULTIPLE SIGNIFICANT TRAUMA W CC	25,705	1,414	0.00
DRG_CD=959	OTHER O.R. PROCEDURES FOR MULTIPLE SIGNIFICANT TRAUMA W/O CC/MCC	10,474	2,426	0.00
DRG_CD=963	OTHER MULTIPLE SIGNIFICANT TRAUMA W MCC	18,422	1,339	0.00
DRG_CD=964	OTHER MULTIPLE SIGNIFICANT TRAUMA W CC	4,010	1,155	0.00
DRG_CD=965	OTHER MULTIPLE SIGNIFICANT TRAUMA W/O CC/MCC	0	0	.
LTI_Indicator		-4,751	1,308	0.00

Table 45: Human Immunodeficiency Virus Infection

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		18,705	1,680	0.00
HCC1	HIV/AIDS	-1,611	811	0.05
HCC2	SEPTICEMIA/SHOCK	-1,240	1,344	0.36
HCC5	OPPORTUNISTIC INFECTIONS	8,661	2,676	0.00
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	4,613	2,570	0.07
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	-306	2,644	0.91
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	922	1,346	0.49
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-93	1,800	0.96
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	2,196	2,477	0.38
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	2,841	2,176	0.19
HCC17	DIABETES WITH ACUTE COMPLICATIONS	1,286	9,230	0.89
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	1,243	3,737	0.74
HCC19	DIABETES WITHOUT COMPLICATION	1,408	1,112	0.21
HCC21	PROTEIN-CALORIE MALNUTRITION	1,794	1,058	0.09
HCC25	END-STAGE LIVER DISEASE	6,589	2,470	0.01
HCC26	CIRRHOSIS OF LIVER	-1,478	2,302	0.52
HCC27	CHRONIC HEPATITIS	1,349	1,143	0.24
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	9,397	1,957	0.00
HCC32	PANCREATIC DISEASE	303	1,657	0.86
HCC33	INFLAMMATORY BOWEL DISEASE	636	3,247	0.84
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	3,519	2,033	0.08
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	3,252	2,298	0.16
HCC44	SEVERE HEMATOLOGICAL DISORDERS	2,756	3,225	0.39
HCC45	DISORDERS OF IMMUNITY	2,833	1,308	0.03
HCC51	DRUG/ALCOHOL PSYCHOSIS	-3,060	10,364	0.77
HCC52	DRUG/ALCOHOL DEPENDENCE	-2,611	4,702	0.58
HCC54	SCHIZOPHRENIA	4,372	1,542	0.00
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	3,430	959	0.00
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	8,099	5,870	0.17

Coef Name	Label	Coef Value	Std Error	P Value
HCC68	PARAPLEGIA	3,520	4,015	0.38
HCC69	SPINAL CORD DISORDERS/INJURIES	6,183	3,697	0.09
HCC70	MUSCULAR DYSTROPHY	21,145	20,524	0.30
HCC71	POLYNEUROPATHY	-255	1,037	0.81
HCC72	MULTIPLE SCLEROSIS	-7,936	6,513	0.22
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	-3,052	5,414	0.57
HCC74	SEIZURE DISORDERS AND CONVULSIONS	3,407	1,111	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	2,915	3,535	0.41
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	3,463	3,589	0.33
HCC78	RESPIRATORY ARREST	-5,238	14,769	0.72
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	29	1,328	0.98
HCC80	CONGESTIVE HEART FAILURE	-1,802	1,594	0.26
HCC81	ACUTE MYOCARDIAL INFARCTION	4,168	3,473	0.23
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-229	2,579	0.93
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-1,810	1,954	0.35
HCC92	SPECIFIED HEART ARRHYTHMIAS	721	1,701	0.67
HCC95	CEREBRAL HEMORRHAGE	10,131	4,471	0.02
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	6,759	2,193	0.00
HCC100	HEMIPLEGIA/HEMIPARESIS	3,454	2,723	0.20
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	-266	5,102	0.96
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	-1,120	2,178	0.61
HCC105	VASCULAR DISEASE	-694	1,226	0.57
HCC107	CYSTIC FIBROSIS	-2,900	22,438	0.90
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	-267	977	0.78
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	1,271	1,963	0.52
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	74	3,207	0.98
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-3,474	5,481	0.53
HCC130	DIALYSIS STATUS	3,313	1,984	0.10
HCC131	RENAL FAILURE	404	1,060	0.70
HCC132	NEPHRITIS	-1,934	5,168	0.71

Coef Name	Label	Coef Value	Std Error	P Value
HCC148	DECUBITUS ULCER OF SKIN	8,707	2,147	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	-568	2,231	0.80
HCC150	EXTENSIVE THIRD-DEGREE BURNS	0	0	.
HCC154	SEVERE HEAD INJURY	0	0	.
HCC155	MAJOR HEAD INJURY	-1,501	3,904	0.70
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	-8,907	4,309	0.04
HCC158	HIP FRACTURE/DISLOCATION	8,652	3,385	0.01
HCC161	TRAUMATIC AMPUTATION	7,421	9,503	0.43
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	3,531	1,518	0.02
HCC174	MAJOR ORGAN TRANSPLANT STATUS	6,080	5,547	0.27
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-2,878	2,658	0.28
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	11,267	5,638	0.05
Age_Lt_35		-6,902	1,790	0.00
Age_Lt_45		-6,133	1,614	0.00
Age_Lt_55		-5,125	1,560	0.00
Age_Lt_60		-4,987	1,716	0.00
Age_Lt_65		-3,119	1,904	0.10
Age_Lt_75		502	2,146	0.82
Age_Lt_80		-613	3,179	0.85
Age_Lt_85		-5,933	5,387	0.27
Age_Lt_90		-5,810	7,969	0.47
Age_Lt_95		-15,811	20,384	0.44
Age_Gt_94		0	0	.
ORIGDS		-2,528	1,623	0.12
ESRD		1,185	1,366	0.39
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	-7,754	2,848	0.01
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	2,814	3,417	0.41
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	4,585	10,597	0.67
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	337	4,904	0.95
D_HCC107	DISABLED, CYSTIC FIBROSIS	0	0	.
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	-944	3,274	0.77
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	1,517	2,062	0.46
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY	9,888	7,458	0.18

Coef Name	Label	Coef Value	Std Error	P Value
RF_CHF_DM	DISEASE *CEBROVASCULAR DISEASE*CORONARY DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	913	2,980	0.76
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	2,917	2,678	0.28
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	3,428	2,307	0.14
DRG_CD=003	ECMO OR TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	202,625	11,773	0.00
DRG_CD=004	TRACH W MV 96+ HRS OR PDX EXC FACE, MOUTH & NECK W/O MAJ O.R.	126,298	7,328	0.00
DRG_CD=005	LIVER TRANSPLANT W MCC OR INTESTINAL TRANSPLANT	95,052	14,679	0.00
DRG_CD=009	BONE MARROW TRANSPLANT	21,595	14,470	0.14
DRG_CD=969	HIV W EXTENSIVE O.R. PROCEDURE W MCC	44,191	1,710	0.00
DRG_CD=970	HIV W EXTENSIVE O.R. PROCEDURE W/O MCC	15,946	3,677	0.00
DRG_CD=974	HIV W MAJOR RELATED CONDITION W MCC	16,326	801	0.00
DRG_CD=975	HIV W MAJOR RELATED CONDITION W CC	2,571	830	0.00
DRG_CD=976	HIV W MAJOR RELATED CONDITION W/O CC/MCC	-3,337	1,063	0.00
DRG_CD=977	HIV W OR W/O OTHER RELATED CONDITION	0	0	.
LTI_Indicator		9,143	1,641	0.00

Table 46: Ungroupable

Coef Name	Label	Coef Value	Std Error	P Value
Intercept		10,406	615	0.00
HCC1	HIV/AIDS	-2,217	2,083	0.29
HCC2	SEPTICEMIA/SHOCK	535	729	0.46
HCC5	OPPORTUNISTIC INFECTIONS	-2,253	2,081	0.28
HCC7	METASTATIC CANCER AND ACUTE LEUKEMIA	1,685	800	0.04
HCC8	LUNG, UPPER DIGESTIVE TRACT, AND OTHER SEVERE CANCERS	-517	867	0.55
HCC9	LYMPHATIC, HEAD AND NECK, BRAIN, AND OTHER MAJOR CANCERS	92	803	0.91
HCC10	BREAST, PROSTATE, COLORECTAL AND OTHER CANCERS AND TUMORS	-1,258	477	0.01

Coef Name	Label	Coef Value	Std Error	P Value
HCC15	DIABETES WITH RENAL OR PERIPHERAL CIRCULATORY MANIFESTATION	1,127	578	0.05
HCC16	DIABETES WITH NEUROLOGIC OR OTHER SPECIFIED MANIFESTATION	2,381	590	0.00
HCC17	DIABETES WITH ACUTE COMPLICATIONS	2,605	2,919	0.37
HCC18	DIABETES WITH OPHTHALMOLOGIC OR UNSPECIFIED MANIFESTATION	956	1,023	0.35
HCC19	DIABETES WITHOUT COMPLICATION	244	369	0.51
HCC21	PROTEIN-CALORIE MALNUTRITION	4,816	749	0.00
HCC25	END-STAGE LIVER DISEASE	-1,859	1,421	0.19
HCC26	CIRRHOSIS OF LIVER	-1,683	1,509	0.26
HCC27	CHRONIC HEPATITIS	725	2,023	0.72
HCC31	INTESTINAL OBSTRUCTION/PERFORATION	974	811	0.23
HCC32	PANCREATIC DISEASE	-698	935	0.46
HCC33	INFLAMMATORY BOWEL DISEASE	2,160	1,368	0.11
HCC37	BONE/JOINT/MUSCLE INFECTIONS/NECROSIS	1,954	724	0.01
HCC38	RHEUMATOID ARTHRITIS AND INFLAMMATORY CONNECTIVE TISSUE DISEASE	1,090	612	0.08
HCC44	SEVERE HEMATOLOGICAL DISORDERS	2,581	1,081	0.02
HCC45	DISORDERS OF IMMUNITY	-474	1,208	0.69
HCC51	DRUG/ALCOHOL PSYCHOSIS	29	2,182	0.99
HCC52	DRUG/ALCOHOL DEPENDENCE	-85	1,876	0.96
HCC54	SCHIZOPHRENIA	1,212	1,154	0.29
HCC55	MAJOR DEPRESSIVE, BIPOLAR, AND PARANOID DISORDERS	643	593	0.28
HCC67	QUADRIPLEGIA, OTHER EXTENSIVE PARALYSIS	-623	1,682	0.71
HCC68	PARAPLEGIA	5,283	1,348	0.00
HCC69	SPINAL CORD DISORDERS/INJURIES	3,194	1,642	0.05
HCC70	MUSCULAR DYSTROPHY	-844	4,599	0.85
HCC71	POLYNEUROPATHY	951	517	0.07
HCC72	MULTIPLE SCLEROSIS	1,797	1,528	0.24
HCC73	PARKINSONS AND HUNTINGTONS DISEASES	1,584	1,004	0.11
HCC74	SEIZURE DISORDERS AND CONVULSIONS	3,558	723	0.00
HCC75	COMA, BRAIN COMPRESSION/ANOXIC DAMAGE	2,618	2,242	0.24
HCC77	RESPIRATOR DEPENDENCE/TRACHEOSTOMY STATUS	5,616	1,518	0.00

Coef Name	Label	Coef Value	Std Error	P Value
HCC78	RESPIRATORY ARREST	7,023	4,004	0.08
HCC79	CARDIO-RESPIRATORY FAILURE AND SHOCK	916	558	0.10
HCC80	CONGESTIVE HEART FAILURE	103	539	0.85
HCC81	ACUTE MYOCARDIAL INFARCTION	-1,307	1,048	0.21
HCC82	UNSTABLE ANGINA AND OTHER ACUTE ISCHEMIC HEART DISEASE	-264	888	0.77
HCC83	ANGINA PECTORIS/OLD MYOCARDIAL INFARCTION	-1,349	576	0.02
HCC92	SPECIFIED HEART ARRHYTHMIAS	7	341	0.98
HCC95	CEREBRAL HEMORRHAGE	5,865	2,000	0.00
HCC96	ISCHEMIC OR UNSPECIFIED STROKE	949	809	0.24
HCC100	HEMIPLEGIA/HEMIPARESIS	2,123	1,085	0.05
HCC101	CEREBRAL PALSY AND OTHER PARALYTIC SYNDROMES	1,249	2,599	0.63
HCC104	VASCULAR DISEASE WITH COMPLICATIONS	2,521	623	0.00
HCC105	VASCULAR DISEASE	561	356	0.12
HCC107	CYSTIC FIBROSIS	-634	14,518	0.97
HCC108	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	427	410	0.30
HCC111	ASPIRATION AND SPECIFIED BACTERIAL PNEUMONIAS	1,864	1,059	0.08
HCC112	PNEUMOCOCCAL PNEUMONIA, EMPHYSEMA, LUNG ABSCESS	1,325	1,869	0.48
HCC119	PROLIFERATIVE DIABETIC RETINOPATHY AND VITREOUS HEMORRHAGE	-750	1,123	0.50
HCC130	DIALYSIS STATUS	792	940	0.40
HCC131	RENAL FAILURE	-123	464	0.79
HCC132	NEPHRITIS	-2,139	2,526	0.40
HCC148	DECUBITUS ULCER OF SKIN	2,757	652	0.00
HCC149	CHRONIC ULCER OF SKIN, EXCEPT DECUBITUS	2,681	604	0.00
HCC150	EXTENSIVE THIRD-DEGREE BURNS	-3,673	14,534	0.80
HCC154	SEVERE HEAD INJURY	-13,200	10,338	0.20
HCC155	MAJOR HEAD INJURY	-2,860	1,887	0.13
HCC157	VERTEBRAL FRACTURES WITHOUT SPINAL CORD INJURY	-864	856	0.31
HCC158	HIP FRACTURE/DISLOCATION	3,381	1,068	0.00
HCC161	TRAUMATIC AMPUTATION	3,700	1,928	0.05
HCC164	MAJOR COMPLICATIONS OF MEDICAL CARE AND TRAUMA	10	544	0.98
HCC174	MAJOR ORGAN TRANSPLANT STATUS	5,276	1,609	0.00

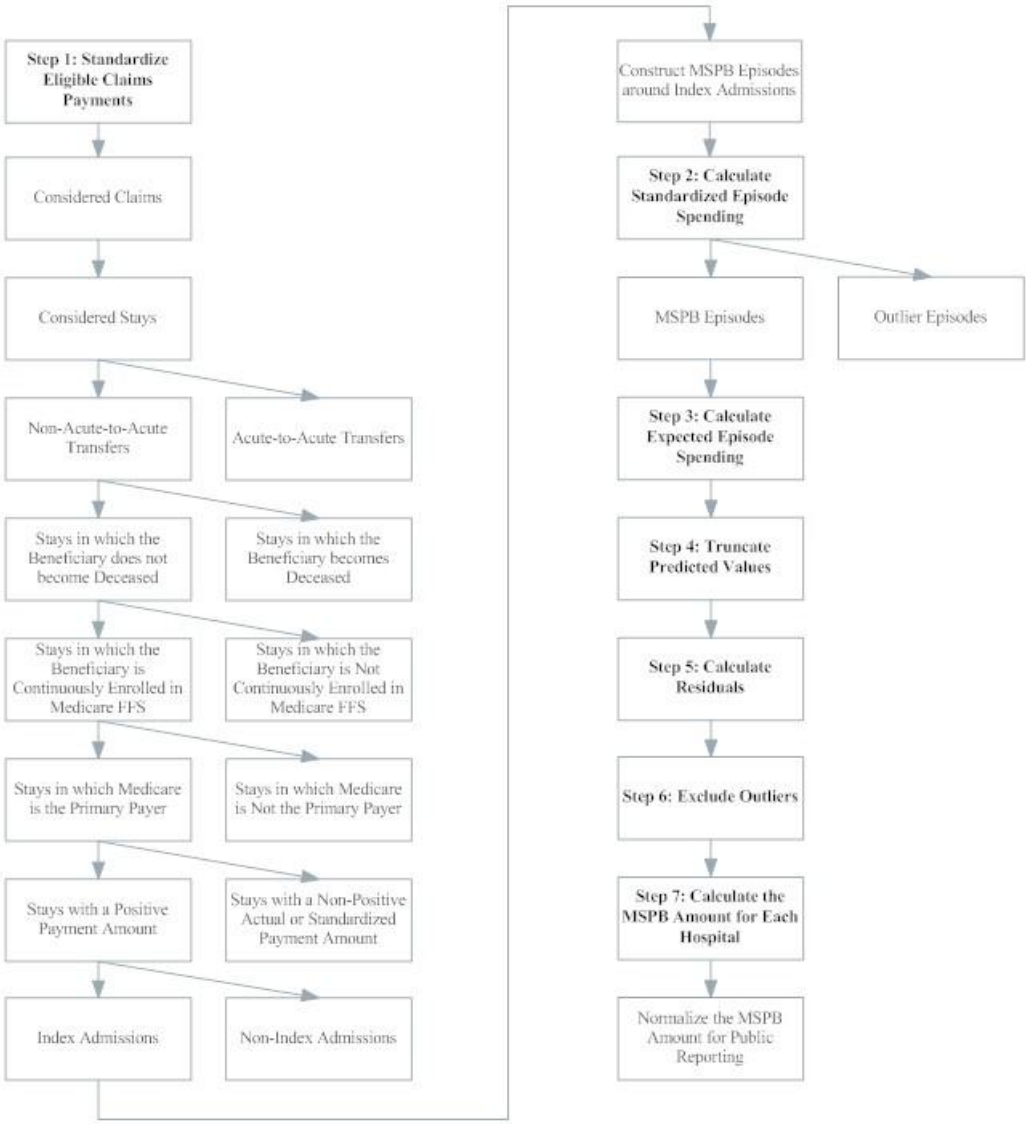
Coef Name	Label	Coef Value	Std Error	P Value
HCC176	ARTIFICIAL OPENINGS FOR FEEDING OR ELIMINATION	-588	908	0.52
HCC177	AMPUTATION STATUS, LOWER LIMB/AMPUTATION COMPLICATIONS	905	1,122	0.42
Age_Lt_35		471	1,146	0.68
Age_Lt_45		-2,004	850	0.02
Age_Lt_55		-2,997	634	0.00
Age_Lt_60		-301	693	0.66
Age_Lt_65		-295	645	0.65
Age_Lt_75		106	459	0.82
Age_Lt_80		1,176	463	0.01
Age_Lt_85		1,564	475	0.00
Age_Lt_90		2,255	524	0.00
Age_Lt_95		2,327	708	0.00
Age_Gt_94		1,665	1,281	0.19
ORIGDS		513	414	0.21
ESRD		2,661	605	0.00
D_HCC5	DISABLED, OPPORTUNISTISTIC INFECTIONS	10,546	3,663	0.00
D_HCC44	DISABLED, SEVERE HEMATOLOGICAL DISORDERS	23,234	2,108	0.00
D_HCC51	DISABLED, DRUG/ALCOHOL PSYCHOSIS	291	3,252	0.93
D_HCC52	DISABLED, DRUG/ALCOHOL DEPENDENCE	-2,185	2,520	0.39
D_HCC107	DISABLED, CYSTIC FIBROSIS	-3,891	15,051	0.80
DM_CVD	DIABETES MELLITUS * CEREBROVASCULAR DISEASE	1,159	1,056	0.27
CHF_COPD	CONGESTIVE HEART FAILURE*CHRONIC OBSRUCTIVE PULMONARY DISEASE	572	677	0.40
COPD_CVD_CAD	CHRONIC OBSRUCTIVE PULMONARY DISEASE *CEBROVASCULAR DISEASE*CORONARY	4,543	2,330	0.05
RF_CHF_DM	DIABETES MELLITUS * CONGESTIVE HEART* RENAL FAILURE	597	846	0.48
DM_CHF	DIABETES MELLITUS * CONGESTIVE HEART FAILURE	151	743	0.84
RF_CHF	RENAL FAILURE* CONGESTIVE HEART FAILURE	798	930	0.39
DRG_CD=981	EXTENSIVE O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W MCC	36,158	573	0.00
DRG_CD=982	EXTENSIVE O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W CC	17,296	573	0.00

Coef Name	Label	Coef Value	Std Error	P Value
DRG_CD=983	EXTENSIVE O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W/O CC/MCC	5,472	674	0.00
DRG_CD=984	PROSTATIC O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W MCC	22,537	1,558	0.00
DRG_CD=985	PROSTATIC O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W CC	9,810	1,306	0.00
DRG_CD=986	PROSTATIC O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W/O CC/MCC	281	1,594	0.86
DRG_CD=987	NON-EXTENSIVE O.R. PROC UNRELATED TO PRINCIPAL DIAGNOSIS W MCC	23,865	651	0.00
DRG_CD=988	NON-EXTENSIVE O.R. PROC UNRELATED TO PRINCIPAL DIAGNOSIS W CC	9,546	613	0.00
DRG_CD=989	NON-EXTENSIVE O.R. PROC UNRELATED TO PRINCIPAL DIAGNOSIS W/O CC/MCC	0	0	.
LTI_Indicator		2,183	624	0.00

S_7_2_Construction_Logic

The diagram below summarizes the identification of MSPB index admissions from the discussed included and excluded populations, the construction of MSPB episodes around the index admissions, and the seven-step measure construction logic discussed in S.7.2. A detailed description of the MSPB Measure methodology titled "MSPB Measure Information Form" is publicly available at the following URL: http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1228772057350.

Although measure information form at the link above was developed for the initial implementation of the MSPB measure for Medicare Inpatient Prospective Payment System (IPPS) hospital public reporting and incentive payment programs, one can readily extend this measure to other hospitals and beneficiaries who were not included in initial specifications. For instance, the measure specifications described in the URL above state that railroad retirement board (RRB) beneficiaries and certain hospitals not paid through the IPPS system (e.g., hospitals in Maryland) are excluded from the measure; however, the MSPB Measure can be readily expanded to include RRB beneficiaries as well as hospitals paid under different payment systems, such as Maryland hospitals. RRB beneficiaries can be incorporated with no changes to the methodology, Maryland hospitals and other IPPS-exempt hospitals can be incorporated into the MSPB measure methodology by applying an IPPS-style price standardization approach to discharges from those hospital types. Supporting analyses for inclusion of these beneficiaries and hospital types are included in 1.7.



Return to Measure Evaluation

Hospital-Specific Report

February 2012

Medicare Spending Per Beneficiary Measure

HEARTCARE REGIONAL MEDICAL CENTER
Provider ID: 999999
State

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TABLE OF CONTENTS

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1 BACKGROUND

This report provides information on your hospital's performance on the Medicare Spending Per Beneficiary (MSPB) Measure that CMS intends to make public on the *Hospital Compare* website. CMS expects to include this measure in future years of the Hospital Value-Based Purchasing (VBP) program. The Hospital VBP program is designed to improve the efficiency and quality of care by providing financial incentives to hospitals based on their performance on selected quality measures. As part of the Hospital VBP Program, the MSPB Measure assesses Medicare Part A and Part B payments for services provided to a Medicare beneficiary during a spending per beneficiary episode that spans from three days prior to an inpatient admission to 30 days after discharge. The payments included in this measure are price-standardized and risk-adjusted to remove sources of variation not directly related to hospitals' decisions to utilize care. Detailed measure specifications, including exclusions, the payment standardization methodology, and an MSPB Measure calculation example, can be found at: http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1228772053996.

How to Use This Report

You can use this hospital-specific report (HSR) to assess your hospital's performance on the MSPB Measure for the period of May 15, 2010 through February 14, 2011. To determine how your hospital performed, *Section 2: Results* provides an overview of your hospital's performance on the MSPB Measure and a summary of how hospitals in your State and in the Nation performed. Your hospital's MSPB Measure, which is the ratio your hospital's price-standardized, risk-adjusted MSPB amount to the median MSPB amount across all hospitals, will be reported on the *Hospital Compare* website. *Section 2: Results* also presents additional statistics regarding your hospital's performance on the MSPB Measure and a comparison of your performance to other hospitals in your State and across the Nation. This section also includes your hospital's MSPB spending breakdowns by claim type and by Major Diagnostic Category (MDC).

Separate from this report, your hospital will also receive three supplementary hospital-specific data files (an index admission file, a beneficiary risk score file, and an MSPB episode file) related to your MSPB Measure. These files will allow your hospital to validate the calculation of your MSPB Measure. Your hospital will receive these files in CSV (Comma Separated Values) format (sometimes referred to as Comma Delimited format) through *QualityNet*, at the same time your hospital receives this report. This data has been formatted in such a way as to enable you to easily review the hospital-specific data that CMS used to calculate your MSPB Measure.

Additional Resources

- For more information about the MSPB Measure, including measure methodologies and frequently asked questions, visit the Hospital VBP webpage on QualityNet: http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1228772053996 or the FY 2012 IPPS/LTCH Final Rule: http://www.gpo.gov/fdsys/pkg/FR-2011-08-18/pdf/2011-19719.pdf

- If you have questions or concerns about your HSR or your MSPB Measure results, please submit them to: cmsmspbmeasure@acumenllc.com

- For more information on the HVBP Program and other CMS hospital quality initiatives, see: http://www.cms.hhs.gov/HospitalQualityInits/

2 RESULTS

This section presents your hospital's performance on the MSPB Measure for the period of May 15, 2010 through February 14, 2011, as well as additional measure statistics. Your hospital's performance on this measure will be reported on *Hospital Compare*. The tables in this report summarize your hospital's MSPB performance and present detailed measure statistics for your hospital, hospitals in your State, and hospitals across the U.S. All the results presented in this hospital-specific report are price-standardized to remove local and regional price differences which are not directly related to hospitals' decisions to utilize care. More information about the standardization approach can be found at: http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1228772057350. Your hospital's individual MSPB Measure is not combined with the MSPB Measure from any other hospital; however, if your hospital is located in a State or territory with fewer than 10 hospitals, your State's results in this report are combined with other small or nearby States or territories to protect confidentiality. Specifically, results are combined as follows: (1) the District of Columbia and Delaware are combined; (2) Alaska is combined with Washington; (3) North Dakota is grouped with South Dakota; and (4) Vermont is combined with New Hampshire. Although State results are provided in this report for your information, only your MSPB Measure will be displayed on *Hospital Compare*.

Your Hospital's Results

Table 1 displays your hospital's MSPB Measure performance during the period of May 15, 2010 through February 14, 2011. A hospital's MSPB Measure is calculated as the ratio of the standardized, risk-adjusted MSPB Amount for each hospital to the median MSPB Amount across all hospitals. The MSPB Amount is defined as the average spending level for a hospital divided by the average expected spending level for that hospital, multiplied by the average spending over all episodes across all hospitals. As a result, an MSPB Measure ratio of greater than one indicates that your hospital's MSPB Amount is more expensive than the national median spending amount. An MSPB Measure ratio of less than one indicates that your hospital's MSPB Amount is less expensive than the national median spending amount. Additional information detailing the MSPB Measure calculation can be found in the Measure Information Form for the MSPB Measure at: http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1228772057350.

Table 1: MSPB Measure for
HEARTCARE REGIONAL MEDICAL CENTER

Your Hospital's MSPB Measure*
1.08

*This information will be posted on *Hospital Compare* for hospitals with 10 or more eligible admissions.

Table 2 displays your hospital's MSPB Amount during the period from May 15, 2010 through February 14, 2011 and summarizes your hospital's MSPB performance relative to other hospitals in your State and in the entire Nation.

Table 2: Additional Information About Your Hospital's MSPB Performance*
HEARTCARE REGIONAL MEDICAL CENTER

Number of Eligible Admissions at Your Hospital	Your Hospital's MSPB Amount	State Average MSPB Amount	U.S. National Average MSPB Amount
21	19,546.53	18,900.02	17,683.47

*This information will not be posted on *Hospital Compare.*

Detailed Medicare Spending Per Beneficiary Measure Statistics

To supplement the summary information above, this section provides a more detailed breakdown of the MSPB Measure. Table 3 presents the major components used to calculate your hospital's MSPB Measure. The first column lists five statistics. The first two—the number of eligible admissions and average spending per episode—are self-explanatory. The MSPB Amount describes what your hospital's average spending is after controlling for your patients' health status and regional variation in Medicare payments. The Average MSPB Measure, calculated in the fifth row, is the MSPB Amount divided by the U.S. National Median MSPB Amount in the fourth row. The information provided in Table 3 allows your hospital to follow the calculation of its MSPB Measure and compare its values to those calculated at the State and national levels. Columns 2, 3 and 4 display these statistics for your hospital, your State, and the entire U.S., respectively. Table 4 displays national distribution of the MSPB Measure across all hospitals in the Nation and Figure 1 presents this same information in a histogram.

Table 3: Detailed MSPB Statistics*
HEARTCARE REGIONAL MEDICAL CENTER

	Your Hospital	State	U.S.
Number of Eligible Admissions	21	64,000	4,482,704
Average Spending per Episode	16,215.81	15,502.55	18,736.44
MSPB Amount (Avg. Risk-Adjusted Spending)	19,546.53	18,900.02	17,683.47
U.S. National Median MSPB Amount	18,017.19	18,017.19	18,017.19
Average MSPB Measure	1.08	1.05	0.98

*This information will not be posted on *Hospital Compare*.

Figure 1: National Distribution of the MSPB Measure

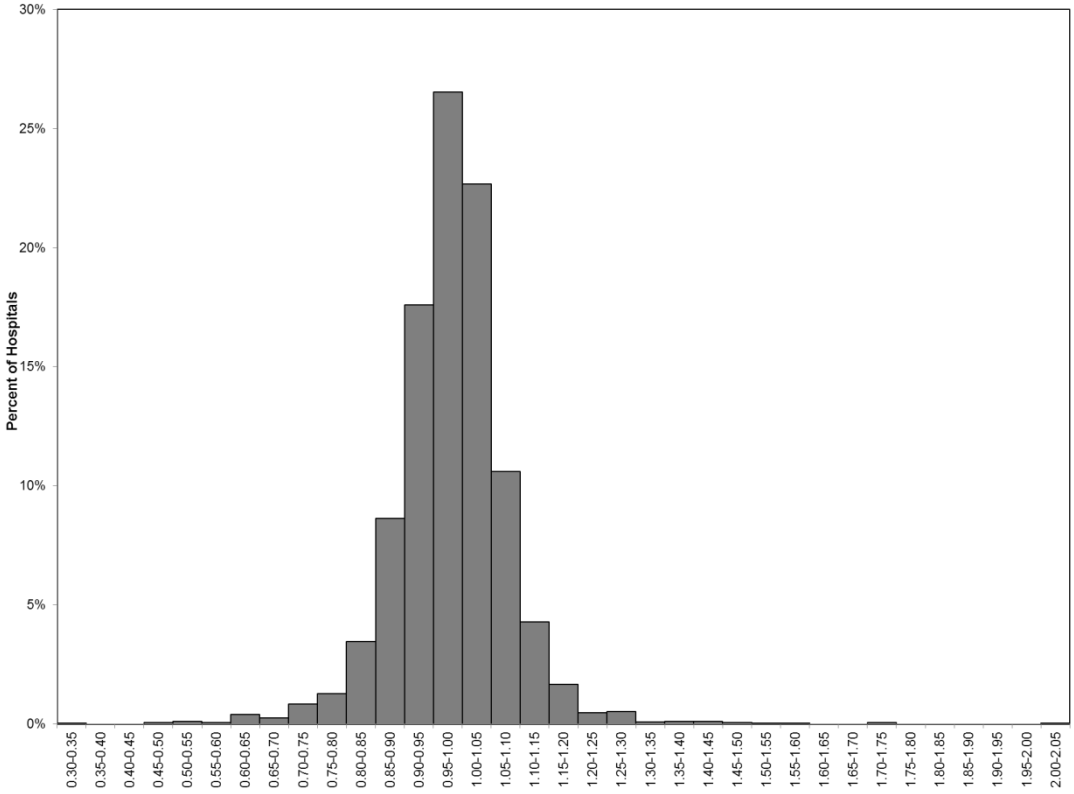

Table 4: National Distribution of the MSPB Measure, Percentiles

Percentile	MSPB Value
5	0.83
10	0.87
25	0.93
50	0.98
75	1.03
90	1.08
95	1.12

The MSPB spending per beneficiary episode is defined as all claims whose discharge date falls between 3 days prior to an inpatient PPS hospital admission (index admission) through 30 days post hospital discharge. Only discharges occurring between May 15, 2010 and January 15, 2011 are included in the measure calculation. Table 5 breaks down your hospital's MSPB spending into three categories: 3 days prior to index admission, during-index admission, and 30 days after hospital discharge. The "3 Days Prior to Index Admission" category includes all claims that begin during the 3 days prior to an index admission. The "During-Index Admission" category includes all claims that fall between the episode's index admission date and discharge

date. The "30 Days After Hospital Discharge" category includes all Medicare Parts A and B claims for services furnished from the index hospitalization discharge, up to and including 30 days post-discharge. Within these three categories, spending levels are broken down by claim type. For comparison, the table also presents State and National values for these categories.

Table 5: Detailed MSPB Spending Breakdowns by Claim Type*, [1]
HEARTCARE REGIONAL MEDICAL CENTER

		Your Hospital		State	Nation
	Claim Type	**Spending per Episode**	**Percent of Spending**	**Percent of Spending**	**Percent of Spending**
3 Days Prior to Index Admission	*Total Pre-Index*	*323*	*1.99%*	*1.0%*	*1.2%*
	Home Health Agency	0	0.00%	0.2%	0.1%
	Hospice	50	0.31%	0.0%	0.0%
	Inpatient	0	0.00%	0.0%	0.0%
	Outpatient	23	0.14%	0.2%	0.2%
	Skilled Nursing Facility	0	0.00%	0.1%	0.0%
	Durable Medical Equipment	0	0.00%	0.0%	0.1%
	Carrier	250	1.54%	0.5%	0.8%
During-Index Admission	*Total During-Index*	*6,687*	*41.23%*	*70.2%*	*67.8%*
	Home Health Agency	47	0.29%	3.1%	0.1%
	Hospice	75	0.46%	4.9%	0.1%
	Inpatient	5,262	32.45%	47%	50.8%
	Outpatient	0	0.00%	0.1%	0.2%
	Skilled Nursing Facility	340	2.10%	10%	6.4%
	Durable Medical Equipment	76	0.47%	0.1%	0.1%
	Carrier	887	5.47%	5.0%	10.0%
30 Days After Hospital Discharge	*Total Post-Index*	*9,206*	*56.77%*	*28.8%*	*31.0%*
	Home Health Agency	1,248	7.70%	3.5%	3.8%
	Hospice	230	1.42%	0.9%	0.5%
	Inpatient	4,000	24.67%	12%	9.0%
	Outpatient	12	0.07%	0.0%	3.0%
	Skilled Nursing Facility	3,255	20.07%	6%	8.9%
	Durable Medical Equipment	61	0.38%	0.5%	0.6%
	Carrier	400	2.47%	5.9%	5.2%

*This information will not be posted on *Hospital Compare*.

[1] Percentages reported in this table may not add up to 100% due to rounding.

When comparing hospitals across the country on a measure of spending, it is important to remove sources of variation which are not directly related to hospitals' decisions to utilize care. For example, the cost of MSPB episodes can vary across hospitals due to differences in patient age or severity of illness. Risk adjustment accounts for such variation across hospitals by adjusting for observable patient factors over which hospitals have no control (i.e., prior to the hospital admission). Table 6 presents average spending and average expected spending (based on beneficiary age and health status) breakdowns by Major Diagnostic Category (MDC). Average Expected Spending per Episode values in Table 6 are calculated as the predicted values from a risk adjustment model that measures the relationship between episode spending and beneficiary age and severity of illness. Episodes in the Pre-MDC category are included in the other MDC categories based on the principal diagnosis on the episode's index stay. More information on the MSPB risk adjustment methodology and the price standardization approach can be found at: http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1228772057350.

Columns A and B display your hospital's average spending per episode and average expected spending per episode by MDC. Columns C and D display these values for your State, while columns E and F display these values for the Nation. This chart can help you identify how your case mix compares to your State and the Nation. For instance, if the value in Column B is higher than Column F in any row, your patients have higher expected spending levels (based on their age and observable severity of illness) than the Nation at large for that particular MDC. If Column F is larger than Column B, on the other hand, then your patients have lower expected spending levels than patients in the Nation at large.

Table 6: Detailed MSPB Spending Breakdowns by MDC*
HEARTCARE REGIONAL MEDICAL CENTER

MDC	Description	Your Hospital		State		National	
		(A) Average Spending per Episode	(B) Average Expected Spending per Episode	(C) Average Spending per Episode	(D) Average Expected Spending per Episode	(E) Average Spending per Episode	(F) Average Expected Spending per Episode
1	Nervous System	35,250	20,074	21,342	20,324	19,407	19,860
2	Eye	--	--	11,502	12,234	11,922	12,266
3	Ear, Nose, Mouth, and Throat	--	--	11,234	12,342	12,458	12,892

MDC	Description	Your Hospital		State		National	
		(A) Average Spending per Episode	(B) Average Expected Spending per Episode	(C) Average Spending per Episode	(D) Average Expected Spending per Episode	(E) Average Spending per Episode	(F) Average Expected Spending per Episode
4	Respiratory System	14,585	16,444	16,324	15,565	16,562	17,059
5	Circulatory System	19,053	17,422	16,533	17,200	18,210	18,737
6	Digestive System	6,605	11,700	8,000	9,200	15,923	16,430
7	Hepatobiliary System and Pancreas	--	--	22,000	21,499	17,282	17,836
8	Musculoskeletal System and Connective Tissue	23,685	15,455	22,891	18,900	24,880	25,259
9	Skin, Subcutaneous Tissue, and Breast	--	--	14,234	11,274	14,991	15,420
10	Endocrine, Nutritional, and Metabolic System	6,305	11,650	15,923	16,348	14,725	15,165
11	Kidney and Urinary Tract	8,601	10,917	6,685	7,436	17,013	17,467
12	Male Reproductive System	--	--	10,934	15,678	10,818	11,156
13	Female Reproductive System	--	--	11,112	13,765	11,682	12,055
14	Pregnancy, Childbirth, and Puerperium	--	--	--	--	6,920	7,131
15	Newborn and Other Neonates (Perinatal Period)	--	--	--	--	--	--
16	Blood and Blood Forming Organs and Immunological Disorders	--	--	14,346	15,734	14,959	15,546
17	Myeloproliferative DDs (Poorly Differentiated Neoplasms)	--	--	29,456	26,235	27,969	28,900
18	Infectious and Parasitic DDs	--	--	27,234	25,742	26,490	27,177
19	Mental Diseases and Disorders	--	--	15,672	13,453	12,546	12,905

MDC	Description	Your Hospital		State		National	
		(A) Average Spending per Episode	(B) Average Expected Spending per Episode	(C) Average Spending per Episode	(D) Average Expected Spending per Episode	(E) Average Spending per Episode	(F) Average Expected Spending per Episode
20	Alcohol/Drug Use or Induced Mental Disorders	--	--	11,235	10,800	10,400	10,739
21	Injuries, Poison, and Toxic Effect of Drugs	--	--	17,323	17,000	15,871	16,429
22	Burns	--	--	29,876	30,102	27,348	28,836
23	Factors Influencing Health Status	--	--	15,000	16,234	15,132	15,559
24	Multiple Significant Trauma	--	--	41,200	40,123	40,401	41,081
25	Human Immunodeficiency Virus Infection	--	--	25,565	24,234	22,638	23,533
U	"Ungroupable" episodes that could not be assigned to one of the existing MDCs.	--	--	24,500	21,345	33,387	34,142

*This information will not be posted on *Hospital Compare*.

Return to Measure Evaluation

S_5_2_DataSourceReference

CMS Office of Information Systems (OIS) maintains a detailed Medicare Claims Processing Manual available at the following URL: http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Internet-Only-Manuals-IOMs-Items/CMS018912.html

#2165 Payment-Standardized Total Per Capita Cost Measure for Medicare Fee-for-Service (FFS) Beneficiaries, Date Submitted: Jan 31, 2013

Resource Use Measure Evaluation Form Version 2.0

This form contains the information submitted by measure developers/stewards, organized according to NQF's measure evaluation criteria and process. For more information about Resource Use Measures and the Resource Use measure evaluation criteria, please visit the Cost & Resource Use Project Page.

Developer submission items are indicated by Blue Text
Questions to be answered by the Steering Committee about the criteria are indicated by Red Text

NQF Generic Rating Scale (for use unless otherwise indicated)
High - Based on the information submitted, there is high confidence (or certainty) that the criterion is met
Moderate - Based on the information submitted, there is moderate confidence (or certainty) that the criterion is met
Low - Based on the information submitted, there is low confidence (or certainty) that the criterion is met
Insufficient - There is insufficient information submitted to evaluate whether the criterion is met (e.g., blank, incomplete, or not relevant, responsive, or specific to the particular question)

Reviewer Name: **Date:**

Descriptive Measure Information

Measure Number and Name: #2165 Payment-Standardized Total Per Capita Cost Measure for Medicare Fee-for-Service (FFS) Beneficiaries
Steward: Centers for Medicare & Medicaid Services
Description: The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries assesses the per capita (per beneficiary) cost of health care services for Medicare FFS beneficiaries enrolled in Parts A and B and attributed to medical group practices. The measure includes all Medicare Part A and Part B costs during a calendar year and is payment-standardized and risk-adjusted (using patient demographics and medical conditions) to account for any potential differences in costs among providers that result from circumstances beyond the physician's control. Under CMS' attribution rule, beneficiaries are attributed on the basis of the plurality of primary care services, to those medical group practices with the greatest potential to influence the quality and cost of care delivered to Medicare FFS beneficiaries.
Resource Use Measure Type: Per capita (population- or patient-based)
Data Source: Administrative claims
Level of Analysis: Clinician : Group/Practice
Costing Method: Standardized pricing
Target Population: Senior Care
Resource Use Service Categories: Inpatient services: Inpatient facility services; Inpatient services: Evaluation and management; Inpatient services: Procedures and surgeries; Inpatient services: Imaging and diagnostic; Inpatient services: Lab services; Inpatient services: Admissions/discharges; Inpatient services: Labor (hours, FTE, etc.); Ambulatory services: Outpatient facility services; Ambulatory services: Emergency Department; Ambulatory services: Evaluation and management; Ambulatory services: Procedures and surgeries; Ambulatory services: Imaging and diagnostic; Ambulatory services: Lab services; Durable Medical Equipment (DME); Other services not listed

1. Importance to Measure and Report

Resource use measures will be evaluated based on the extent to which the specific measure focus is important to making significant contributions toward understanding healthcare costs for a specific high-impact aspect of healthcare where there is variation or a demonstrated high-impact aspect of healthcare (e.g., affects large numbers, leading cause of morbidity/mortality, variation in resource use [current and/or future], severity of illness, and patient/societal consequences of poor quality) or overall poor performance. Candidate consensus standards must be judged to be important to measure and report in order to be evaluated against the remaining criteria.

1a. High Priority

The measure focus addresses:

A specific national health Goal/Priority identified by DHHS or the National Priorities Partnership convened by NQF:

OR

A demonstrated high-impact aspect of healthcare (e.g., affects large numbers, leading cause of morbidity/mortality, high resource use [current and/or future], severity of illness, and patient/societal consequences of poor quality).

IM.1. Demonstrated High Impact Aspect of Healthcare

Affects large numbers; High resource use; Other

If other: Provider accountability for costs of care; tool for assessing differences in costs across providers; tool for monitoring cost effects of quality performance changes; tool for pay-for-performance and other payment reform efforts that focus on high value care and not volume

IM.1.1. Summary of Evidence of High Impact *(Provide epidemiologic or resource use data)*

The U.S. health care system has the highest per capita expenditure ($8,086 per person in 2009) of any nation (Klees et al. 2011). For the Medicare program alone, the total expenditure in 2010 reached $522.8 billion and is expected to grow at an average annual rate of 6.3 percent from 2013 to 2020 (Klees et al. 2011). Despite this intensive use of societal resources, there is wide variation in how health services are used, and disparities in access, quality of care, and health outcomes persist (Fisher et al. 2009; Agency for Healthcare Research & Quality 2002; Committee on Quality of Health Care in America 2001). Decades of research have revealed regional variation in health care utilization and expenditure—in the Medicare program—that is primarily due to differences in the volume of services provided, not geographic differences or regional variations in patients' health (Fisher et al. 2009). Contributing to the phenomenon of regional variation is the FFS reimbursement model in Medicare Parts A and B, which fails to support primary care functions such as care coordination, rewards care delivered by multiple providers, disperses accountability for patient care, and does not reward better outcomes or more appropriate use of services (Fisher et al. 2009, Guterman et al. 2009; Thorpe et al. 2010; Berenson and Rich 2010; Rich et al. 2012).

As part of its efforts to reform Medicare reimbursement policies and alter incentives that affect care delivery, CMS will begin applying a value-based payment modifier (VBM) under the Medicare Physician Fee Schedule in 2015 (CMS 2012). An integral step toward systematically evaluating—and paying for—high-value care is the development of resource use measures and the integration of quality and resource use measures into an assessment of the value of care provided (CMS 2012; Quality Alliance Steering Committee 2010). To work with physicians and medical group practices regarding this change in reimbursement policies, CMS has invited large medical group practices that provide PCSs to participate in quality reporting through the Physician Quality Reporting System (PQRS), receive reports regarding their quality and cost performance, and provide feedback to CMS regarding the process and reports. Since 2008, CMS has delivered, to select physicians and physician groups, confidential feedback reports that assess providers' prior-year performance on a range of resource use and, as of 2010, quality measures.

The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries

To what extent does the summary of evidence of high impact support the categories listed in IM.1.?

- ☐ High
- ☐ Moderate
- ☐ Low
- ☐ Insufficient

is among the measures in the report and will ultimately feed into the calculation of the VBM intended to reward high-value care. Beginning in 2015, participating medical group practices can elect to be evaluated based on a combination of quality composite and cost composite scores using 2013 Medicare data. Medical group practices that deliver higher-value care (high-quality care at low risk-adjusted, payment-standardized costs) will have the opportunity to receive a positive adjustment to their payments, whereas those providing lower-value care will receive a negative payment adjustment. The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is foundational to the calculation of the cost composite that will feed into the VBM. In addition to the importance of this measure to CMS, myriad stakeholders have expressed interest in the availability of reliable, valid resource use measures for programmatic and policy uses (McGlynn 2008), and the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries supports broader initiatives. According to the Institute for Healthcare Improvement (IHI), reducing per capita cost growth is part of the triple aim first posited by IHI and then adopted as part of the U.S. National Quality Strategy as the affordable care aim (Stiefel and Nolan 2012). Thus, the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries fulfills an important aspect of the National Quality Strategy. Because the area of resource use reporting is emergent, limited evidence exists regarding the effect of this information on providers' behavior. Some early work in areas of high managed care penetration suggested the use of physician practice pattern profiles was associated with lower costs (Kralewski et al. 2000). Further, physicians have indicated that they would consider cost information when making clinical decisions but often do not have access to this information (American Institutes for Research 2012). The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries could provide necessary information to medical groups that could ultimately lead to behavior change. ***Citations available in Appendix B***	
1b. Opportunity for Improvement Demonstration of resource use or cost problems and opportunity for improvement, i.e., data demonstrating variation in the delivery of care across providers and/or population groups (disparities in care). IM.2.1. **Briefly explain the benefits (improvements in performance) envisioned by use of this measure.** We anticipate several key benefits due to the use of this measure, including the following: • Improved information to provider groups about their patients' health care costs. The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries will be used to give providers information about the costs of their patients' care, filling a current information gap. In a recent study, physicians indicated that they would use information about their resource use to guide their clinical decision making and communications with patients about treatment options (American Institutes for Research 2012). This measure would equip providers with information they need to act as stewards of health care resources. • Greater insight into the relationship between health care costs and quality. The measure can help elucidate the relationship between quality changes and costs (Chung et al., 2008; CMS 2009). According to CMS, a per capita resource use measure could be used to "compare expected annual costs with actual costs to determine whether certain performance improvements decrease resource use" (CMS 2009). • Clearer provider accountability for patient health care costs. This measure is an important step toward holding provider groups accountable for their patients' health care costs, particularly as the per capita cost information is aligned with quality measures. • Opportunity to construct measures of care efficiency by integrating resource use with quality measures. A 2008 systematic review of efficiency measures found a dearth of measures	**To what extent does the information presented demonstrate this measurement area as a cost problem or that there is variation in resource across entities?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**

that can actually be classified as measures of efficiency that integrate information about the quality of care and resources used (McGlynn 2008).

- Improved resource use measures that can aid understanding of variations in per capita costs by care quality or provider organization characteristics. To date, there have been significant gaps in the area of resource use measurement – and a general lag behind quality measures despite the growing demand for measures of resource use. Although episode-based measures of resource use have been developed, particularly in the commercial sector, applying these measures involves several methodological challenges. Such challenges include attributing episodes to individual providers and defining an episode of care for chronic conditions, which have less clear initiation and end points. The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries complements extant episode-based measures as a population-based measure of resource utilization, providing an overall estimate of costs that takes into account costs for overall patient health – not just those associated with particular disease states or clinical events.
- Improved quality through examination of the breakdown of costs by type of service. The physician feedback reports provide per capita costs for all services covered under FFS Medicare in total and by detailed type of service. The goal of separating per capita costs into categories of services is to provide medical group practices with details on how their costs of delivering specific health care services compare with those of their peers. Note that different categories of service can be substitutes or complements. For example, practices providing more ambulatory preventive care might avoid some hospitalizations of their patients (service substitutes), leading to higher evaluation and management costs but lower inpatient hospital costs compared with peers. At the same time, higher numbers of evaluation and management visits also could be associated with higher ancillary services, such as diagnostic tests (service complements). Displaying costs by categories of service provides greater detail on areas in which providers might be able to improve the quality and efficiency of care.
- Provide actionable information to physicians about their patients. Future physician feedback reports will contain quality and cost information for all attributed Medicare FFS beneficiaries, as well as a detailed breakdown of specific patients that were attributed to the medical group practice. This will provide physicians with information to make actionable changes for the care they provide to each of their patients.

Citations

American Institutes for Research. "Lessons Learned: Physicians' Views of Comparative Information on Costs and Resource Use Findings and Implications for Report Developers." Princeton, NJ: Robert Wood Johnson Foundation, October 2012. Available at [http://www.rwjf.org/content/dam/farm/reports/issue_briefs/2012/rwjf402127]. Accessed January 3, 2013.

Centers for Medicare & Medicaid Services. "Medicare Resource Use Measurement Plan." Baltimore, MD: CMS, 2009. Available at [http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/QualityInitiativesGenInfo/downloads/ResourceUse_Roadmap_OEA_1-15_508.pdf]. Accessed January 3, 2013.

Chung, Jeanette, Erin Kaleba, and Gregory Wozniak. "A Framework for Measuring Healthcare Efficiency and Value." Chicago, IL: American Medical Association, August 2008. Available at [http://www.ama-assn.org/ama1/pub/upload/mm/370/framewk_meas_efficiency.pdf]. Accessed January 3, 2013.

McGlynn, Elizabeth A. "Identifying, Categorizing, and Evaluating Health Care Efficiency Measures: Final Report." AHRQ Publication No. 08-0030. Rockville, MD: Agency for Healthcare Research & Quality, April 2008. Available at [http://www.ahrq.gov/qual/efficiency/efficiency.pdf]. Accessed January 3, 2013.

IM.2.2. **Summary of Data Demonstrating Performance Gap** *(Variation or overall less than*

optimal performance across providers)

A recent Institute of Medicine report indicated that the use of unnecessary health services and inefficiently delivered care accounted for excess spending of $210 billion and $130 billion, respectively, in 2009 (Smith et al. 2012). As mentioned earlier, wide variation in FFS Medicare practice patterns and expenditures have been extensively documented. According to a Dartmouth Atlas analysis of 2006 Medicare data, regions with the highest spending levels had expenditures that were twice the expenditures of regions with the lowest spending levels after accounting for geographic differences in payment and patient illness (Fisher et al. 2009).

Using Medicare Parts A and B administrative claims data for beneficiaries with 12 months of continuous enrollment, we applied the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries and found that for groups with at least 25 eligible professionals and 20 attributed beneficiaries the average payment-standardized risk-adjusted per capita cost was $10,602 (standard deviation= $4,076; median = $9, 837) across all participating medical groups in California, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, and Wisconsin in 2011. For more information, please see Section 2, Scientific Acceptability (Measure Testing attachment). Although all variation might not necessarily indicate poor quality, there is a wide gap between the highest and lowest per capita costs. More information is needed regarding the source of variation, the relationship between costs and quality, and the implications for efficiency.

IM.2.4. **Summary of Data on Disparities by Population Group** *(for example by race/ethnicity, gender, age, insurance status, socioeconomic status, and/or disability, etc. If you do not have data on your specific measure, perform a literature search/review and report data for the measure or similar appropriate concept.)*

Health disparities contribute to rising health care expenditures. A 2009 Urban Institute report projected that health disparities among African Americans, Hispanics, and non-Hispanic whites will cost the health care system approximately $337 billion, including $220 billion for Medicare, from 2009 to 2018 (Waidman 2009). Costs to the Medicare program are projected to double due to health disparities among African Americans and Hispanics as they comprise a higher proportion of the elderly (Waidman 2009). Medicare beneficiaries who are dually eligible for Medicaid due to disability, low income, or some combination of these factors are particularly vulnerable because they are more likely to be in poor health and have multiple chronic illnesses than other beneficiaries (Kaiser Family Foundation 2012; MedPAC 2004). In 2008, Medicare spending on these dually eligible beneficiaries was almost two times higher than spending on nondual eligible Medicare beneficiaries (Jacobson et al. 2012).

Although certain subgroups may account for a disproportionate share of Medicare spending, our analysis of risk-adjusted per capita costs (using the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries) for medical group practices, stratified by certain patient characteristics showed no consistent pattern in terms of mean costs across the proportion of beneficiaries with these characteristics in either category. Average costs were $9,914 (standard deviation of $3,527) for groups with the lowest proportion of dual eligible beneficiaries and $10,606 (standard deviation of $4,106) for the groups with the highest proportion of dual eligible beneficiaries and were $12,052 (standard deviation of $5,132) for the groups with the lowest proportion of nonwhites and $10,132 (standard deviation of $3,925) for the groups with the highest proportion of nonwhites. An analysis of differences by subgroups would have to be taken in the context of the quality of care provided.

Citations available in Appendix B

1c. Measure Intent

The intent of the resource use measure and the measure construct are clearly described.
AND
The resource use service categories (i.e., types of resources/costs) that are included in the resource use measure are consistent with and representative of the intent of the measure.

IM.3.1. **Describe intent of the measure and its components/ Rationale (including any citations) for analyzing variation in resource use in this way.**

As stated earlier, the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries has two primary purposes. First, it is an integral component of the reporting aspect of CMS's Value-Based Payment Modifier Program and Physician Feedback Reporting Program. The measure aims to provide confidential information to participating medical group practices regarding the costs of care they provide to attributed beneficiaries to inform their practice patterns (CMS 2012). More importantly, through confidential reporting of the quality of care furnished to Medicare beneficiaries compared with the cost of that care, the reports support efforts by medical group practices to provide high quality care to their Medicare FFS patients in an efficient and effective manner. Second, the measure will also be used in the calculation of the Medicare FFS VBM to redress the incentives in FFS reimbursement for high volume (CMS 2012). More specifically, under the optional quality tiering approach, the VBM, which will be based on the quality and cost of care medical group practices furnish to Medicare beneficiaries, will be used to adjust Medicare physician fee schedules payments. When combined with quality information, the measure aims to facilitate the introduction of provider accountability into the Medicare FFS program for the value of care beneficiaries receive.

S.7.7. **Resource Use Service Categories (Units)** *(Select all categories that apply)*

Inpatient services: Inpatient facility services; Inpatient services: Evaluation and management; Inpatient services: Procedures and surgeries; Inpatient services: Imaging and diagnostic; Inpatient services: Lab services; Inpatient services: Admissions/discharges; Inpatient services: Labor (hours, FTE, etc.); Ambulatory services: Outpatient facility services; Ambulatory services: Emergency Department; Ambulatory services: Evaluation and management; Ambulatory services: Procedures and surgeries; Ambulatory services: Imaging and diagnostic; Ambulatory services: Lab services; Durable Medical Equipment (DME); Other services not listed

If other: Hospice; Home health; skilled nursing facility; Anesthesia; Ambulance services; Chemotherapy; Drugs administered in an ambulatory setting or used with DME (covered by Medicare Part B); Orthotics, chiropractic, enteral and parenteral nutrition; some vision services; some hearing and speech services; immunizations

To what extent do the categories of costs represented by the resource use service categories (listed in S.7.7.) support the stated intent of the measure? (i.e., are all of the resource use service categories represented that should be? Are any missing?)

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

1. Overall Importance to Measure and Report

1a. High Impact	H	M	L	I
1b. Opportunity for Improvement	H	M	L	I
1c. Measure Intent	H	M	L	I

Based on your rating of the subcriteria, make a summary determination of the extent to which the criterion of **Importance to Measure and Report** has been met. Please provide a rationale based on specific subcriteria.

Rationale:

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

2. Scientific Acceptability of the Measure Properties

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the cost or resources used to deliver care. **Measures must be judged** to meet the subcriteria for both reliability and validity to pass this criterion and be evaluated against the remaining criteria.

Construction Logic

S.7.1. **Brief Description of Construction Logic**

The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is formed by first attributing beneficiaries to medical group practices. Then, unadjusted per capita costs are calculated as the sum of all Medicare Part A and Part B costs for all beneficiaries attributed to a medical group practice, divided by the number of attributed beneficiaries. All unadjusted costs are then payment-standardized and risk adjusted to accommodate differences in costs between peers that result from circumstances beyond physicians' control. Risk-adjusted costs are computed as the ratio of a medical group practice's payment-standardized (but not risk-adjusted) per capita costs to its expected per capita costs, as determined by the risk adjustment algorithm. Finally, to express the risk-adjusted cost in dollars and for ease of interpretation, the ratio is multiplied by the mean cost of all beneficiaries attributed to all practices.

S.7.2. **Construction Logic** *(Detail logic steps used to cluster, group or assign claims beyond those associated with the measure's clinical logic.)*

The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is calculated according to the steps outlined below. Detailed information regarding each of the steps is available in the Comparability Section.

STEP 1. ATTRIBUTE ELIGIBLE BENEFICIARIES TO A MEDICAL GROUP PRACTICE THAT PROVIDED THE PLURALITY OF PRIMARY CARE SERVICES.

Beneficiaries are attributed to medical group practices that provided the plurality of primary care services (PCS). Only beneficiaries that received PCS from at least one physician during the measurement period are eligible for assignment. The attribution method is a two-step process, where in the first step beneficiaries are assigned to medical group practices based on PCS provided by primary care physicians (PCPs)—defined as physicians practicing internal medicine, family practice, general practice, or geriatric medicine. A beneficiary is attributed to a medical group practice if the PCPs in the medical group practice accounted for a larger amount of total Medicare allowable charges for PCS than PCPs in any other group or solo practice. In the second step, beneficiaries who are unassigned to a group and had at least one PCS from a physician, regardless of specialty, are assigned to a medical group practice if the professionals in the group accounted for a larger amount of total Medicare allowable charges for PCS than professionals in any other group or solo practice. This step recognizes that some beneficiaries may receive PCS from non-PCPs (i.e., specialist physicians, nurse practitioners, physician assistants, and clinical nurse specialists).

A list of CMS specialties identified as physicians is available in the attachment titled S_7_2_Construction_Logic. Also, see Adjustments of Comparability Section S.13.2 (Detail Attribution Approach) for a full description of the attribution methodology.

STEP 2. COMPUTE PAYMENT-STANDARDIZED COSTS TO ACCOUNT FOR GEOGRAPHIC VARIATIONS IN MEDICARE COSTS.
To adjust for variations in beneficiary costs due to Medicare geographic adjustment factors (e.g., wage rates, rent, etc.), standardized payments are calculated.
See Adjustments for Comparability Section S.9.6 (Costing Method) for details on standardizing Medicare payments for beneficiaries.
STEP 3. CALCULATE TOTAL OBSERVED PAYMENT-STANDARDIZED COSTS, AT THE BENEFICIARY LEVEL.
Sum costs (calculated in Step 2) across all Part A and Part B claim types for a beneficiary for the calendar year.
STEP 4. TRUNCATE BENEFICIARY-LEVEL COSTS TO ACCOUNT FOR EXTREME OUTLIERS.
Outlier values are truncated to prevent extreme values from having a disproportionate effect on cost distributions and the risk adjustment model. Specifically, beneficiaries whose payment-standardized total costs are in the bottom one percentile of the distribution are excluded; for beneficiaries with payment-standardized total costs in the top 1 percentile among all beneficiaries attributed to all groups in the sample, the beneficiary's cost is set to the value of the 99th percentile cost (note: this approach is equivalent to Winsorization which is a statistical transformation that limits extreme values in data to reduce the effect of possibly spurious outliers).
STEP 5. ESTIMATE THE EXPECTED BENEFICIARY-LEVEL PAYMENT-STANDARDIZED COSTS.
The expected payment-standardized costs are calculated by an ordinary least squares regression, where the beneficiary's annual payment-standardized costs are regressed on the beneficiary's prior year community CMS-HCC risk score, squared prior year community CMS-HCC risk score, prior year new enrollee CMS-HCC score (if a new Medicare enrollee in the prior year), squared prior year new enrollee CMS-HCC risk score, and prior year ESRD indicator flag.
See Adjustments for Comparability Section S.9.2 (Risk-Adjustment Type) and S.9.3 (Statistical risk model method and variables) for details on the risk adjustment model.
STEP 6. CALCULATE OBSERVED-TO-EXPECTED COST RATIO FOR GROUPS.
For each group, divide the sum of the observed payment-standardized costs (estimated in step 3) by the sum of the expected payment-standardized costs (estimated in step 5) to obtain the group's observed-to-expected (O/E) ratio.
STEP 7. CALCULATE RISK-ADJUSTED PAYMENT-STANDARDIZED COSTS IN DOLLAR FIGURES.
To express the risk-adjusted per capita cost in dollar figures, the group's O/E ratio (calculated in Step 6) is multiplied by the mean observed payment-standardized costs across all beneficiaries for whom an expected cost is calculated. This step recognizes that due to missing HCC risk scores and truncation, expected per capita costs may not be computed for some beneficiaries. As such, these beneficiaries are not included in the computation of the mean observed payment-standardized costs.

Click here to go to the Construction Logic Attachment

S.7.3. **Concurrency of clinical events, measure redundancy or overlap, disease interactions** *(Detail the method used for identifying concurrent clinical events, how to manage them, and provide the rationale for this methodology.)*
We do not provide This is an annual per capita cost measure for medical group practices that applies to all clinical events and conditions. Therefore, we do not provide any specifications for the concurrency of clinical events, measure redundancy or overlap, and disease interactions.

S.7.4. **Complementary services** *(Detail how complementary services have been linked to the measure and provide rationale for this methodology.)*
We do not provide This is an annual payment-standardized per capita cost measure for medical group practices that applies to all service categories, care settings, and conditions. Therefore, we do not provide any specifications for complementary services.

S.7.5. **Clinical hierarchies** *(Detail the hierarchy of codes or condition groups used and provide rationale for this methodology.)*
We do not provide This is accounted for during the risk-adjustment process. The measure is risk-adjusted based on prior year CMS-HCC risk scores. Detailed information and an evaluation of the CMS-HCC risk model can be found at [http://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Downloads/Evaluation_Risk_Adj_Model_2011.pdf].
See Adjustments for Comparability Section S.9.3 (Statistical Risk Model Method and variables) for details on the risk adjustment model and a description of the CMS-HCC score.

S.7.6. **Missing Data** *(Detail steps associated with missing data and provide rationale for this methodology (e.g., any statistical techniques to impute missing data)*
We do not provide The computation of the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is

based on all final action Medicare claims for the measurement year. We recognize that there may be claims in which relevant information is missing; however, we did not develop any measure specifications or specific guidelines for handling missing data because there is no indication from examination of our data that the data are missing systematically. As such, calculation of the measure should not be biased by missing information.

S.7.7. **Resource Use Service Categories (Units)** *(Select all categories that apply)*
Inpatient services: Inpatient facility services; Inpatient services: Evaluation and management; Inpatient services: Procedures and surgeries; Inpatient services: Imaging and diagnostic; Inpatient services: Lab services; Inpatient services: Admissions/discharges; Inpatient services: Labor (hours, FTE, etc.); Ambulatory services: Outpatient facility services; Ambulatory services: Emergency Department; Ambulatory services: Evaluation and management; Ambulatory services: Procedures and surgeries; Ambulatory services: Imaging and diagnostic; Ambulatory services: Lab services; Durable Medical Equipment (DME); Other services not listed
If other: Hospice; Home health; skilled nursing facility; Anesthesia; Ambulance services; Chemotherapy; Drugs administered in an ambulatory setting or used with DME (covered by Medicare Part B); Orthotics, chiropractic, enteral and parenteral nutrition; some vision services; some hearing and speech services; immunizations

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the construction logic well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population.	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*

Clinical Logic

S.8.1. **Brief Description of Clinical Logic** *(Briefly describe your clinical logic approach including clinical topic area, whether or not you account for comorbid and interactions, clinical hierarchies, clinical severity levels and concurrency of clinical events.)*
This is an annual payment-standardized per capita cost measure for medical group practices that applies to all clinical topic areas. Comorbidities and clinical hierarchies are accounted for during the risk-adjustment process. See Adjustments for Comparability Section S.9.3 (Statistical Risk Model Method and Variables) for details on the risk adjustment model.

S.8.2. **Clinical Logic** *(Detail any clustering and the assignment of codes, including the grouping methodology, the assignment algorithm, and relevant codes for these methodologies.)*
Not applicable. This is an annual per capita cost measure for medical group practices that applies to all service categories, care settings, and conditions.

S.8.3. **Evidence to Support Clinical Logic Described in S.8.2 Describe the rationale, citing evidence to support the grouping of clinical conditions in the measurement population(s) and the intent of the measure** *(as described in IM3)*
Not applicable

S.8.4. **Measure Trigger and End mechanisms** *(Detail the measure's trigger and end mechanisms and provide rationale for this methodology)*
There is no discrete trigger for the per capita measure. The measure captures total annual Medicare Parts A and B costs from January 1 to December 31 of the measurement year. The rationale for the one-year period is that it is long enough to provide meaningful data. In addition, it is easily measured because there are often fewer changes in physician fee schedule rules, for example, within a

calendar year than across calendar years and it is also readily understood by providers. By providing a broader picture of a beneficiary's treatment costs than a single episode of care, the per capita measure promotes an emphasis on primary care to reduce expensive hospitalizations, coordination of care to reduce overutilization, and the use of more efficient settings of care (that is, fewer emergency department visits) to reduce the overall medical costs of a beneficiary over a longer period.

S.8.5. **Clinical severity levels** *(Detail the method used for assigning severity level and provide rationale for this methodology)*
We do not provideThis is accounted for during the risk-adjustment process. See Adjustments for Comparability Section S.9.3 (Statistical Risk Model Method and Variables) for details on the risk adjustment model.

S.8.6. **Comorbid and interactions** *(Detail the treatment of co-morbidities and disease interactions and provide rationale for this methodology.)*
We do not provide This is accounted for during the risk-adjustment process. See Adjustments for Comparability Section S.9.3 (Statistical Risk Model Method and Variables) for details on the risk adjustment model.

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the clinical logic well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*

Adjustments for Comparability – Inclusion/Exclusion Criteria

S.9.1. **Inclusion and Exclusion Criteria Detail initial inclusion/exclusion criteria and data preparation steps** *(related to clinical exclusions, claim-line or other data quality, data validation, e.g. truncation or removal of low or high dollar claim, exclusion of ESRD patients)*

Beneficiaries who are not fully and continuously enrolled in Medicare FFS Parts A and B during the measurement year or who met certain other criteria are excluded and therefore not attributed to a medical group practice. [1] Specifically, a beneficiary is excluded from the sample of beneficiaries if between January and December of the measurement year, one or more of the following exclusion criteria was met:

- Newly enrolled or disenrolled in Medicare FFS Part A or Part B coverage.

Beneficiaries who were not continuously enrolled in both Medicare FFS Parts A and B for the entire measurement year are excluded from the measure. The per capita cost measure has a one calendar year measurement period and as to ensure comparability in beneficiary costs for group comparisons, only beneficiaries continuously enrolled for all 12 months of the year are included in the measure.

- Enrolled in Medicare Advantage for any part of the year.

Beneficiaries who were enrolled in Medicare Advantage any time during the measurement year are excluded from the measure to ensure comparability in beneficiary costs for group comparisons.

- Resided outside the United States.

To fully capture beneficiaries' medical services and their associated costs, we excluded beneficiaries who resided outside the United States or U.S. possessions or territories. Medicare claims do not capture the costs associated with services rendered outside the United States. Including beneficiaries who receive care outside the United States may underestimate total costs and result in unfair comparisons across groups.

In addition to those beneficiaries who are excluded prior to attribution to a medical group practice, beneficiaries attributed to

medical group practices with outlier values are truncated to ensure that extreme outlier costs do not have a disproportionate effect on cost distributions and the risk-adjustment model. Specifically, beneficiaries whose payment-standardized total costs are below the first percentile are eliminated.
[1] Although death during the measurement year is not an explicit exclusion criterion, Part A or Part B beneficiaries who died during the measurement year would no longer be enrolled in Medicare and are therefore a subset of those excluded due to disenrollment in Medicare Parts A or B.

2b.3. Exclusion Analysis
Click here to go to the developer submission for Exclusion Analysis (2b3)

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent are the inclusion/exclusion criteria well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population.	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*
2b3. Exclusions are supported by the clinical evidence. **AND/OR** There is a rationale or analysis demonstrating that the measure results are sufficiently distorted due to the magnitude and/or frequency of the non-clinical exclusions; **AND** Measure specifications for scoring include computing exclusions so that the effect on the measure is transparent (i.e., impact clearly delineated, such as number of cases excluded, exclusion rates by type of exclusion); **AND** If patient preference (e.g., informed decision-making) is a basis for exclusion, there must be evidence that the exclusion impacts performance on the measure; in such cases, the measure must be specified so that the information about patient preference and the effect on the measure is transparent (e.g., numerator category computed separately, denominator exclusion category computed separately).	**To what extent are the inclusion/exclusion criteria supported by the clinical evidence or supported by evidence of sufficient frequency and impact on performance results?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**

Adjustments for Comparability – Risk Adjustment
S.9.2. Risk Adjustment Type *(Select type)*
Statistical risk model

S.9.3. Statistical risk model method and variables *(Name the statistical method - e.g., logistic regression and list all the risk factor variables.)*
In computing the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries, cost data for each beneficiary are risk adjusted. The risk adjustment process involves several steps, beginning with preparing the data for risk adjustment at the

beneficiary level and culminating with the computation of a group practice-specific risk-adjusted per capita cost. Risk-adjusted costs are computed as the ratio of a medical group practice's payment-standardized , observed, per capita costs to its expected per capita costs, as determined by the risk adjustment algorithm. Finally, to express the risk-adjusted cost in dollars and for ease of interpretation, the ratio is multiplied by the mean cost of all beneficiaries attributed to all practices.

These steps are described in Section 7.2 (Construction Logic), under Steps 3-7. The discussion below focuses on the calculation of the expected beneficiary costs.

To control for patient differences that can affect medical costs, regardless of the care provided, per capita cost measures are risk adjusted prospectively using CMS-HCC risk scores from the year prior to the measure year. An ordinary least squares model is estimated where the truncated payment-standardized total costs (TOT_COST) are regressed on the following independent variables:

1. COMMUNITY_HCC_SCORE: Prior year community CMS-HCC risk score (if no new enrollee risk score is available)
2. COMMUNITY_HCC_SCORE_SQUARED: Prior year community CMS-HCC risk score squared (if no new enrollee risk score if available)
3. NEW_ENROLLEE_HCC_SCORE: Prior year new enrollee CMS-HCC risk score (if new enrollee or if both new enrollee and community scores are available)
4. NEW_ENROLLEE_HCC_SCORE_SQUARED: Prior year new enrollee CMS-HCC risk score squared (if new enrollee or if both new enrollee and community scores are available)
5. NEW_AVAIL: An indicator equal to 1 if a new CMS-HCC score is available, and 0 otherwise
6. ESRD_FLAG: Prior year ESRD status indictor

More specifically, the following linear regression is estimated:

TOT_COST = ß0 + ß1 *(1-NEW_AVAIL)*COMMUNITY_HCC_SCORE
+ ß2*(1-NEW_AVAIL)*COMMUNITY_HCC_SCORE_SQUARED
+ß3*NEW_AVAIL*NEW_ENROLLEE_HCC_SCORE
+ ß4 *NEW_AVAIL*NEW_ENROLLEE_HCC_SCORE_SQUARED
+ß5*ESRD_FLAG + error

where ß0 is a constant term, ß1 through ß5 are regression coefficients, and error is an error term. The regression yields a set of coefficients, one per independent variable. Each coefficient measures the association between its corresponding independent variable and total beneficiary cost when the other independent variables are held constant. Squared CMS-HCC scores were added in the regression model to capture the diminishing impact of the risk scores on total costs as it increases. The testing of the risk adjustment model described in the Measure Testing attachment supports the functional form.

The CMS-HCC model assigns International Classification of Diseases–9th Revision (ICD-9) diagnosis codes to 70 clinical conditions. The CMS-HCC risk adjustment model is developed and calibrated using Medicare FFS claims, making it a well-suited tool for the risk adjustment of total per capita costs. It is also used to adjust payments for Part C benefits offered by Medicare Advantage plans and Program of All Inclusive Care for the Elderly organizations to aged/disabled beneficiaries. The CMS-HCC model incorporates prior year diseases and demographic factors to compute separate sets of coefficients for beneficiaries in the community, beneficiaries in long-term care institutions, new Medicare enrollees, and beneficiaries with end stage renal disease (ESRD) (both community and institutional).

The community and new enrollee CMS-HCC risk scores are used in the regression model. The former are composed of two major components: demographic information and medical conditions; the latter are composed only of demographic information. Demographic information includes age, sex, Medicaid status, and disability as the original reason for Medicare eligibility. The medical conditions are based on previous years' diagnoses and are classified in clinically meaningful categories that are expected to predict medical expenditures.

Detailed information and an evaluation of the CMS-HCC risk model can be found at [http://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Downloads/Evaluation_Risk_Adj_Model_2011.pdf]. The 70 HCCs that CMS incorporates into its risk scores are available on page 17 of the document found at [http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeedbackProgram/Educational-Resources.html].

S.9.4. **Detailed Risk Model Specifications** *available at measure-specific Web page URL identified in S.1 OR in attached data dictionary/code list Excel or csv file.*

Available at measure-specific web page URL identified in S.1

S.9.5. **Stratification Details/Variables** *(All information required to stratify the measure results including the stratification variables,*

definitions, specific data collection items/responses, code/value sets)
This measure uses risk-adjusted costs for comparison purposes and further stratification is not done.

2b.4. **Risk Adjustment Statistics**
Click here to go to the developer submission for Risk Adjustment (2b4)

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the risk adjustment strategy well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*
2b4. An evidence-based risk-adjustment strategy (e.g., risk models, risk stratification) is specified; is based on factors that influence the measured outcome (but not factors related to disparities in care or the quality of care) and are present at start of care; and has demonstrated adequate discrimination and calibration **OR** Rationale/data support no risk-adjustment/-stratification.	**To what extent are the risk adjustment factors present at the start of care with adequate discrimination and calibration?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**

Adjustments for Comparability – Costing Method

S.9.6. **Costing method** *Detail the costing method including the source of cost information, steps to capture, apply or estimate cost information, and provide rationale for this methodology.*
Standardized pricing

S.9.6a. **Describe the Costing method**

For most types of medical services, Medicare adjusts payments to providers to reflect differences in local input payments (for example, wage rates and real estate costs). Payment standardization equalizes the costs associated with a specific service, such that a given service is paid at the same level across all providers of the same type, regardless of geographic location or differences in Medicare payment rates among some facilities. [1]

The per capita cost measure uses CMS' payment standardization methodology. Specifically, the payment standardization methodology:

- Eliminates adjustments made to national payment amounts to reflect differences in regional labor costs and practice expenses (measured by hospital wage indexes and geographic practice cost indexes)
- Substitutes a national amount in the case of services paid on the basis of state fee schedules
- Eliminates Medicare's payments to hospitals for graduate indirect medical education (IME) and for serving a disproportionate population of poor and uninsured (i.e., disproportionate share payments (DSH))
- Maintains differences that exist in actual payments resulting from: (i) the choice of setting in which a services is provided, (ii) the choice about who provides the service, (iii) the choice as to whether to provide multiple services in the same encounter, and (iv) differences in provider experience with regard to outlier cases
- Treats outlier payments as a given rather than trying to determine what outlier payment would have been in a standardized world. Actual outlier payments are adjusted for differences in wages using the wage index.

Detailed specifications can be found on QualityNet at [http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1228772057350]. Furthermore, the standardization methodology is similar to that adopted by the Institute of Medicine: http://iom.edu/Activities/HealthServices/GeographicVariation/Data-Resources.aspx.
A summary of the standardization methodology for seven of the Medicare claim types—inpatient hospital; outpatient hospital; skilled nursing facility; home health agency; hospice; physician services; and durable medical equipment, prosthetics, orthotics, and supplies (DMEPOS)—is available here, starting on page 19, [http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeedbackProgram/downloads/2011_group_detail_methodology.pdf].
[1] Payment-standardization and price-standardization are terms that are often used interchangeably. The standardizing pricing approach discussed in this submission is referred to as payment-standardization since Medicare claims payments are being standardized.

S.9.6b. **Attach pricing table here** *(Select Actual Prices Paid, Relative Value Units [RVUs], Other, or We do not provide specifications for a costing method)*

Pricing Table not provided

2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the costing method well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*

Adjustments for Comparability – Scoring

S.10. **Type of Score** *(Select the most relevant)*
Continuous variable; Attachment
Click here to go to the sample score report

S.11. **Interpretation of Score** *(Classifies interpretation of a ratio score(s) according to whether higher or lower resource use amounts is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score, etc.)*
The quality and resource use reports (QRURs), which are confidential feedback reports disseminated to medical group practices, display payment-standardized (to remove geographic Medicare payment differences) and risk-adjusted per capita (per beneficiary) costs for each group's attributed patients. Risk adjusted per capita costs for attributed beneficiaries are expressed in dollar figures to allow for easier comparison among medical practice groups. The total per capita cost can be interpreted as follows:

- A simple difference greater than zero from the national benchmark indicates that the medical practice group's total per capita costs are higher than the average total per capita costs of all groups.
- A simple difference less than zero from the national benchmark indicates that the medical practice group's total per capita costs are lower than the average total per capita costs of all groups.
- A simple difference equal to zero from the national benchmark indicates that the medical practice group's total per capita costs are equal to the average total per capita costs of all groups.

The computation of the national benchmark is described in Section 13.5 (Define benchmarking or comparative estimates).

S.12. Detail Score Estimation *(Detail steps to estimate measure score.)* Steps for computing the risk adjusted total per capita cost is described in Section 7.2 (Construction Logic).	
2a1. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. Electronic health record (EHR) measure specifications are based on the quality data model (QDM).	**To what extent is the scoring method well defined and precisely specified?** ☐ **High/Moderate** *(Specifications are unambiguous)* ☐ **Low** *(One or more specifications are ambiguous)*
2b1. The measure specifications are consistent with the measure intent described under criterion 1c and captures the most inclusive target population	**To what extent is the clinical logic consistent with the measure intent and captures the broadest target population?** ☐ **High/Moderate** *(Measure specifications are consistent with the measure intent and captures the broadest target population)* ☐ **Low** *(Measure specifications do not reflect the measure intent)*
2b5. Data analysis demonstrates that methods for scoring and analysis of the specified measure allow for identification of statistically significant and practically/clinically meaningful differences in performance.	**To what extent does the scoring method allow for identification of statistically significant and practically/clinically meaningful differences in performance?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**
Comparability of Multiple Data Sources ***Measure not specified for multiple data sources – Not Applicable***	
2b6. If multiple data sources/methods are specified, there is demonstration that they produce comparable results.	**To what extent do the multiple data sources/methods produce comparable results?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient** ☐ **Not Applicable**
Reliability Testing ***Click here to go to the developer submission for Reliability Testing (2a2)***	

2a2. Reliability testing demonstrates the measure data elements are repeatable, producing the same results a high proportion of the time when assessed in the same population in the same time period and/or that the measure score is precise.	☐ **High** *(Data element **AND** measure score reliability testing done and is acceptable)* ☐ **Moderate** *(Data element **OR** measure score reliability testing is done and acceptable)* ☐ **Low** *(There is empirical evidence of Unreliability for either data elements or measure score)* ☐ **Insufficient** *(Inappropriate method or scope of reliability testing)*
Validity Testing ***Click here to go to the developer submission for Validity Testing (2b2)***	
2b2. Validity testing demonstrates that the measure data elements are correct and/or the measure score correctly reflects the quality of care provided, adequately identifying differences in quality.	☐ **High** *(Data element **AND** measure score were tested with the appropriate method, scope and the results are within acceptable norms **AND** Threats to validity are empirically assessed and adequately addressed; measure results are not biased)* ☐ **Moderate** *(Data element **OR** measure score were tested with the appropriate method, scope and the results are within acceptable norms **OR** face validity was systematically assessed **AND** Threats to validity are empirically assessed and adequately addressed; measure results are not biased)* ☐ **Low** *(Statistical results of the testing of data element OR measure score are outside of acceptable norms **OR** Threats to validity have not been addressed and the measure score is bias.)* ☐ **Insufficient** *(Inappropriate method or scope of testing; inadequate assessment of face validity)*

2a. Overall Reliability

2a1. Construction Logic	**H/M**		**L**	
2a1. Clinical Logic	**H/M**		**L**	
2a1. Adjustments for Comparability – Inclusion/Exclusion Criteria	**H/M**		**L**	
2a1. Adjustments for Comparability – Risk Adjustment	**H/M**		**L**	
2a1. Adjustments for Comparability – Costing Method	**H/M**		**L**	
2a1. Adjustments for Comparability – Scoring	**H/M**		**L**	
2a2. Reliability Testing	**H**	**M**	**L**	**I**

Based on your ratings for the above criteria, how would you rate the overall reliability of this measure? How well overall has the developer demonstrated the measure results are repeatable and can be implemented consistently?

☐ **High** *(Specifications are unambiguous; data element **AND** measure score reliability testing done and is acceptable)*
☐ **Moderate** *(Specifications are unambiguous and data element **OR** measure score reliability testing is done and acceptable)*
☐ **Low** *(One or more specifications are ambiguous **OR** there is empirical evidence of unreliability for either data elements or measure score)*
☐ **Insufficient** *(Inappropriate method or scope of reliability testing)*

Rationale:

2b. Overall Validity

2b1. Construction Logic	H/M L
2b1. Clinical Logic	H/M L
2b1. Adjustments for Comparability – Inclusion/Exclusion Criteria	H/M L
2b3. Exclusions	H M L I
2b1. Adjustments for Comparability – Risk Adjustment	H/M L
2b4. Risk Adjustment	H M L I
2b1. Adjustments for Comparability – Costing Method	H/M L
2b1. Adjustments for Comparability – Scoring	H/M L
2b5. Significant Differences in Performance	H M L I
2b6. Comparability of Multiple Data Sources	H M L I NA
2b2. Validity Testing	H M L I

Based on your ratings for the above criteria, how would you rate the overall validity of this measure? How well overall has the developer demonstrated this measure is valid?

☐ **High** *(Data element **AND** measure score were tested with the appropriate method, scope and the results are within acceptable norms **AND** Threats to validity are empirically assessed and adequately addressed; measure results are not biased)*
☐ **Moderate** *(Data element **OR** measure score were tested with the appropriate method, scope and the results are within acceptable norms **OR** face validity was systematically assessed **AND** Threats to validity are empirically assessed and adequately addressed; measure results are not biased)*
☐ **Low** *(Statistical results of the testing of data element **OR** measure score are outside of acceptable norms **OR** Threats to validity have not been addressed and the measure score is bias.)*
☐ **Insufficient** *(Inappropriate method or scope of testing; inadequate assessment of face validity)*

Rationale:

2c. Disparities in Care

If disparities in care have been identified, measure specifications, scoring, and analysis allow for identification of disparities through stratification of results (e.g., by race, ethnicity, socioeconomic status, gender)
OR
Rationale/data justifies why stratification is not necessary or not feasible.

SA.10.1. **If measure is stratified for disparities, provide stratified results** *(Scores by stratified categories/cohorts)*
The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is not stratified to detect disparities.

SA.10.2. **If disparities have been reported/identified, but measure is not specified to detect disparities, please explain.**

To what extent do the measure specifications, scoring, and analysis allow for identification of disparities through stratification of results (Refer to item IM2.4 for summary of disparities data)?

☐ **High**
☐ **Moderate**

As described in Section IM.2.4., we have examined per capita costs by certain demographic characteristics and have not detected a consistent pattern. Furthermore, any differences in per capita resource use by subgroup would have to be considered in the context of the quality of care provided. To date, we have not identified disparities through the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries.	☐ **Low** ☐ **Insufficient**

3. Feasibility

Extent to which the required data are readily available or could be captured without undue burden, and can be implemented for performance measurement.

3a. Byproduct of Care Processes For clinical measures, the required data elements are routinely generated and used during care delivery (e.g., blood pressure, lab test, diagnosis, medication order). F.1. **Data Elements Generated as Byproduct of Care Processes.** Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims); Other **If other:** The data elements come from Medicare administrative claims	**To what extent are the data elements generated as byproducts of care processes?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**
3b. Electronic Sources The required data elements are available in electronic health records or other electronic sources. If the required data are not in electronic health records or existing electronic sources, a credible, near-term path to electronic collection is specified. F.2. **To what extent are the specified data elements available electronically in defined fields?** ALL data elements are in defined fields in electronic claims	**To what extent are the data elements available in electronic health records or other electronic sources?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**
3c. Data Collection Strategy Demonstration that the data collection strategy (e.g., source, timing, frequency, sampling, patient confidentiality, costs associated with fees/licensing of proprietary measures) can be implemented (e.g., already in operational use, or testing demonstrates that it is ready to put into operational use). F.4. **Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues.** During operational use of the measures in the QRURs, we have modified the way in which the Medicare administrative claims data are obtained. Rather than using Standard Analytic Files, the claims data are now available on CMS' IDR, where the data are readily retrievable without undue burden. The IDR contains only the final action claims developed from the Medicare National Claims History database—that is, non-rejected claims for which a payment has been made after all disputes and adjustments have been resolved and details clarified. However, we understand that there may be discrepancies, missing information, and/or errors in the claims and therefore conduct a rigorous quality assurance process to ensure that the information that we utilize is correct to the best of our	**To what extent can the data collection strategy be implemented?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**

knowledge.

F.5. **Describe any fees, licensing, or other requirements to use any aspect of the measure as specified.**
Not applicable. There are no fees, licensing, or other requirements to use any aspect of the measure as specified.

F.5.a. **If there are any fees associated with the use of this measure as specified, attach the fee schedule here**

3. Overall Feasibility

3a. Byproduct of Care Processes	H	M	L	I
3b. Electronic Sources	H	M	L	I
3c. Data Collection Strategy	H	M	L	I

Based on your rating of the subcriteria, make a summary determination of the extent to which the criterion of **Feasibility** has been met. Please provide a rationale based on specific subcriteria.

Rationale:

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

4. Usability and Use

Extent to which potential audiences (e.g., consumers, purchasers, providers, policymakers) are using or could use performance results for both accountability and performance improvement to achieve the goal of high-quality, efficient healthcare for individuals or populations.

4a. Accountability and Transparency

Performance results are used in at least one accountability application within three years after initial endorsement and are publicly reported within six years after initial endorsement (or the data on performance results are available). If not in use at the time of initial endorsement, then a credible plan for implementation within the specified timeframes is provided.

U.1. **Current and Planned Use**

NQF-endorsed measures are expected to be used in at least one accountability application within 3 years and publicly reported within 6 years of initial endorsement in addition to performance improvement.

Planned	Current	For Current use, Provide URL
Payment Program	Quality Improvement with Benchmarking (external benchmarking to multiple organizations)	http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeedbackProgram/
	Quality Improvement (Internal to the specific organization)	http://www.cms.gov/Medicare/Medicare-Fee-for-Service-

To what extent have performance results been used in accountability applications or a credible plan for use has been provided?

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

		Payment/PhysicianFeedbackProgram/

U.1.1. **For each CURRENT use, checked above, provide:**

- Name of program and sponsor
- Purpose
- Geographic area and number and percentage of accountable entities and patients included

The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is currently in use: (1) for quality improvement with external benchmarking and (2) for internal quality improvement. Details regarding the current use of the measure for these purposes are provided below.

PROGRAM AND SPONSOR: Centers for Medicare & Medicaid Services' Physician Value-Based Payment Modifier and Physician Feedback Reporting Program

PURPOSE: The Value-Based Payment Modifier and Physician Feedback Reporting Program addresses Section 3003 and 3007 respectively, of the 2010 Affordable Care Act, which directs the Secretary of Health and Human Services to provide confidential feedback information to physicians and groups of physicians about the cost and quality of care furnished to their Medicare FFS beneficiaries. To enhance the quality and efficiency of health care services provided to Medicare beneficiaries, since 2008, CMS has disseminated confidential feedback reports—the Quality and Resource Use Reports (QRURs)—to a select group of medical group practices that contain measures of quality and cost of care. The medical group practice–specific information in the QRURs is intended to support efforts to provide high quality care in an efficient and effective manner. Furthermore, this information is provided alongside benchmarks and is intended to stimulate medical group practices to deliver the highest quality and most efficient care with an emphasis on system-based care to their Medicare FFS beneficiaries.

GEOGRAPHIC AREA AND PERCENTAGE OF ACCOUNTABLE ENTITIES AND PATIENTS INCLUDED: In 2011, 54 group practices across the nation that participated in the Group Practice Reporting Option (GPRO) I of the Physician Quality Reporting System (PQRS) in 2011 received reports. Each of the groups comprised at least 200 eligible professionals sharing a single TIN. In fall 2013, medical group practices nationwide with at least 25 eligible professionals billing under the group's TIN will receive these confidential reports. Approximately 7,000 medical group practices will receive reports at that time.

U.1.2. **If not currently publicly reported OR used in at least one other accountability application (e.g., payment program, certification, licensing) what are the reasons?**

The Value-Based Payment Modifier program addresses Section 3007 of the 2010 Affordable Care Act, which directs the Secretary to develop and implement a budget-neutral VBM. The CY2012 Medicare Physician Fee Schedule (MPFS) Final Rule specifies that, beginning in 2015, the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries will be an input to the calculation of the VBM for those groups of physicians that elect the optional quality tiering methodology. Under this approach, the VBM will be based on the quality and cost of care medical group practices furnish to Medicare beneficiaries and will be used to adjust Medicare physician fee schedule payments. The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is foundational to the costs of care in the VBM under the quality tiering approach. While the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is currently being used in the Quality and Resource Use Reports provided to medical group practices as described above, the measure is not currently used to adjust payment; however, it will be used in the VBM, which the Secretary will phase in over a three-year period, beginning in 2015.

U.1.3. **If not currently publicly reported OR used in at least one accountability application, provide**

a credible plan for implementation within the expected timeframes -- any accountability application within 3 years and publicly reported within 6 years of initial endorsement. As described in Section U1.2, the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries will be used under the Value-Based Payment Modifier and Physician Feedback Reporting Program, which is intended to enhance the quality and efficiency of health care services provided to Medicare beneficiaries. As finalized in the CY2012 Medicare Physician Fee Schedule (MPFS) Final Rule, the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries will serve as the foundation to the cost component of a composite measure that will be applied to the VBM under the quality tiering approach. The VBM will be phased in over a three-year period, beginning in 2015. A timeline for implementation and the intended audience of the VBM are as follows: September 2013: Confidential Physician Feedback Reports will be disseminated to medical group practices with at least 25 eligible professionals. Quality and cost information shown in these reports will be based on calendar year 2012 performance. Medical group practices will have the opportunity to preview the optional quality tiering approach to calculating the VBM in these reports. The report is for informational purposes only and will not affect payment. September 2014: Confidential Physician Feedback Reports will be disseminated to medical group practices. Quality and resource use information in these reports will be based on calendar year 2013 performance. Providers will have the opportunity to see their performance using the optional quality tiering approach before the VBM is rolled out in 2015. January 2015: The VBM will be applied to medical group practices with at least 100 eligible professionals, who elect quality tiering. The initial performance period is calendar year 2013. September 2015: Confidential Physician Feedback Reports will be disseminated to all medical group practices. Quality and resource use information in these reports will be based on performance during 2014. January 2016: CMS has not yet made proposals on how the VBM will be applied to medical group practices in 2016. The performance period is calendar year 2014. September 2016: Confidential Physician Feedback Reports will be disseminated to all medical group practices. Quality and resource use information in these reports will be based on performance during 2015. January 2017: The phase in of the VBM will be complete. All physicians paid under the Medicare physician fee schedule will be affected by the modifier.	
4b. Improvement Progress toward achieving the goal of high-quality, efficient healthcare for individuals or populations is demonstrated. If not in use for performance improvement at the time of initial endorsement, then a credible rationale describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations. U.2.1. **Provide data that demonstrate improvement in performance and/or health.** This is an initial endorsement. Data are not currently available. U.2.2. **If no improvement was demonstrated, what are the reasons? If not in use for performance improvement at the time of initial endorsement, provide a credible rationale that describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.** This is an initial endorsement. Data are not currently available.	**To what extent has progress toward high-quality, efficient healthcare been demonstrated or a credible rationale has been provided?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**
4c. Unintended Consequences The benefits of the performance measure in facilitating progress toward achieving high-quality, efficient healthcare for individuals or populations outweigh evidence of unintended negative consequences to individuals or populations (if such evidence exists).	**To what extent do the benefits of the measure outweigh any evidence**

U.3. **Were any unintended negative consequences to individuals or populations identified during testing; OR has evidence of unintended negative consequences to individuals or populations been reported since implementation? If so, identify the negative unintended consequences and describe how benefits outweigh them or actions taken to mitigate them.** Unintended or negative consequences to individuals or populations have not been identified during testing or reported since the confidential feedback reports have been disseminated to medical group practices. CMS will continue to monitor for unintended consequences to vulnerable populations.	**of unintended negative consequences?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**
4d. Measure Deconstruction Data and result detail are maintained such that the resource use measure, including the clinical and construction logic for a defined unit of measurement can be deconstructed to facilitate transparency and understanding.	**Based on your review of the specifications, to what extent can the measure be deconstructed to facilitate transparency and understanding for those being measured (e.g., clinicians, hospitals) and those using the measure results (e.g., consumers, purchasers)?** ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **Insufficient**

4. Overall Usability and Use

4a. Accountability and Transparency	**H**	**M**	**L**	**I**
4b. Improvement	**H**	**M**	**L**	**I**
4c. Unintended Consequences	**H**	**M**	**L**	**I**
4d. Measure Deconstruction	**H**	**M**	**L**	**I**

Based on your rating of the subcriteria, make a summary determination of the extent to which the criterion of **Usability and Use** has been met. Please provide a rationale based on specific subcriteria.

Rationale:

☐ **High**
☐ **Moderate**
☐ **Low**
☐ **Insufficient**

5. Comparison to Related or Competing Measures

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are

compared to address harmonization and/or selection of the best measure.

5a. Harmonization

The measure specifications are harmonized with related measures;

OR

The differences in specifications are justified

H.1. If there are related measures (conceptually, either same measure focus or target population) or competing measures (conceptually both the same measure focus and same target population), select the NQF # and title of all related and/or competing measures.

1598 : Total Resource Use Population-based PMPM Index

H.1.1. If this measure conceptually addresses EITHER the same measure focus OR the same target population as NQF-endorsed measure(s): Are the measure specifications completely harmonized?

No

H.1.2. If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden.

The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries and the Total Resource Use Population-Based Per Member Per Month (PMPM) Index measure, which is intended for use in commercial health plans, have distinct target populations and important differences, despite sharing a measure focus on per capita resource use. These differences include those relating to the structure of the insurance coverage provided, population characteristics, data sources, and payment-standardization and risk adjustment methodologies. The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries provides a better assessment of overall spending on healthcare services for Medicare FFS beneficiaries and CMS programs than the Total Resource Use Population-Based Per Member Per Month (PMPM) Index measure. The Medicare FFS program has fundamentally different enrollment, coverage, payment, and delivery structures than commercial insurance, which is the focus of the Total Resource Use Population-Based Per Member Per Month (PMPM) Index measure. Within the Medicare FFS environment, beneficiaries can receive medical services from any provider that accepts Medicare as total or partial payment for services rendered. The Medicare FFS program does not require a primary care provider of record. Moreover, Medicare FFS does not restrict beneficiaries to receive care from providers who are part of a network, which is often the case in commercial insurance plans. Unlike commercial insurers, or even Medicare Advantage, annual enrollment or contracts for health care services do not apply to care covered under Medicare FFS during a 12-month period. Furthermore, Medicare and Dual Eligible beneficiaries (who comprised about a quarter of the 2011 beneficiaries for whom CMS computed per capita costs) also have different health status, medical needs/utilization, and costs than members of commercial insurance plans. In order to have a stable population to track and compare, the beneficiaries included in the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries are limited to those who were continuously enrolled in both Parts A and B Medicare for 12 months. CMS estimates that approximately 15 percent of Medicare beneficiaries are excluded from the target population by a combination of initial exclusions and use of attribution rules that are applied to this measure to ensure that the population for whom data are collected has received primary care services. Unlike the Total Per Capita Resource Use Per Member Per Month (PMPM) Index that includes prescription drug costs, CMS does not have prescription drug data for all covered beneficiaries, so the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries cannot include those costs. Only about 60 percent of Medicare FFS beneficiaries are enrolled in the voluntary Part D prescription program, and currently CMS does not have access to private prescription data on a beneficiary claim basis. Furthermore, a significant portion of Medicare beneficiaries receive prescription coverage through employment-based benefits, and CMS does not have access to those data. Lastly, CMS is committed to maintaining and enhancing its approaches to risk adjustment using the CMS-HCC methodology, which was developed for and tested on the Medicare population, and payment standardization that can readily be applied to Medicare FFS data. Without adequate risk adjustment and payment standardization methods, making meaningful assessments and comparisons of provider resource use would not be possible, since the unadjusted resource use measure would not reflect differences in the populations that providers treat or the geographic areas where they practice. CMS' continued use of these risk adjustment and payment standardization methodologies for computing total per capita Medicare FFS costs will ensure that analyses take into account coverage and payment policies that are both distinct and important for this population.

5b. Competing Measures

The measure is superior to competing measures (e.g., is a more valid or efficient way to measure);
OR
Multiple measures are justified.

H.1. If there are related measures (conceptually, either same measure focus or target population) or competing measures (conceptually both the same measure focus and same target population), select the NQF # and title of all related and/or competing measures.

1598 : Total Resource Use Population-based PMPM Index

H.1.3. If this measure conceptually addresses both the same measure focus and the same target population as NQF-endorsed measure(s): Describe why this measure is superior to competing measures (e.g., a more valid or efficient way to measure quality); OR provide a rationale for the additive value of endorsing an additional measure. (Provide analyses when possible.)

The Total Resource Use Population-Based Per Member Per Month (PMPM) Index measure (#1598) from HealthPartners is the only NQF-endorsed measure with the same measure focus (total resource use) and a non-condition specific target population as the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries. It should be noted that the HealthPartners measure focuses on a target population of patients who are younger than 65 years of age and are enrolled in commercial health plans, whereas the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries has been developed for Medicare FFS beneficiaries, of whom approximately 75 percent are age 65 or older. In 2011, a quarter of patients (whose data are cited here) were covered by both Medicare and Medicaid.

The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is a superior approach to computing the total per capita cost for CMS's Medicare FFS beneficiary population than the previously endorsed Total Resource Use Population-Based Per Member Per Month (PMPM) Index for the following reasons. First, HCC risk scores have been uniquely tailored, tested, and calibrated as a risk-adjustment approach specifically for Medicare FFS beneficiaries, unlike the Johns Hopkins ACG approach. For example, CMS's Program of All-Inclusive Care for the Elderly (PACE) Program, Medicare Advantage, and Medicare Shared Savings Program, among others, all use the HCC risk-adjustment method. As such, the HCC risk score is the preferred approach for risk adjustment for Medicare FFS beneficiaries. Similarly, the attribution, exclusion, and payment-standardization methods that are applied to this measure are unified across CMS initiatives, such as the Medicare Shared Savings Program, Medicare Advantage, and PACE. Thus, the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is broadly applicable across Agency initiatives and is specifically tailored to the Medicare FFS structure and beneficiary population.

Preliminary Recommendation for Endorsement

In this section we ask for your preliminary recommendation for this measure on its overall suitability for endorsement. Based on your individual rating of each of the four major criteria, provide your initial recommendation for endorsement for this measure.

Based on your individual rating of all the criteria, does the measure meet the criteria to be suitable for endorsement?

1. Importance to Measure and Report	H	M	L	I
2a. Overall Reliability	H	M	L	I
2b. Overall Validity	H	M	L	I
2c. Disparities in Care	H	M	L	I
3. Feasibility	H	M	L	I
4. Usability and Use	H	M	L	I

Rationale:

☐ **Yes**

☐ **No**

Appendix A

Reporting Guidelines (Optional)

S.13.1. **Describe discriminating results approach** *Detail methods for discriminating differences (reporting with descriptive statistics--e.g., distribution, confidence intervals).*

The results of the measure (per capita costs) are analyzed through descriptive statistics (for example, minimum, maximum, percentiles, and means). The QRURs, in which the measure is currently reported, give providers the opportunity to compare their total per capita costs with the total per capita costs of their peers.

S.13.2. **Detail attribution approach** *Detail the attribution rules used for attributing resources/costs to providers (e.g., a proportion of total measure cost or frequency of visits during the measure's measurement period) and provide rationale for this methodology.*

DESCRIPTION OF ATTRIBUTION APPROACH

Beneficiaries are attributed to medical group practices that provided the plurality of primary care services (PCS). Only beneficiaries that received PCS from at least one physician during the measurement period are eligible for assignment. PCS are defined based on the following Healthcare Common Procedure Coding System (HCPCS)/Current Procedural Terminology (CPT) codes (Source: RTI International and American Medical Association, 2010 Current Procedural Terminology: Professional Edition):

99201–99205 Office or other outpatient visits for the evaluation and management of a new patient
99211–99215 Office or other outpatient visit for the evaluation and management of an established patient
99304–99306 Initial nursing facility care, per day, for the evaluation and management of a patient
99307–99310 Subsequent nursing facility care, per day, for the evaluation and management of a patient
99315–99316, 99318 Nursing facility discharge day management
99318 Evaluation and management of a patient involving an annual nursing facility assessment
99324–99328 Domiciliary or rest home visit for the evaluation and management of a new patient
99334–99337 Domiciliary or rest home visit for the evaluation and management of an established patient
99339–99340 Individual physician supervision of a patient (patient not present) in home, domiciliary, or rest home
99341–99345 Home visit for the evaluation and management of a new patient
99347–99350 Home visit for the evaluation and management of an established patient
G0402 Initial Medicare visit
G0438 Annual wellness visit, initial
G0438 Annual wellness visit, subsequent

The attribution method is a two-step process, where in the first step beneficiaries are assigned to medical group practices based on PCS provided by primary care physicians (PCPs)—defined as physicians practicing internal medicine, family practice, general practice, or geriatric medicine. A beneficiary is attributed to a medical group practice if the PCPs in the medical group practice accounted for a larger amount of total Medicare allowable charges for PCS than PCPs in any other group or solo practice. In the second step, beneficiaries who are unassigned to a group and had at least one PCS from a physician, regardless of specialty, are assigned to a medical group practice if the professionals in the group accounted for a larger amount of total Medicare allowable charges for PCS than professionals in any other group or solo practice. This step recognizes that some beneficiaries may receive PCS from non-PCPs (i.e., specialist physicians, nurse practitioners, physician assistants, and clinical nurse specialists).

Two-digit CMS specialty codes that appear in Medicare carrier claims files are used to define specialties. For some medical professionals, different CMS specialty codes are included on different claims—for example, general practitioner versus endocrinologist. A medical professional's specialty is determined from carrier claims from the performance year and based on the specialty code listed most frequently on line items for services rendered by the professional. There is one exception to this rule: if a medical professional is associated in Medicare claims with multiple specialties and the most commonly listed code is 99 (the Unknown Physician specialty), then the professional is assigned the second-most-frequently listed specialty.

A table of CMS specialty codes is available in the attachment titled S_7_2_Construction_Logic. It should also be noted that CMS requires that each eligible professional designate one clinical specialty when they enroll as a Medicare provider. Clinicians are expected to update these and other data that are part of Medicare's online Provider Enrollment, Chain and Ownership System (PECOS) at https://pecos.cms.hhs.gov/pecos/login.do.

RATIONALE FOR ATTRIBUTION APPROACH

The proposed attribution method places an emphasis on PCS provided by PCPs through the first step attribution rule, while also acknowledging the role that physicians of other specialties and other eligible professionals have in providing PCS through the second

step of the method. This attribution method is devised to promote more coordinated care for all services provided to Medicare FFS beneficiaries. The attribution method for the proposed measure of per capita cost is closely aligned with the beneficiary assignment methods used for the Medicare Shared Savings Program, the Physician Quality Reporting System, the Quality and Resource Use Reports, and the Physician Value Based Modifier. Applying consistent assignment methods across these programs would allow us to streamline our processes and potentially reduce confusion among group practices considering participation in these different programs. In addition, large physician group practices providing the plurality of PCS should be responsible for coordinating the care of the beneficiaries; therefore, the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is appropriate for these groups. We note that single specialty groups that do not provide primary care services (e.g., anesthesiologists would not be attributed beneficiaries under this rule). Thus this measure would not be used for such single specialty groups.

S.13.3. **Identify and define peer group** *Identify the peer group and detail how peer group is identified and provide rationale for this methodology.*
A medical practice group's peer group consists of all other medical practice groups nationwide.

S.13.4. **Sample size** ***Detail the sample size requirements for reporting measure results.***
Only those medical group practices with at least 20 attributed beneficiaries receive the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries. This sample size was tested to ensure that the measure is statistically reliable, while providing measure results for a maximum number of medical group practices.

Eligible professionals are defined in more detail in the attachment titled S_7_2_Construction_Logic.

S.13.5. **Define benchmarking and comparative estimates** *Detail steps to produce benchmarking and comparative estimates and provide rationale for this methodology.*
A medical practice group's total per capita costs are compared with the average total per capita cost of all medical group practices. To compute the benchmark, each group's performance is weighted by the number of attributed beneficiaries, giving less weight in this benchmark to those with fewer attributed beneficiaries. This acknowledges that the total per capita cost of groups with fewer attributed beneficiaries may not be as reliable as those with a greater number of attributed beneficiaries. Simple differences are then calculated to compare a practice's and its peers' total per capita costs. This is intended to stimulate medical group practices to deliver the highest quality care, efficiently and effectively.

Detailed steps for the computation of the benchmarks are as follows:

STEP 1. COMPUTE THE BENCHMARK MEAN.

- Compute the numerator of the benchmark by first multiplying the total per capita cost of each medical group practice by the number of its attributed beneficiaries. The sum of these yields the numerator.
- Compute the denominator of the benchmark by summing the number of attributed beneficiaries across all medical practice groups.
- Compute the benchmark by dividing the numerator by the denominator.

STEP 2. COMPUTE THE SIMPLE DIFFERENCE.

The difference between a practice's and the benchmark total per capita cost is computed by subtracting the benchmark total per capita cost from the practice's total per capita cost.

- A simple difference greater than zero indicates that the medical group practice's total per capita costs are higher than the average total per capita costs of all groups.
- A simple difference less than zero indicates that the medical group practice's total per capita costs are lower than the average total per capita costs of all groups.
- A simple difference equal to zero indicates that the medical group practice's total per capita costs are equal to the average total per capita costs of all groups.

Appendix B

Citations

IM.1.2. Citations for Evidence of High Impact cited in IM.1.1.

Agency for Healthcare Research & Quality. "Improving Health Care Quality." AHRQ Pub. No. 02-P032. Rockville, MD: Agency for Healthcare Research & Quality. September 2002. Available at [http://www.ahrq.gov/news/qualfact.pdf]. Accessed January 3, 2013.

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McGlynn, Elizabeth A. "Identifying, Categorizing, and Evaluating Health Care Efficiency Measures: Final Report." AHRQ Publication No. 08-0030. Rockville, MD: Agency for Healthcare Research & Quality. April 2008. Available at [http://www.ahrq.gov/qual/efficiency/efficiency.pdf]. Accessed January 3, 2013.

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IM.2.3. Citations for Data on Performance Gap

Fisher, Elliot, David Goodman, Jonathan Skinner, and Kristen Bronner. "Health Care Spending, Quality, and Outcomes: More Isn't Always Better." Hanover, NH: Dartmouth Institute for Health Policy and Clinical Practice, February 2009. Available at [http://www.dartmouthatlas.org/downloads/reports/Spending_Brief_022709.pdf]. Accessed January 3, 2013.

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IM.2.5. **Citations for Data on Disparities cited in IM.2.4**

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Contact Information

Co.1 **Measure Steward (Intellectual Property Owner):**
Centers for Medicare & Medicaid Services

Co.2 **Point of Contact:**
Sheila | Roman | sheila.roman@cms.hhs.gov | 410-786-6004

Co.3 **Measure Developer if different from Measure Steward:**
Centers for Medicare & Medicaid Services

Co.4 **Point of Contact:**
Sheila | Roman | sheila.roman@cms.hhs.gov | 410-786-6004

Additional Information

Workgroup/Expert Panel involved in measure development
Ad.1 **Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.**

Measure Developer/Steward Updates and Ongoing Maintenance
Ad.3 **Year the measure was first released:** 1998
Ad.4 **Month and Year of most recent revision:** 12/2012
Ad.5 **What is your frequency for review/update of this measure?** Annual
Ad.6 **When is the next scheduled review/update for this measure?** 09/2013

Ad.7 **Copyright statement:**
Ad.8 **Disclaimers:**
Ad.9 **Additional Information/Comments:**

Measure Testing to Demonstrate Scientific Acceptability of Measure Properties

Measure Title: Payment-Standardized Total Per Capita Cost Measure for Medicare Fee-for-Service (FFS) Beneficiaries

Date of Submission: 3/8/2013

Type of Measure:

☐ Composite	☐Outcome
X Cost/resource	☐Process
☐Efficiency	☐Structure

This Word document template must be used to submit information for measure testing.

- **For all measures, sections 1, 2a2, 2b2, 2b3, 2b5 must be completed**
- **For outcome or resource use measures**, section **2b4** also must be completed
- If specified for **multiple data sources** (e.g., claims and medical records), section **2b6** also must be completed
- Respond to all questions with answers immediately following the question (*unless meet the skip criteria or those that are indicated as optional*).
- Maximum of 10 pages (*incuding questions/instructions; do not change margins or font size; contact project staff if need more pages*)
- All information on testing to demonstrate meeting the criteria for scientific acceptability of measure properties (2a,2b) must be in this form. An appendix for *supplemental* materials may be submitted, but there is no guarantee it will be reviewed.

1. DATA/SAMPLE USED FOR ALL TESTING OF THIS MEASURE

Often the same data are used for all aspects of measure testing. In an effort to eliminate duplication, the first five questions apply to all measure testing. If there are differences by aspect of testing,(e.g., reliability vs. validity) be sure to indicate the specific differences in question 7.

1.1. What type of data was used for testing? (*Check all the sources of data identified in the measure specifications and data used for testing the measure. Testing must be provided for all the types of data specified and intended for measure implementation*)

Measure Specified to Use Data From:	Measure Tested with Data From:
☐abstracted from paper record	☐abstracted from paper record
X administrative claims	X administrative claims
☐clinical database/registry	☐clinical database/registry
☐abstracted from electronic health record	☐abstracted from electronic health record
☐eMeasure implemented in electronic health record	☐eMeasure implemented in electronic health record
☐other: Click here to describe	☐other: Click here to describe

1.2. If used an existing dataset, identify the specific dataset *(the dataset used for testing must be consistent with the measure specifications for target population and healthcare entities being measured; e.g., Medicare Part A claims, Medicaid claims, other commercial insurance, nursing home MDS, home health OASIS, clinical registry).*

Testing of the measure is based on Medicare Parts A and B administrative claims and enrollment data for the measurement year, and CMS' Hierarchal Condition Category (HCC) risk scores (used in risk adjustment). This is consistent with the measure specifications for the target population and healthcare entities being measured.

1.3. What are the dates of the data used in testing? January 1, 2011 to December 31, 2011

1.4. What levels of analysis were tested? (*testing must be provided for all the levels specified and intended for measure implementation, e.g., individual clinician, hospital, health plan*)
☐ **individual clinician** **X group/practice** ☐ **hospital/facility/agency** ☐ **health plan**
☐ **other**: Click here to describe

1.5. How many and which measured entities were included in the testing and analysis (by level of analysis and data source)? (*identify the number and descriptive characteristics of measured entities included in the analysis (e.g., size, location, type); if a sample was used, describe how entities were selected for inclusion in the sample*)

The primary data used in this analysis include medical group practices, identified by Taxpayer Identification Number (TIN), that satisfied the following criteria in 2011: (1) at least 25 eligible professionals (EPs) billed Medicare under the group's TIN; (2) at least 20 beneficiaries were attributed to the medical group practice; and (3) the medical group practice was located in California, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, or Wisconsin. Medical group practices in these nine states received Individual Physician Quality and Resource Use Reports (QRURs) in December, 2012. In fall 2013, QRURs will be disseminated to all medical group practices nationwide with at least 25 EPs. (More information on the attribution rule can be found in Adjustments of Comparability Section S.13.2., Detail Attribution Approach.)

There were 1,450 medical group practices in the nine states in total, regardless of whether or not they had at least 20 attributed beneficiaries. Of those, 881 (61 percent) had at least 20 beneficiaries attributed to the group, and, of these, 802 medical group practices (91 percent) had at least 25 EPs as well as at least 20 attributed beneficiaries. Among these 802 groups, 44 percent (353 groups) had 25 to 50 EPs, 25 percent (202 groups) had 51 to 100 EPs, 17 percent (136 groups) had 101 to 200 EPs, and 14 percent (111 groups) had more than 200 EPs. The number of groups with and without at least 20 attributed beneficiaries, by the number of EPs, is available in Exhibit I.1 in Section I.A of the supplementary materials.

Among the medical group practices with at least 25 EPs and 20 attributed beneficiaries, approximately 22 percent of groups were located in California. Illinois and Michigan had the second- and third-highest number of groups among the nine states with 20 and 16 percent of groups located in the two states, respectively. Minnesota, Missouri, and Wisconsin each had between 9 and 10 percent. Finally, Iowa, Kansas, and Nebraska had the fewest number of groups within each state with 5, 4, and 3 percent, respectively.

For medical group practices with at least 25 EPs and 20 attributed beneficiaries, the average number of EPs in a group was 145 (median = 59; coefficient of variation[1] = 2.4) and the average number of beneficiaries attributed to the group was 3,267 (median = 1,189; coefficient of variation = 1.6). The average number of EPs in a medical group practice was highest in California, with an average of 202 EPs per medical group practice. Minnesota, Wisconsin, and Michigan had the second-, third-, and fourth-highest number of EPs per group with 197, 197, and 118, respectively. The remaining five states had an average ranging from 88 to 111 EPs. The average number of beneficiaries attributed to a group practice was highest in Wisconsin, with 5,501 beneficiaries attributed to a group. Iowa, Missouri, and Kansas had the second-, third-, and fourth-highest number of attributed beneficiaries with 4,553, 3,702, and 3,349 attributed beneficiaries on average, respectively. All other states had fewer than 3,079 attributed beneficiaries. California had the lowest number of attributed beneficiaries, at 2,621.

EPs were associated with medical specialties based on the plurality of the two-digit CMS specialty codes on all 2011 professional claims for which the physician was listed as the "performing provider." Primary care physicians—comprising physicians practicing Internal Medicine, Family Practice, General Practice, or Geriatric Medicine—represented 33 percent of all EPs practicing in the nine states, followed by Medical Specialists at 20 percent and Surgeons at 16 percent. Other (Non-Physician) Medical Professionals[2] made up 16 percent of the sample, Other Physicians 9 percent, and Emergency Medicine Physicians 5 percent.

1.6. How many and which <u>patients</u> were included in the testing and analysis (by level of analysis and data source)? (*identify the number and descriptive characteristics of patients included in the analysis (e.g., age, sex, race, diagnosis); if a sample was used, describe how patients were selected for inclusion in the sample*)

Medicare fee-for-service (FFS) beneficiaries were attributed to medical group practices based on the attribution methodology described in the Adjustments of Comparability Section S.13.2 (Detail Attribution Approach). There were 2,619,746 beneficiaries attributed to medical group practices with at least 25 EPs and at least 20 attributed beneficiaries across the nine states. By states, the greatest number of beneficiaries was attributed to groups in Illinois (488,854) and California (469,091) and the fewest number of beneficiaries was attributed to Nebraska (70,194). Approximately three-quarters (75.2 percent) of beneficiaries are 65 years old or older and approximately 23 percent are 80 years old or older. About 56 percent of beneficiaries are female and the racial/ethnic composition of the sample is as follows: 84 percent white, 9 percent black, 3 percent Hispanic, 2 percent Asian, and 2 percent other races/ethnicities. About one-quarter (26 percent) of the sample is dually eligible, meaning that the beneficiary was dually eligible for Medicaid due to disability, low income, or some combination of factors. Lastly, the average HCC score is approximately 1.1, with an inter-quartile range of 0.21 (0.93 at the 25th percentile and 1.14 at the 75th percentile). A comparison of patient descriptive characteristics, by the size of the medical group practices, is available in Exhibit I.2 in Section 1.B of the Supplementary Materials.

[1] The coefficient of variation is equal to the standard deviation divided by the mean and provides a standardized measure of variation.

[2] A list of non-physician specialties can be found in the attachment S13_Specialty_Code.

1.7. If there are differences in the data or sample used for different aspects of testing (e.g., reliability, validity, exclusions, risk adjustment), identify how the data or sample are different for each aspect of testing reported below.
Not applicable. The same data and sample were used for all testing below.

_____

2a2. RELIABILITY TESTING
Note*: If accuracy/correctness (validity) of data elements was empirically tested, separate reliability testing of data elements is not required – report validity of data elements in 2b2*

2a2.1. What level of reliability testing was conducted? (*may be one or both levels*)
☐ **Critical data elements used in the measure** (*e.g., inter-abstractor reliability*)
X **Performance measure score** (e.g., *signal-to-noise*)

2a2.2. For each level checked above, describe the method of reliability testing and what it tests (*describe the steps—do not just name a method; what type of error does it test; what statistical analysis was used*)

To assess reliability of the Payment-Standardized Total Per Capita Cost Measure for Medicare Fee-for-Service (FFS) Beneficiaries, we measured the extent of variation in the measure due to actual differences in the performance of medical group practices versus variation that arose from measurement error. Statistically, reliability depends on performance variation for a measure across medical group practices ("signal"), the random variation in performance for a measure within a group's panel of attributed beneficiaries ("noise"), and the number of beneficiaries attributed to the group. High reliability for a measure suggests that comparisons of relative performance across groups are likely to be stable over different performance periods and that the performance of one group on the measure can be confidently distinguished from another. For each medical group practice, reliability was estimated as a ratio of variation between groups and the total variation (between groups and variation from measurement error):

$$\text{Reliability} = \frac{\text{Variation Between Groups}}{\text{Variation Between Groups} + \text{Variation from Measurement Error}}$$

Potential reliability values range from 0.00 to 1.00, where 1.00 (highest possible reliability) signifies that all variation in the measure's rates is the result of variation in differences in performance across groups, whereas 0.0 (lowest possible reliability) signifies that all variation is a result of measurement error. Although there is no universally agreed-upon minimum reliability threshold above which performance can be deemed reliable, reliabilities in the 0.50–0.70 range are often considered moderate and values greater than 0.70 high.

A detailed description of how the reliability was computed is available in Section II.A of the supplementary materials.

2a2.3. For each level checked above, what were the statistical results from reliability testing? *(e.g., percent agreement and kappa for the critical data elements; distribution of reliability statistics from a signal-to-noise analysis and association with case volume)*

For medical group practices with at least 25 EPs and 20 attributed beneficiaries, we found that the average reliability was 0.95, that 99 percent of groups (797 of 802) had a reliability exceeding 0.50, and 96 percent of groups (769 of 802) had a reliability exceeding 0.70—a common threshold for high

reliability. Reliability increased with the size of the medical group practice. For example, the average reliability for groups with more than 200 EPs was 0.99 and exceeded 0.70 for all 111 groups of this size.

All groups in the three highest quartiles for number of attributed beneficiaries had reliabilities exceeding 0.70. For these groups, which had more than 249 attributed beneficiaries, average reliabilities ranged from 0.97 to 1.00. For groups with 249 or fewer attributed beneficiaries, the average reliability was 0.83. About 98 percent (196 of 201) had reliabilities exceeding 0.50, and 84 percent (168 of 201) had reliabilities exceeding 0.70. Like group size, the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is more reliable among practices with more attributed beneficiaries. The threshold of at least 20 attributed beneficiaries allows for high reliabilities across the majority of groups while allowing more groups to receive resource use information in their confidential feedback reports (QRURs).

Exhibits II.1 and II.2 in Section II.B of the supplementary materials show the breakdown of reliabilities by group size and by the number of attributed beneficiaries.

2a2.4. What is your interpretation of the results in terms of demonstrating reliability? *(i.e., what do the results mean and what are the norms for the test conducted?)*

Our findings show that the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is a reliable measure of total resource use for medical group practices. The results show that for groups with at least 20 attributed beneficiaries, measure reliability exceeds 0.70 for 96 percent of groups.

2b2. VALIDITY TESTING

2b2.1. What level of validity testing was conducted? (*may be one or both levels*)

☐ **Critical data elements**

X Performance measure score

X Empirical validity testing

☐ **Systematic assessment of face validity of performance measure score as an indicator** of quality or resource use. *(i.e., is an accurate reflection of performance quality or resource use and can distinguish performance)*

2b2.2. For each level checked above, describe the method of validity testing and what it tests. *(describe the steps—do not just name a method; what was tested, e.g., accuracy of data elements compared to authoritative source, relationship to another measure as expected; what statistical analysis was used)*

Construct validity was tested in three ways. First, the non-price-standardized and non-risk-adjusted total per capita costs were compared to the risk-adjusted per capita cost measure using Pearson correlations at the group practice level. Then, standard utilization statistics were compared with the total per capita cost measure using Pearson correlations at the group practice level. The standard utilization statistics examined included counts of the following: professional evaluation and management services, procedures, hospital services, emergency services, ancillary services, post-acute services, and all other services. Lastly, for a subset of medical group practices, namely those that practiced in Iowa, Kansas, Missouri, or Indiana, we examined whether their standard utilization statistics in 2010 correlated with the total per capita cost measure in 2011.

The non-price-standardized and non-risk-adjusted measures and the utilization statistics were utilized as proxies to evaluate how well the Payment-Standardized Total Per Capita Cost Measure for

Medicare Beneficiaries measures the overall performance of medical group practices. The underlying assumption behind the first correlation is that the correlation between the unadjusted (non-payment-standardized and non-risk-adjusted) costs and the risk-adjusted costs should be highly correlated. For correlations between the utilization measures and total per capita cost, the anticipated strength of the correlation is anticipated to depend on the costliness of the service being counted. For example, expensive services such as inpatient hospital services and post-acute care services (such as services in a skilled nursing facility) should have a strong positive correlation with the measure.

The Pearson correlation coefficient could theoretically range from –1.00 to 1.00 and indicates the strength of a linear relationship between two variables. The closer the value is to positive or negative 1, the stronger the relationship between the two variables. A positive correlation indicates that the values of the two variables are moving together in the same direction, whereas a negative correlation indicates movement in opposite directions.

In Section III.B of the Supplemental Materials we describe some findings from face validity tests that were conducted during the development phase of the measure.

2b2.3. What were the statistical results from validity testing? *(e.g., correlation; t-test, ANOVA)*

The non payment-standardized and non risk-adjusted total per capita costs were positive and highly correlated with a correlation of 0.852 ($p < 0.0001$). The total per capita cost measure and the utilization statistics were positive and highly correlated. All correlations were greater than 0.790. Lastly, the total per capita cost measure and the utilization statistics in 2010 were also positive and highly correlated. All correlations were greater than 0.900 except for the number of evaluation and management services (corr=0.643, $p < 0.0001$) and the number of procedures (corr=0.267, $p < 0.0001$).

Exhibit III.1 in Section III.A of the supplementary materials shows the correlation of total per capita cost with the utilization statistics in more detail.

2b2.4. What is your interpretation of the results in terms of demonstrating validity? *(i.e., what do the results mean and what are the norms for the test conducted?)*

This indicates that the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries accurately identifies the performance of medical group practices. The high correlation for higher cost services, such as inpatient and post-acute care services, indicates that the measure accurately captures the resources that are used by medical group practices.

_____

2b3. EXCLUSIONS ANALYSIS

NA ☐ no exclusions — *skip to #2b5*

2b3.1. Describe the method of testing exclusions and what it tests. *(describe the steps—do not just name a method; what was tested, e.g., whether exclusions affect overall performance scores; what statistical analysis was used*)

Excluded demographic characteristics of beneficiaries were compared with those included in the computation of the total per capita cost measure. T-tests were performed to examine whether there were statistically significant differences in beneficiary demographics. The demographic characteristics

that we examined were age, sex, race/ethnicity, dual eligibility status for Medicare and Medicaid, and the distribution of HCC risk scores.[3]

2b3.2. What were the statistical results from testing exclusions? *(include overall number and percentage of individuals excluded, frequency distribution of exclusions across measured entities, and impact on performance measure scores)*

There were 3,027,955 beneficiaries attributed to medical group practices with at least 25 EPs and 20 attributed beneficiaries across the nine states. Based on the following exclusion restrictions, 408,209 beneficiaries were excluded from the analysis:

- Newly enrolled or disenrolled in Medicare FFS Part A or Part B coverage[4]
- Enrolled in Medicare Advantage for any part of the year
- Those residing outside the United States

Following exclusions, 2,619,746 beneficiaries were included in our analysis. Compared to the original sample of beneficiaries, we observed no statistically significant differences in beneficiary characteristics after the exclusions were applied. A table comparing beneficiary-level characteristics of the original sample of beneficiaries to those who were included in the analysis is available in Exhibit IV.1 in Section IV of the supplementary materials.

2b3.3. What is your interpretation of the results in terms of demonstrating that exclusions are needed to prevent unfair distortion of performance results? *(i.e., the value outweighs the burden of increased data collection and analysis. Note: **If patient preference is an exclusion**, the measure must be specified so that the effect on the performance score is transparent, e.g., scores with and without exclusion*)

The statistically insignificant difference in the demographic characteristics of those beneficiaries included in the target population and those from the original sample indicates that our exclusions do not distort the performance of our results.

_____

2b5. IDENTIFICATION OF STATISTICALLY SIGNIFICANT & MEANINGFUL DIFFERENCES IN PERFORMANCE

2b5.1. Describe the method for determining if statistically significant and clinically/practically meaningful differences in performance measure scores among the measured entities can be identified. *(describe the steps—do not just name a method; what statistical analysis was used)*

To address statistical significance of the quality and per capita cost measures, we examined whether a group's performance rate differed significantly from the average rate across all groups. We conducted a two-sided test of the null hypothesis that the group's performance did not differ from the mean performance of all groups with at least one measure-eligible case. We estimated the percentage

[3] These characteristics were selected to compare included and excluded beneficiaries based on aspects of vulnerability (e.g., high risk scores, dual eligibility) among the Medicare population.

[4] Although death during the measurement year is not an explicit exclusion criterion, Part A or Part B beneficiaries who died during the measurement year would no longer be enrolled in Medicare and are therefore a subset of those excluded due to disenrollment in Medicare Parts A or B.

of groups that were statistically significantly different from the mean at the five percent significance level.

A detailed description of how the reliability was computed is available in Section V.A of the supplementary materials.

2b5.2. What were the statistical results from testing the ability to identify differences in performance measure scores across measured entities? *(at a minimum, the distribution of performance measure scores for the measured entities by decile/quartile, mean, std dev; preferably also number and percentage statistically different from mean or some benchmark, different form expected, etc.)*

For groups with at least 25 EPs and 20 attributed beneficiaries, the average payment-standardized, risk-adjusted per capita cost was $10,602. The interquartile range was $2,346 ($8,819 at the 25th percentile and $11,165 at the 75th percentile). The average per capita cost decreased as group size increased from $11,075 for group practices with 25 to 50 EPs to $9,862 for group practices with more than 200 EPs.

Exhibit V.1 in Section V.B of the supplementary materials shows the distribution of the per capita cost by group size and by state.

Across the 802 medical group practices with at least 25 EPs and 20 attributed beneficiaries, 65 percent (523 of 802) reported payment-standardized, risk-adjusted total per capita costs that were either statistically significantly greater or less than the mean payment-standardized, risk-adjusted total per capita cost at the 5 percent significance level. Slightly less than one-fifth (19 percent, (155 of 802) had costs that were statistically greater (more expensive) than the mean, and 46 percent (368 of 802) had costs that were statistically less than (less expensive) than the mean. Groups with more than 200 EPs were more likely than smaller groups to have total per capita costs that were statistically significantly different (either greater or less) than the mean.

The average payment-standardized, risk-adjusted per capita costs were $16,151 for groups that were statistically significantly greater than the mean, $10,218 for groups statistically no different from the mean, and $8,555 for groups that were significantly lower than that mean. The interquartile range was $6,094 for groups that were significantly greater than the mean; $1,670 for groups that were significantly lower than the mean; and $1,179 for groups statistically no different from the mean.

2b5.3. What is your interpretation of the results in terms of demonstrating the ability to identify statistically significant and clinically/practically meaningful differences in performance across measured entities? *(i.e., what do the results mean and what are the norms for the test conducted?*)

The substantial variation in the payment-standardized total per capita costs and the substantial number of medical group practices that can be identified as being statistically lower or higher than the peer group mean indicate that the total per capita cost measure is able to meaningfully differentiate group performance.

_____

If not an intermediate or health outcome or resource use measure, this section can be deleted.

2b4. RISK ADJUSTMENT/STRATIFICATION FOR OUTCOME OR RESOURCE USE MEASURES

2b4.1. What method of controlling for differences in case mix is used?

X Statistical risk model with 6 risk factors

☐ **Stratification by** Click here to enter number of categories **risk categories**

☐ **No risk adjustment or stratification**

☐ **Other,** Click here to enter description

2b4.2. If an outcome or resource use measure is not risk adjusted or stratified, provide rationale and analyses to demonstrate that controlling for differences in patient characteristics (case mix) is not needed to achieve fair comparisons across measured entities.

Not applicable. Our model is risk-adjusted to control for patient risk factors.

2b4.3. Describe the conceptual/clinical and statistical methods and criteria used to select factors used in the statistical risk model or for stratification by risk. *(e.g., potential factors identified in literature and/or expert panel; regression analysis; statistical significance of p<0.10; correlation of x or higher)*

The risk adjustment of the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries utilizes the CMS-HCC risk score derived from the CMS-HCC risk-adjustment model that Medicare uses to adjust payments to Medicare Advantage plans. Each risk score summarizes a Medicare beneficiary's expected costs of care relative to other beneficiaries into one score based on a beneficiary's demographic characteristics and medical history. The CMS-HCC risk-adjustment methodology has undergone an extensive review process to ensure its suitability for the Medicare FFS population and to select reliable input diagnoses that are specifically relevant for the system and for the Medicare FFS population. This credibility of the risk-adjustment approach, along with the transparency of the approach and the desire to harmonize it with other CMS initiatives, led to the selection of this risk-adjustment approach.

During development of the risk-adjusted, payment-standardized total per capita cost measure, we tested several different options for severity adjustment including, individual HCCs and risk scores, CMS' Complication or Comorbidity (CC) or Major Complication or Comorbidity (MCC) lists in the Medicare Severity Diagnosis Related Groups (MS-DRG) grouper, individual MS-DRGs and a combination of CCs, MCCs, and HCCs. All options were tested in combination with age- and sex-interacted dummy variables, with dual Medicare and Medicaid enrollment status, and local market characteristics. The models were compared using goodness of fit as measured by R-squared and coefficient estimates using split-half testing, in which the sample was split into two randomly selected halves and the correlations in cost rankings examined.

2b4.4. What were the statistical results of the analyses used to select risk factors?

The HCC model fit the data better than the CC/MCC model. Addition of CCs and MCCs to the model did little to improve the fit of the model of HCC scores alone, increasing the R-squared by 0.002 points. Addition of MS-DRGs also did little to improve the fit, increasing the R-squared by a factor of 0.017 points. Two models, one that contained only the HCC score and its square and another that contained both HCC scores and MS-DRGs were selected for split-half testing. We found that the correlation was slightly worse in the second model. The addition of CCs and MCCs or MS-DRGs did little to improve the model fit.

The R-squared of the model was 0.20 and all coefficients included in the regression model were statistically significant at the 1 percent significance level. The effect of the risk-adjustment methodology was also examined. Groups with the lowest 20 percent of all costs were adjusted upward by an average of 17 percent and the highest 20 percent of all costs were adjusted downward by an average of 24 percent. The middle 60 percent of groups, on average, had per capita costs adjusted upward by about 1 percent.

2b4.5. Describe the method of testing/analysis used to develop and validate the adequacy of the statistical model or stratification approach. *(describe the steps—do not just name a method; what statistical analysis was used)*

During the development phase of the model, a logarithmic model was considered in addition to the linear regression model. A linear model was selected based on lack of improvement in model fit from a logarithmic model and due to the potential difficulty it might pose in interpretation by the public.

Provide the statistical results from testing the approach to controlling for differences in patient characteristics (case mix) below.
if stratified, skip to 2b4.9

2b4.6. Statistical Risk Model Discrimination Statistics

Discrimination of the measure is described by the R-squared of the model, because this is a multivariate linear regression model. R-squared results are described in Section 2b4.4.

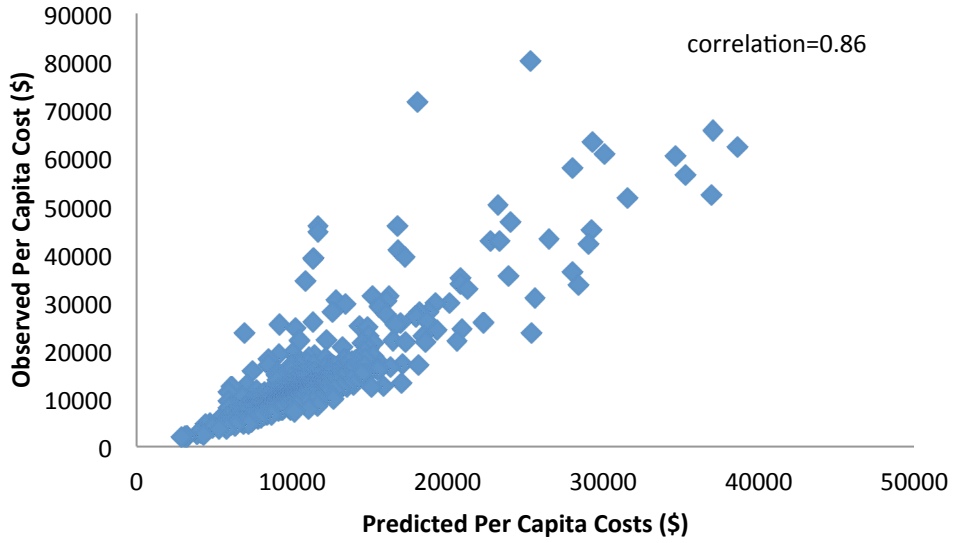
2b4.7. Statistical Risk Model Calibration Statistics

To examine the fit of the risk adjustment model to the data set, we examined the Pearson's correlation between the unadjusted total per capita cost (observed costs) and the risk-adjusted total per capita cost (expected costs).

2b4.8. Statistical Risk Model Calibration – Risk decile plots or calibration curves:

Exhibit 1 shows a scatter plot of the payment standardized non risk-adjusted (observed) per capita costs and risk-adjusted (predicted) per capita costs. There is a strong positive correlation of 0.86 ($p < 0.001$) between the two variables, indicating that the model accurately fits our data.

Exhibit 1. Scatterplot of Payment Standardized Non Risk-Adjusted (Observed) Per Capita Costs and Risk-Adjusted (Predicted) Per Capita Costs



Source: Medicare fee-for-service (FFS) claims data, January to December 2011.

Note: The total number of medical group practices (N = 802) includes only those groups with at least 25 EPs and at least 20 attributed beneficiaries practicing in California, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, or Wisconsin in 2011. Groups are identified by their taxpayer identification numbers (TINs). The diagonal line represents the fitted line.

2b4.9. Results of Risk Stratification Analysis

Not applicable. Our model is not stratified.

2b4.10. What is your interpretation of the results in terms of demonstrating adequacy of controlling for differences in patient characteristics (case mix)? *(i.e., what do the results mean and what are the norms for the test conducted)*

The statistical significance of the coefficients included in the regression model, the explanatory power of these coefficients included in the model as indicated by the R-squared value, and the face validity of the risk adjustment approach demonstrate that the CMS-HCC risk score adequately controls for patient risk factors.

***2b4.11. Optional Additional Testing** *(not required, but would provide additional support of adequacy of risk model, e.g., testing of risk model in another data set; sensitivity analysis for missing data; other methods)*

SUPPLEMENTAL MATERIALS

PAYMENT-STANDARDIZED TOTAL PER CAPITA COST MEASURE FOR MEDICARE FEE-FOR-SERVICE BENEFICIARIES

Submitted by:

The Centers for Medicare & Medicaid Services

January 31, 2013

Revised March 8, 2013

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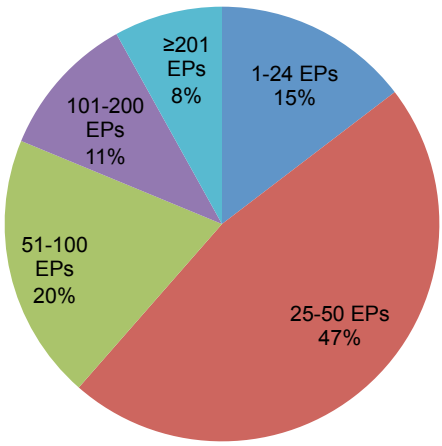
I. DESCRIPTION OF SAMPLE USED FOR TESTING

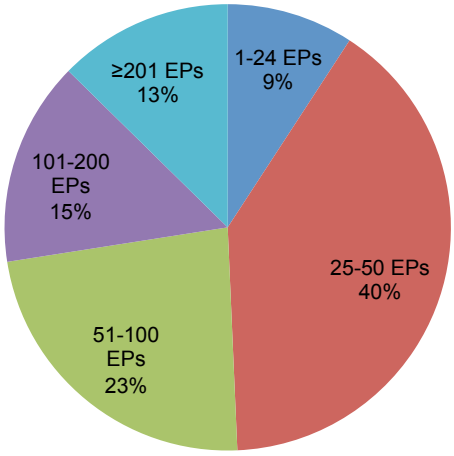
A. Measured Entities Included in Testing and Analysis

- **Among all groups, 85 percent (1,238 of 1,450) had at least 25 eligible professionals (EPs) (Exhibit I.1).** Almost half (47 percent) of all groups had 25 to 50 EPs, 20 percent had 51 to 100 EPs, 11 percent had 101 to 200 EPs, and 8 percent had 201 or more EPs.
- **881 of the 1,450 groups (61 percent) had at least 20 attributed beneficiaries.**[5] Groups without attributed beneficiaries were more likely to be the smallest groups (25 to 50 EPs) than to be groups with more than 50 EPs.
- **Among groups with at least 20 attributed beneficiaries,** 91 percent (802 of 881) overall had at least 25 EPs; 40 percent of all groups had 25 to 50 EPs, 23 percent had 51 to 100 EPs, 15 percent had 101 to 200 EPs, and 13 percent had 201 or more EPs. The proportion of groups within group size categories that had at least 20 attributed beneficiaries increased as group size increased.
    - Within group size categories, 52 percent of groups with 25 to 50 EPs, 70 percent of groups with 51 to 100 EPs, 88 percent of groups with 101 to 200 EPs, and 95 percent of groups with 201 or more EPs had at least 20 attributed beneficiaries and were ultimately included in the analysis.

Exhibit I.1. Number of Groups in the Nine States, by Medical Group Practice Size



With and Without Attributed Beneficiraries (N = 1,450)



With at Least 20 Attributed Beneficiaries (N = 881)

Source: Medicare fee-for-service (FFS) claims data, January to December 2011.
Note: Medical group practices are identified by their taxpayer identification numbers (TINs). The analysis is restricted to medical group practices with eligible professionals (EPs) practicing in California, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, or Wisconsin in 2011.

[5] A description of the attribution methodology can be found in Section S.7.2. Construction Logic.

B. Patients Included in Testing and Analysis

- **There were 2,619,746 beneficiaries attributed to medical group practices with at least 25 EPs and at least 20 attributed beneficiaries across the nine states.** The greatest number of beneficiaries was attributed to groups in Illinois (488,854) and California (469,091); the fewest number to beneficiaries was attributed to Nebraska (70,194). Approximately three-quarters (75.2 percent) of beneficiaries are 65 years old or older and approximately 23 percent are 80 years old or older. About 56 percent of beneficiaries are female, and the racial/ethnic decomposition of the sample is as follows: 84 percent white, 9 percent black, 3 percent Hispanic, 2 percent Asian, and 2 percent other races/ethnicities. Dual eligible beneficiaries—namely, those who are eligible for Medicaid due to disability, low income, or some combination of factors—constitute about one-quarter (26 percent) of the sample. The average hierarchical condition category (HCC) risk score is approximately 1.1, with an interquartile range of 0.21 (0.93 at the 25th percentile and 1.14 at the 75th percentile).
- **Beneficiaries attributed to larger medical group practices were similar in age distribution, more likely to be female, less likely to be white, and less likely to be dually eligible.** Beneficiaries attributed to larger groups were also slightly more likely to be female (57.6 percent female for groups with more than 200 EPs, compared with 56.3 percent in groups with 25 to 50 EPs) and slightly less likely to be white (79.8 percent white for groups with more than 200 EPs, compared with 85.2 percent in groups with 25 to 50 EPs).
- **Beneficiaries in larger groups had similar hierarchical condition category (HCC) risk scores.** The average risk score was 1.08 for groups with 25 to 50 EPs and 1.07 for groups with more than 200 EPs. The HCC risk scores at the 25th and 75th percentiles ranged from 0.90 to 1.17 for groups with 25 to 50 EPs and from 0.97 to 1.13 for groups with more than 200 EPs.

Exhibit I.2. Summary of Characteristics of Beneficiaries Attributed to Medical Group Practices for Groups with At Least 25 Eligible Professionals (EPs) and At Least 20 Attributed Beneficiaries, by Group Size (Percentages Unless Otherwise Noted)

Beneficiary Characteristic	Averages Across All Groups	Groups with 25 to 50 EPs	Groups with 51 to 100 EPs	Groups with 101 to 200 EPs	Groups with More than 200 EPs
Age (%)					
< 45	7.68	6.77	8.31	9.75	6.88
≥ 45 and < 65	17.13	17.04	17.51	16.79	17.11
≥ 65 and < 70	21.17	21.36	20.74	21.57	20.86
≥ 70 and < 75	17.56	17.61	17.55	17.34	17.70
≥ 75 and < 80	13.90	13.96	13.86	13.54	14.26
≥ 80 and < 85	11.30	11.41	11.19	10.82	11.71
≥ 85	11.27	11.87	10.83	10.17	11.48
Sex (%)					
Female	56.14	56.28	55.05	56.24	57.55
Male	43.86	43.72	44.95	43.76	42.45
Race/Ethnicity (%)					
White	84.31	85.17	86.43	82.59	79.84
Black	8.80	7.83	8.22	9.43	12.16
Hispanic	2.64	2.55	2.20	3.50	2.69
Asian	1.79	1.85	1.19	1.77	2.68
Other	2.11	2.36	1.63	1.96	2.37
Dual Status[a] (%)					
Yes	25.50	25.91	24.47	26.01	25.44
No	74.50	74.09	75.53	73.99	74.56
Distribution of HCC[b] Scores					
Mean	1.07	1.08	1.07	1.04	1.07
Standard Deviation	0.27	0.31	0.27	0.22	0.19
Min	0.44	0.44	0.61	0.55	0.85
1%	0.62	0.60	0.69	0.68	0.85
25%	0.93	0.90	0.93	0.94	0.97
50%	1.02	1.03	1.02	0.99	1.02
75%	1.14	1.17	1.12	1.09	1.13
95%	1.60	1.63	1.62	1.42	1.37
99%	2.01	2.16	1.94	1.91	1.89
Max	2.86	2.63	2.86	2.08	2.22

Source: Medicare FFS claims data, January to December 2011.

Note: The total number of medical group practices (N = 802) includes only those groups with at least 25 EPs and at least 20 attributed beneficiaries practicing in California, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, or Wisconsin in 2011. Groups are identified by their taxpayer identification numbers (TINs).

[a] An indicator showing whether the Medicare beneficiary was dually eligible for Medicaid due to disability, low income, or some combination of these factors.

[b] HCC Score: Hierarchical Condition Category Score.

II. RELIABILITY ANALYSIS

A. Methods

1. Overview

To assess reliability of the Payment-Standardized Total Per Capita Cost Measure for Medicare Fee-for-Service (FFS) Beneficiaries, we measured the extent of variation in the measure that is due to actual differences in the performance of medical group practices versus variation that arises from measurement error. Statistically, reliability depends on performance variation for a measure across medical group practices ("signal"), the random variation in performance for a measure within a group's panel of attributed beneficiaries ("noise"), and the number of beneficiaries attributed to the group. High reliability for a measure suggests that comparisons of relative performance across groups are likely to be stable over different performance periods and that the performance of one group on the measure can be confidently distinguished from another. For each medical group practice, reliability was estimated as a ratio of variation between groups and the total variation (between groups and variation from measurement error):

$$\text{Reliability} = \frac{\text{Variation Between Groups}}{\text{Variation Between Groups} + \text{Variation from Measurment Error}}$$

2. Detailed Methods

The methods outlines below follows closely with Adams (2009).

Step 1. Compute the Variation from Measurement Error

For a given medical group practice, the cost profile is the average cost of total Part A and Part B Medicare expenditures among all n beneficiaries in the sample ($\bar{c}$) multiplied by the ratio of group j's observed to expected costs (O_j/E_j). As the number of attributed beneficiaries grows large, O_j/n will converge in distribution to a normal distribution by the central limit theorem, and E_j/n wll converge in probability to $E(x^{\square})\beta$. By the Slutsky theorem, O_j/E_j converges in distribution to a normal distribution.

Observed costs are the sum of Part A and Part B expenditures across all beneficiaries i attributed to the group—that is, $i \in i(j)$—where these beneficiary-level expenditures are assumed equal to a linear combination of HCC risk scores (and squared scores), an end-stage renal disease indicator ($x_i^{\square}$), and a homoskedastic error term (ε_i):

$$O_j = \sum_{i \in i(j)} x_i'\beta + \varepsilon_i = \sum_{i \in i(j)} x_i'\beta + \iota_i'\varepsilon,$$

where ι_i' is a $1 \times n$ matrix with a 1 in the ith position and zeros in all other positions.

Expected costs are the predicted values from linear regression:

$$E_j = \sum_{i \in i(j)} x_i'\hat{\beta} = \sum_{i \in i(j)} x_i'\beta + x_i'(X'X)^{-1}X'\varepsilon$$

Given that $V(\varepsilon) = \sigma^2 I$, $V(O_j/E_j)$ can be computed using the delta method. The partial derivative of O_j/E_j with respect to ε is the following:

$$D_\varepsilon(O_j/E_j) = \frac{1}{E_j^2}\left\{\sum_{i\in i(j)} E_j \iota_i' - O_j[x_i' (X' X)^{-1} X']\right\},$$

which implies a variance of

$$V(O_j/E_j) = D_\varepsilon(O_j/E_j) V(\varepsilon) D_\varepsilon' (O_j/E_j)$$

$$= \frac{\sigma^2}{(E_j^2)^2}\left\{\sum_{i\in i(j)} E_j \iota_i' - O_j[x_i' (X' X)^{-1} X']\right\}\left\{\sum_{i\in i(j)} E_j \iota_i - O_j[X(X' X)^{-1} x_i]\right\}$$

$$= \frac{\sigma^2}{E_j^4}\left[n_j E_j^2 - \left(2O_j E_j - O_j^2\right) M_j\right],$$

where $M_j \equiv \left(\sum_{i\in i(j)} x_i'\right)(X' X)^{-1}\left(\sum_{i\in i(j)} x_i\right)$ and noting that $\iota_i' X = x_i'$.

The variance of the cost profile (variation within groups) is then equal to $\bar{c}^2 V(O_j/E_j)$.

Step 2. Compute the Variation Between Groups

To compute the variation between groups, SAS's PROC MIXED procedure was used. Sample code from Adams (2009) is as follows:

```
PROC MIXED DATA=scoredata METHOD=REML;

   CLASS perf_upin;

   MODEL cost_profile = ;

   RANDOM perf_upin /GDATA=gdata;

RUN;
```

In the example, scoredata is the data set that was created in Step 1 above.

Step 3. Compute Reliabilities

After computing the variation between groups, the reliability of the measure can be computed for each medical group practice.

Reference

Adams, John L. "The Reliability of Provider Profiling: A Tutorial." Santa Monica, CA: RAND Corporation, 2009.

B. Results

Average reliabilities across all groups with at least 25 EPs and at least 20 attributed beneficiaries and by group size are shown in Exhibit II.1.

- **For medical group practices with at least 25 EPs and at least 20 attributed beneficiaries, the average reliability was 0.95.** Of all groups, more than 99 percent (797 of 802) had a reliability exceeding 0.50 and 96 percent (769 of 802) had a reliability exceeding 0.70—a common threshold for high reliability.
- **Reliability increased with the size of the medical group practice, defined by the number of EPs.** For all 111 groups with 201 or more EPs, the average reliability was 0.99 and the reliability exceeded 0.70. For about 99 percent of groups with 101 to 200 EPs, the reliability exceeded 0.70. Thus, the measure is more reliable among practices with 101 or more EPs. CMS specified the current threshold of at least 25 EPs to maximize the number of group practices that receive confidential Quality and Resource Use Reports (QRURs) in anticipation of the value-based payment modifier implementation in 2015. Limiting the threshold to groups with at least 101 EPs would limit the percentage of groups eligible to receive a QRUR with resource use information to 31 percent (247 of 802).

Exhibit II.1. Reliability of Risk-Adjusted, Payment-Standardized Total Per Capita Cost Measure by Group Size, for Groups with At Least 25 Eligible Professionals and At Least 20 Attributed Beneficiaries

Group Size	Number of Groups Reporting	Average Number of Beneficiaries Attributed to a Group	Average of Per Capita Cost Measure	Average Reliability	Number & Percent of Groups with Reliability Exceeding: 0.50	0.70
All Groups	802	3,267	10,602	0.95	797 (99.4%)	769 (95.9%)
25 to 50 EPs	353	914	11,075	0.91	350 (99.2%)	329 (93.2%)
51 to 100 EPs	202	2,490	10,674	0.96	201 (99.5%)	195 (96.5%)
101 to 200 EPs	136	4,233	9,870	0.97	135 (99.3%)	134 (98.5%)
201 or more EPs	111	10,979	9,862	0.99	111 (100%)	111 (100%)

Source: Medicare fee-for-service (FFS) claims data, January to December 2011.

Note: The total number of medical group practices (N = 802) includes only those groups with at least 25 EPs and at least 20 attributed beneficiaries practicing in California, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, or Wisconsin in 2011. Groups are identified by their taxpayer identification numbers (TINs).

Average reliabilities for groups with at least 25 EPs and 20 or more attributed beneficiaries by the number of attributed beneficiaries are shown in Exhibit II.2.

All groups in the three highest quartiles for number of attributed beneficiaries had reliabilities exceeding 0.70. For these groups, which had more than 249 attributed beneficiaries, average reliabilities ranged from 0.97 to 1.00. For groups with fewer than 250 attributed beneficiaries, the average reliability was 0.83. About 98 percent (196 of 201) had reliabilities exceeding 0.50, and 84 percent (168 of 201) had reliabilities exceeding 0.70. Like group size, the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is more reliable among practices with more attributed beneficiaries. The threshold of at least 20 attributed beneficiaries allows for high reliabilities across the majority of groups while allowing more groups to receive resource use information in their confidential feedback reports (QRURs).

Exhibit II.2. Reliability of Risk-Adjusted, Payment-Standardized Total Per Capita Cost Measure by the Number of Attributed Beneficiaries, for Groups with At Least 25 Eligible Professionals and At Least 20 Attributed Beneficiaries

Group Size Quartile of Number of Attributed Beneficiaries	Number of Groups Reporting	Average of Per Capita Cost Measure	Average Reliability	Number & Percent of Groups with Reliability Exceeding: 0.50	0.70
All Groups	802	10,602	0.95	797 (99.4%)	769 (95.9%)
Lowest quartile (20 to 249 attributed beneficiaries)	201	12,089	0.83	196 (97.5%)	168 (83.6%)
2nd quartile (250 to 1,189 attributed beneficiaries)	200	10,229	0.97	200 (100%)	200 (100%)
3rd quartile (1,190 to 4,341 attributed beneficiaries)	201	10,115	0.99	201 (100%)	201 (100%)
Highest quartile (4,342 to 52,194 attributed beneficiaries)	200	9,968	1.00	200 (100%)	200 (100%)

Source: Medicare fee-for-service (FFS) claims data, January to December 2011.

Note: The total number of medical group practices (N = 802) includes only those groups with at least 25 EPs and at least 20 attributed beneficiaries practicing in California, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, or Wisconsin in 2011. Groups are identified by their taxpayer identification numbers (TINs).

III. VALIDITY TESTING

A. Tests of Construct Validity

Construct validity was tested in three ways. First, the non-price-standardized and non-risk-adjusted total per capita costs were compared to the risk-adjusted per capita cost measure using Pearson correlations at the group practice level. Then, standard utilization statistics were compared with the total per capita cost measure using Pearson correlations at the group practice level. The standard utilization statistics examined included counts of the following: professional evaluation and management services, procedures, hospital services, emergency services, ancillary services, post-acute services, and all other services. Lastly, for a subset of medical group practices, namely those that practiced in Iowa, Kansas, Missouri, or Indiana, we examined whether their standard utilization statistics in 2010 correlated with the total per capita cost measure in 2011.

The non-price-standardized and non-risk-adjusted measures and the utilization statistics were utilized as proxies to evaluate how well the Payment-Standardized Total Per Capita Cost Measure for Medicare Beneficiaries measures the overall performance of medical group practices. The underlying assumption behind the first correlation is that the correlation between the unadjusted (non-payment-standardized and non-risk-adjusted) costs and the risk-adjusted costs should be highly correlated. For correlations between the utilization measures and total per capita cost, the anticipated strength of the correlation is anticipated to depend on the costliness of the service being counted. For example, expensive services such as inpatient hospital services and post-acute care services (such as services in a skilled nursing facility) should have a strong positive correlation with the measure.

The Pearson correlation coefficient could theoretically range from –1.0 to 1.0 and indicates the strength of a linear relationship between two variables. The closer the value is to positive or negative 1, the stronger the relationship between the two variables. A positive correlation indicates that the values of the two variables are moving together in the same direction, whereas a negative correlation indicates movement in opposite directions.

- The non-payment-standardized and non-risk-adjusted total per capita costs were positive and highly correlated with a correlation of 0.852 ($p < 0.0001$). This indicates that the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries accurately identifies the performance of medical group practices.
- The total per capita cost measure and the utilization statistics were positive and highly correlated. All correlations were greater than 0.785 (Exhibit III.1).
- The total per capita cost measure and the utilization statistics in 2010 were also positive and highly correlated. All correlations were greater than 0.900 except for the number of evaluation and management services (corr=0.643, $p < 0.0001$) and number of procedures (corr=0.267, $p < 0.0001$). This indicates that the measure accurately captures the resources that are used by medical group practices.

Exhibit III.1. Validity of Per Capita Cost Measure: Correlations Between the Risk-Adjusted, Payment-Standardized Total Per Capita Cost Measure and Utilization Statistics in 2011 and 2010

Utilization Statistics	Correlations with 2011 Utilization Measures[a]	Correlations with 2010 Utilization Measures[a]
Number of Professional Evaluation and Management Services	0.982	0.643
Number of Procedures	0.979	0.267
Number of Hospital Services	0.984	0.931
Number of Emergency Services	0.975	0.916
Number of Ancillary Services	0.974	0.911
Number of Post-Acute Services	0.786	0.900
Number of All Other Services	0.944	0.912

Source: Medicare fee-for-service (FFS) claims data, January to December 2011.

Note: The total number of medical group practices (N = 802) includes only those groups with at least 25 EPs and at least 20 attributed beneficiaries practicing in California, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, or Wisconsin in 2011. Groups are identified by their taxpayer identification numbers (TINs).

[a] All correlations are statistically significant with $p < 0.0001$.

E&M = evaluation and management.

B. Tests of Face Validity

During development of the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries, in-depth interviews were conducted with physicians on the measure. Three rounds of one-on-one, in-depth interviews with 20-25 physicians were conducted in Baltimore, Maryland; Boston, Massachusetts; and Indianapolis, Indiana. Approximately one-half of physicians were primary care physicians (PCPs) and half were a mix of medical specialists and surgeons. Several key findings emerged from the interviews:

- Many physicians responded favorable to holding multiple providers (such as providers in medical group practices) responsible for patient costs, rather than a single physician.
- Once the physicians understood the measures would be risk-adjusted, physicians stated that they would look at inpatient admissions and utilization of expensive tests or procedures to understand what might be driving their patient costs if they were identified as high cost physicians.
- Primary care physicians (PCPs) appeared to find more merit in per capita cost measures than did specialists. Because PCPs treat a wide range of health conditions and illnesses, they agreed that the per capita cost approach presented a holistic view of treatment costs.

Based on these findings, we believe that the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is a meaningful measure for medical group practices. In particular, the attribution rule that places an emphasis on PCS provided by PCPs through the first step attribution rule, while also acknowledging the role that physicians of other specialties and other eligible professionals have in providing PCS through the second step of the method makes this an appropriate method for capturing costs.

IV. EXCLUSION ANALYSIS

There were 3,027,955 beneficiaries attributed to medical group practices with at least 25 EPs and 20 attributed beneficiaries across the nine states. Based on the following exclusion restrictions, 408,209 beneficiaries were excluded from the analysis:

- Newly enrolled or disenrolled in Medicare FFS Part A or Part B coverage[6]
- Enrolled in Medicare Advantage for any part of the year
- Those residing outside the United States

Following exclusions, 2,619,746 beneficiaries were included in our analysis. The rationale for excluding these beneficiaries is available in the Adjustments for Comparability Section S.9.1 (Inclusion and Exclusion Criteria) of the measure information form.

To examine the potential for differences between excluded and included beneficiaries, t-tests were performed to examine whether there were statistically significant differences in beneficiary demographics. The demographic characteristics that we examined were age, sex, race/ethnicity, dual eligibility status for Medicare and Medicaid, and the distribution of HCC risk scores.

- **Compared to the original sample of beneficiaries, we observed no statistically significant differences in beneficiary characteristics after the exclusions were applied (Exhibit IV.1).** This indicates that our exclusions did not distort the performance of our results.

[6] Although death during the measurement year is not an explicit exclusion criterion, Part A or Part B beneficiaries who died during the measurement year would no longer be enrolled in Medicare and are therefore a subset of those excluded due to disenrollment in Medicare Parts A or B.

Exhibit IV.1. Comparison of Excluded and Included Beneficiaries, by Exclusion Criteria

Beneficiary Characteristic	Included Beneficiaries	Included and Excluded Beneficiaries	Excluded Beneficiaries: Part-Year Medicare Parts A or B	Excluded Beneficiaries: Medicare Advantage (HMO)	Excluded Beneficiaries: Living Outside U.S.
Sample Size (N)	2,619,746	3,027,955	407,605	119,434	762
Age (%)	4.43	4.50	4.95	3.79	1.84
<45	12.91	16.07	36.36	19.88	9.97
≥45 and <65	22.23	21.34	15.58	22.89	24.93
≥65 and <70	19.24	18.02	10.14	16.62	25.07
≥70 and <75	15.72	14.82	8.99	13.50	19.29
≥75 and <80	12.97	12.45	9.08	11.26	12.34
≥80 and <85	12.49	12.82	14.91	12.07	6.56
≥85					
Sex (%)	57.92	57.63	55.78	57.86	48.43
Female	42.08	42.37	44.22	42.14	51.57
Male					
Race/Ethnicity (%)	88.48	87.54	81.55	81.31	67.32
White	7.02	7.35	9.51	11.93	3.41
Black	1.26	1.44	2.62	2.39	5.91
Hispanic	1.35	1.59	3.10	2.01	15.22
Asian	1.67	1.73	2.08	1.94	7.48
Other					
Dual Status (%)	17.09	17.91	23.23	22.69	16.54
Yes	82.91	82.09	76.77	77.31	83.46
No					
Distribution of HCC Scores (%)					
Mean	1.03	1.06	1.25	1.14	0.80
Standard Deviation	0.88	0.93	1.20	1.02	0.72
Min	0.11	0.11	0.11	0.11	0.18
1%	0.25	0.25	0.27	0.26	0.27
25%	0.47	0.49	0.49	0.49	0.43
50%	0.75	0.75	0.83	0.81	0.55
75%	1.25	1.27	1.43	1.36	0.92
95%	2.79	2.94	3.81	3.22	2.01
99%	4.48	4.76	5.93	5.12	3.92
Max	14.85	14.85	14.74	12.26	7.28

Source: Medicare fee-for-service (FFS) claims data, January to December 2011.

Note: The total number of medical group practices (N = 802) includes only those groups with at least 25 EPs and at least 20 attributed beneficiaries practicing in California, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, or Wisconsin in 2011. Groups are identified by their taxpayer identification numbers (TINs).

HMO = health maintenance organization

V. STATISTICAL SIGNIFICANCE ANALYSIS

A. Methods

1. Overview

To address statistical significance of the quality and per capita cost measures, we examined whether a group's performance rate differed significantly from the average rate across all physicians. We conducted a two-sided test of the null hypothesis that the group's performance is not different from the mean performance of all groups with at least one measure-eligible case. We estimated the percentage of groups that were statistically significantly different from the mean at the five percent significance level.

2. Detailed Methods

Step 1. Compute the Variation from Measurement Error

For a given medical group practice, the cost profile is the average cost of total Part A and Part B Medicare expenditures among all n beneficiaries in the sample ($\bar{c}$) multiplied by the ratio of group j's observed to expected costs (O_j/E_j). As the number of attributed beneficiaries grows large, O_j/n will converge in distribution to a normal distribution by the central limit theorem, and E_j/n wll converge in probability to $E(x^{\square})\beta$. By the Slutsky theorem, O_j/E_j converges in distribution to a normal distribution.

Observed costs are the sum of Part A and Part B expenditures across all beneficiaries i attributed to the group—that is, $i \in i(j)$—where these beneficiary-level expenditures are assumed equal to a linear combination of HCC risk scores (and squared scores), an end-stage renal disease indicator ($x_i^{\square}$), and a homoskedastic error term (ε_i):

$$O_j = \sum_{i \in i(j)} x_i^{\square} \beta + \varepsilon_i = \sum_{i \in i(j)} x_i^{\square} \beta + \iota_i^{\square} \varepsilon,$$

where $\iota_i^{\square}$ is a $1 \times n$ matrix with a 1 in the ith position and zeros in all other positions.

Expected costs are the predicted values from linear regression:

$$E_j = \sum_{i \in i(j)} x_i^{\square} \hat{\beta} = \sum_{i \in i(j)} x_i^{\square} \beta + x_i^{\square} (X^{\square} X)^{-1} X^{\square} \varepsilon$$

Given that $V(\varepsilon) = \sigma^2 I$, $V\left(O_j/E_j\right)$ can be computed using the delta method. The partial derivative of O_j/E_j with respect to ε is the following:

$$D_{\varepsilon}(O_j/E_j) = \frac{1}{E_j^2}\left\{\sum_{i \in i(j)} E_j \iota_i^{\square} - O_j [x_i^{\square} (X^{\square} X)^{-1} X^{\square}]\right\},$$

which implies a variance of

$$V\left(O_j/E_j\right) = D_{\varepsilon}(O_j/E_j) V(\varepsilon) D_{\varepsilon^{\square}}(O_j/E_j)$$

$$= \frac{\sigma^2}{(E_j^2)^2}\{\sum_{i\in i(j)} E_j \iota_i' - O_j[x_i' (X' X)^{-1} X']\}\{\sum_{i\in i(j)} E_j \iota_i - O_j[X(X' X)^{-1} x_i]\}$$

$$= \frac{\sigma^2}{E_j^4}\left[n_j E_j^2 - \left(2O_j E_j - O_j^2\right) M_j\right],$$

where $M_j \equiv \left(\sum_{i\in i(j)} x_i'\right)(X' X)^{-1}\left(\sum_{i\in i(j)} x_i\right)$ and noting that $\iota_i' X = x_i'$.

The variance of the cost profile (variation within groups) is then equal to $\bar{c}^2 V\left(O_j/E_j\right)$.

B. Results

The distribution of risk-adjusted, payment-standardized total per capita costs for groups with at least 25 EPs and 20 or more attributed beneficiaries is shown in Exhibit IV.1. The Exhibit also breaks down per capita costs by group size and by state.

- **For groups with at least 25 EPs and 20 or more attributed beneficiaries, the average risk-adjusted, payment-standardized per capita cost was $10,602.** The interquartile range was $2,346 ($8,819 at the 25th percentile and $11,165 at the 75th percentile). The average per capita cost decreased as group size increased—from $11,075 for group practices with 25 to 50 EPs to $9,862 for group practices with more than 200 EPs.
- **Greater variation in risk-adjusted, payment-standardized total per capita cost was observed for smaller group practices.** Groups with 25 to 50 EPs had a standard deviation of $4,984 compared with $1,923 for groups with more than 200 EPs.
- **The highest risk-adjusted, payment-standardized total per capita costs were observed in Nebraska at $12,253 and the lowest risk-adjusted, payment-standardized per capita costs in California at $9,870.** Per capita costs at the 25th and 75th percentiles were $10,228 and $12,729, respectively, for Nebraska and $7,722 and $10,317, respectively, in California.

The proportion of medical group practices that are statistically significantly different from the mean is provided in Exhibit V.2.

- Across the 802 group practices with 25 EPs and 20 or more attributed beneficiaries, 65 percent (523 of 802) had risk-adjusted, payment-standardized total per capita costs that were statistically significantly different (either greater or less than the sample mean at the 5 percent level. About one-fifth (19 percent, or 155 of 802) had costs that were statistically higher (more expensive) than the mean and 46 percent (368 of 802) had costs that were statistically lower (less expensive) than the mean. Groups with more than 200 EPs were more likely than smaller groups to have total per capita costs that were statistically significantly different (either greater or less) than the mean.
    - The average risk-adjusted, payment-standardized total per capita cost was $16,151 for groups that were statistically significantly higher than the mean, $8,555 for groups that were significantly lower than the mean, and $10,218 for groups statistically no different from the mean (results not shown). The 25th and 75th percentiles ranged from $11,887 to $17,981, respectively, for groups that were significantly higher than the mean; $7,824 to $9,494, respectively, for groups that

were significantly lower than the mean; and $9,723 to $10,903, respectively, for groups statistically no different from the mean.

Table. CMS Specialty Codes, Specialty Descriptions, and Physician Status, and Provider Stratification Category

CMS Specialty Code	Specialty Description	Physician Status	Eligible Professional (Yes/No)	Provider Stratification Category
1	General Practice	Physicians	Yes	Primary Care Physicians
2	General Surgery	Physicians	Yes	Surgeons
3	Allergy/Immunology	Physicians	Yes	Medical Specialists
4	Otolaryngology	Physicians	Yes	Surgeons
5	Anesthesiology	Physicians	Yes	Other Physicians
6	Cardiology	Physicians	Yes	Medical Specialists
7	Dermatology	Physicians	Yes	Medical Specialists
8	Family Practice	Physicians	Yes	Primary Care Physicians
9	Interventional Pain Management	Physicians	Yes	Medical Specialists
10	Gastroenterology	Physicians	Yes	Medical Specialists
11	Internal Medicine	Physicians	Yes	Primary Care Physicians
12	Osteopathic Manipulative Medicine	Physicians	Yes	Medical Specialists
13	Neurology	Physicians	Yes	Medical Specialists
14	Neurosurgery	Physicians	Yes	Surgeons
15	Speech Language Pathologists	Therapists	Yes	Other Medical Professionals
16	Obstetrics/Gynecology	Physicians	Yes	Surgeons
17	Hospice and Palliative Care	Physicians	Yes	Medical Specialists
18	Ophthalmology	Physicians	Yes	Surgeons
19	Oral Surgery (Dentists Only)	Physicians	Yes	Surgeons
20	Orthopedic Surgery	Physicians	Yes	Surgeons
21	Cardiac Electrophysiology	Physicians	Yes	Medical Specialists
22	Pathology	Physicians	Yes	Other Physicians
23	Sports Medicine	Physicians	Yes	Other Physicians
24	Plastic and Reconstructive Surgery	Physicians	Yes	Surgeons
25	Physical Medicine and Rehabilitation	Physicians	Yes	Medical Specialists
26	Psychiatry	Physicians	Yes	Medical Specialists

CMS Specialty Code	Specialty Description	Physician Status	Eligible Professional (Yes/No)	Provider Stratification Category
27	Geriatric Psychiatry	Physicians	Yes	Medical Specialists
28	Colorectal Surgery (Formerly Proctology)	Physicians	Yes	Surgeons
29	Pulmonary Disease	Physicians	Yes	Medical Specialists
30	Diagnostic Radiology	Physicians	Yes	Other Physicians
31	Intensive Cardiac Rehabilitation	Not Applicable	No	Other Physicians
32	Anesthesiologist Assistant	Practitioners	Yes	Other Medical Professionals
33	Thoracic Surgery	Physicians	Yes	Surgeons
34	Urology	Physicians	Yes	Surgeons
35	Chiropractor, Licensed	Physicians	Yes	Other Medical Professionals
36	Nuclear Medicine	Physicians	Yes	Other Physicians
37	Pediatric Medicine	Physicians	Yes	Other Physicians
38	Geriatric Medicine	Physicians	Yes	Primary Care Physicians
39	Nephrology	Physicians	Yes	Medical Specialists
40	Hand Surgery	Physicians	Yes	Surgeons
41	Optometrist	Physicians	Yes	Other Medical Professionals
42	Certified Nurse Midwife	Practitioners	Yes	Other Medical Professionals
43	Certified Registered Nurse Anesthesiologist	Practitioners	Yes	Other Medical Professionals
44	Infectious Disease	Physicians	Yes	Medical Specialists
45	Mammography Screening Center	Not Applicable	No	Not Applicable
46	Endocrinology	Physicians	Yes	Medical Specialists
47	Independent Diagnostic Testing Facility	Not Applicable	No	Not Applicable
48	Podiatry	Physicians	Yes	Other Medical Professionals
49	Ambulatory Surgical Center	Not Applicable	No	Not Applicable
50	Nurse Practitioner	Practitioners	Yes	Other Medical Professionals
51	Medical Supply Company with Certified Orthotist	Not Applicable	No	Not Applicable

CMS Specialty Code	Specialty Description	Physician Status	Eligible Professional (Yes/No)	Provider Stratification Category
52	Medical Supply Company with Certified Prosthetist	Not Applicable	No	Not Applicable
53	Medical Supply Company with Certified Prosthetist-Orthotist	Not Applicable	No	Not Applicable
54	Medical Supply Company For DMERC	Not Applicable	No	Not Applicable
55	Individual Certified Orthotist	Not Applicable	No	Other Medical Professionals
56	Individual Certified Prosthetist	Not Applicable	No	Other Medical Professionals
57	Individual Certified Prosthetist-Orthotist	Not Applicable	No	Other Medical Professionals
58	Medical Supply Company with Registered Pharmacist	Not Applicable	No	Not Applicable
59	Ambulance Service Supplier (e.g., Private Ambulance Companies, Funeral Homes)	Not Applicable	No	Not Applicable
60	Public Health or Welfare Agencies (Federal, State, and Local)	Not Applicable	No	Not Applicable
61	Voluntary Health or Charitable Agencies (e.g., National Cancer Society, National Heart Association, Catholic Charities)	Not Applicable	No	Not Applicable
62	Clinical Psychologist (Billing Independently)	Practitioners	Yes	Other Medical Professionals
63	Portable X-Ray Supplier (Billing Independently)	Not Applicable	No	Not Applicable
64	Audiologist (Billing Independently)	Audiologists	Yes	Other Medical Professionals
65	Physical Therapist (Independently Practicing)	Therapists	Yes	Other Medical Professionals
66	Rheumatology	Physicians	Yes	Medical Specialists
67	Occupational Therapist (Independently Practicing)	Therapists	Yes	Other Medical Professionals
68	Clinical Psychologist	Practitioners	Yes	Other Medical Professionals
69	Clinical Laboratory (Billing Independently)	Not Applicable	No	Not Applicable
70	Single or Multispecialty Clinic or Group Practice	Physicians	Yes	Other Physicians
71	Registered Dietician/Nutrition Professional	Practitioners	Yes	Other Medical Professionals
72	Pain Management	Physicians	Yes	Other Physicians
73	Mass Immunization Roster Biller	Not Applicable	No	Not Applicable
74	Radiation Therapy Centers	Not Applicable	No	Not Applicable

CMS Specialty Code	Specialty Description	Physician Status	Eligible Professional (Yes/No)	Provider Stratification Category
75	Slide Preparation Facilities	Not Applicable	No	Not Applicable
76	Peripheral Vascular Disease	Physicians	Yes	Surgeons
77	Vascular Surgery	Physicians	Yes	Surgeons
78	Cardiac Surgery	Physicians	Yes	Surgeons
79	Addiction Medicine	Physicians	Yes	Medical Specialists
80	Licensed Clinical Social Worker	Practitioners	Yes	Other Medical Professionals
81	Critical Care (Intensivists)	Physicians	Yes	Medical Specialists
82	Hematology	Physicians	Yes	Medical Specialists
83	Hematology/Oncology	Physicians	Yes	Medical Specialists
84	Preventive Medicine	Physicians	Yes	Medical Specialists
85	Maxillofacial Surgery	Physicians	Yes	Surgeons
86	Neuropsychiatry	Physicians	Yes	Medical Specialists
87	All Other Suppliers (e.g., Drug Stores)	Not Applicable	No	Not Applicable
88	Unknown Supplier/Provider	Not Applicable	No	Not Applicable
89	Certified Clinical Nurse Specialist	Practitioners	Yes	Other Medical Professionals
90	Medical Oncology	Physicians	Yes	Medical Specialists
91	Surgical Oncology	Physicians	Yes	Surgeons
92	Radiation Oncology	Physicians	Yes	Other Physicians
93	Emergency Medicine	Physicians	Yes	Emergency Medicine Physicians
94	Interventional Radiology	Physicians	Yes	Other Physicians
95	Unassigned	Not Applicable	No	Not Applicable
96	Optician	Not Applicable	No	Other Medical Professionals
97	Physician Assistant	Practitioners	Yes	Other Medical Professionals
98	Gynecologist/Oncologist	Physicians	Yes	Surgeons
99	Unknown Physician	Physicians	Yes	Other Physicians
A0	Hospital	Not Applicable	No	Not Applicable

CMS Specialty Code	Specialty Description	Physician Status	Eligible Professional (Yes/No)	Provider Stratification Category
A1	Skilled Nursing Facility	Not Applicable	No	Not Applicable
A2	Intermediate Care Nursing Facility (DMERCs Only)	Not Applicable	No	Not Applicable
A3	Nursing Facility, Other (DMERCs Only)	Not Applicable	No	Not Applicable
A4	Home Health Agency (DMERCs Only)	Not Applicable	No	Not Applicable
A5	Pharmacy (DMERCs Only)	Not Applicable	No	Not Applicable
A6	Medical Supply Company with Respiratory Therapist (DMERCs Only)	Not Applicable	No	Not Applicable
A7	Department Store (For DMERC Use)	Not Applicable	No	Not Applicable
A8	Grocery Store (For DMERC Use)	Not Applicable	No	Not Applicable
B2	Pedorthic Personnel	Not Applicable	No	Not Applicable
B3	Medical Supply Company with Pedorthic Personnel	Not Applicable	No	Not Applicable
B4	Rehabilitation Agency	Not Applicable	No	Not Applicable
B5	Ocularist	Not Applicable	No	Not Applicable
C0	Sleep Medicine	Physicians	Yes	Medical Specialists
C1	Centralized Flu	Not Applicable	No	Not Applicable

{Only for groups with insufficient data for both *the quality composite score and the cost composite score:}*

2012 QUALITY AND RESOURCE USE REPORT AND PHYSICIAN QUALITY REPORTING SYSTEM FEEDBACK REPORT

FULL MEDICAL GROUP PRACTICE NAME

Last Four Digits of Your Group's Taxpayer Identification Number (TIN): #

- Medicare did not produce a 2012 Quality and Resource Use Report (QRUR) for this medical group practice because there were insufficient data (fewer than 20 cases for at least one measure) to evaluate the group's quality and cost performance.

- Medicare attributed beneficiaries to the medical group practice that provided the plurality of each beneficiary's Medicare-covered primary care services in 2012. Groups that provide only specialty services may have too few attributed beneficiaries to be evaluated.

- Medicare will apply a value-based payment modifier, starting in 2015, to medical group practices with 100 or more eligible professionals, based on participation in the Physician Quality Reporting system (PQRS) during 2013.

- Under the value-based payment modifier, groups of 100 or more eligible professionals that *do not* participate in PQRS in 2013 will have their Medicare payments *adjusted downward by 1.0%*. **This requirement applies even if the group provided specialty care and had too few beneficiaries to be attributed to the group.**

- Information on how the value-based payment modifier will be computed, including a detailed discussion of the beneficiary attribution process, is available at http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeedbackProgram/index.html.

- Remember, by October 15, 2013, an authorized group representative must self-nominate/register groups of 100 or more eligible professionals to report 2013 PQRS quality data via one of the three available group reporting mechanisms: (1) a web-interface group reporting mechanism, (2) a qualified registry, or (3) CMS-calculated administrative claims. Information on how to self-nominate/register for PQRS is available at http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/PQRS/index.html.

{End of report groups with insufficient data for both *the quality composite score and the cost composite score}*

{Only for groups with sufficient data for either the quality composite score, the cost composite score, or both :}

2012 QUALITY AND RESOURCE USE REPORT AND PHYSICIAN QUALITY REPORTING SYSTEM FEEDBACK REPORT

FULL MEDICAL GROUP PRACTICE NAME

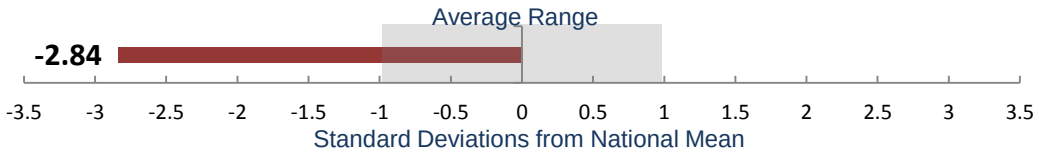
Last Four Digits of Your Group's Taxpayer Identification Number (TIN): #

NOTE: As a participant in the Medicare Shared Savings Program/Pioneer Accountable Care Organization Model/Comprehensive Primary Care Initiative during 2013 and 2014, the value-based payment modifier *would not* apply to your group in 2015 or 2016. This report is informational *only*.

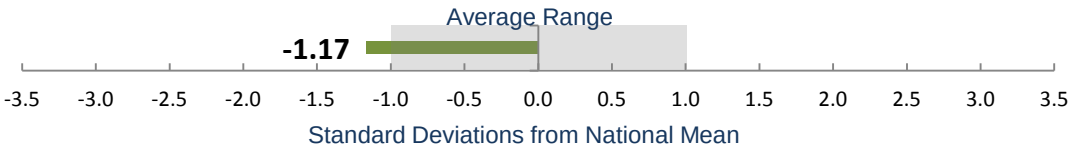
ABOUT THIS REPORT FROM MEDICARE	
WHY	• Medicare will apply a **value-based payment modifier**, starting in 2015, to **medical group practices** with 100 or more **eligible professionals**, based on participation in the **Physician Quality Reporting system (PQRS)** during 2013. Groups that *do not* participate in PQRS in 2013 will have their Medicare payments *adjusted downward by 1.0%*. • Groups that participate in PQRS through one of three PQRS **group practice reporting mechanisms** in 2013 will have their value-based payment modifier set at 0.0%. They may also elect to have it calculated based on a **quality tiering** approach, which could result in an upward, downward, or no payment adjustment. • This report, using quality and cost information for 2012, is designed to show how your group would fare if you requested the quality tiering approach. • Performance information in this report *will not* affect your current Medicare payments.
WHAT	• A summary of your group's 2012 performance, and your quality tiering designation, are shown on the Performance Highlights page of this report. • Exhibits 1 and 2 show how Medicare beneficiaries were **attributed** to your medical group practice in 2012. • Exhibits 3 and 4 show your group's 2012 performance on quality measures and Exhibits 6–10 show your group's 2012 performance on the cost measures that will be used to compute the value-based payment modifier under the quality tiering approach.
WHO	• Medicare is providing 2012 Quality and Resource Use Reports to all groups of physicians with 25 or more eligible professionals (identified by a single Taxpayer Identification Number), so they can understand the methodologies used to calculate the value-based payment modifier. • By law, Medicare must apply the value-based payment modifier to *all physicians* starting January 1, 2017.
WHAT YOU CAN DO	• Participate in PQRS, if your group is not already doing so. Details and deadlines for 2013 participation can be found at http://www.cms.gov/Medicare/Quality-Initiatves-Patient-Assessment-Instruments/PQRS/index.html. • Share your thoughts about the content and format of these reports via e-mail, at QRUR@cms.gov.

PERFORMANCE HIGHLIGHTS

YOUR QUALITY COMPOSITE SCORE: HIGH/AVERAGE/LOW/INSUFFICIENT DATA TO DETERMINE



YOUR COST COMPOSITE SCORE: HIGH/AVERAGE/LOW/INSUFFICIENT DATA TO DETERMINE

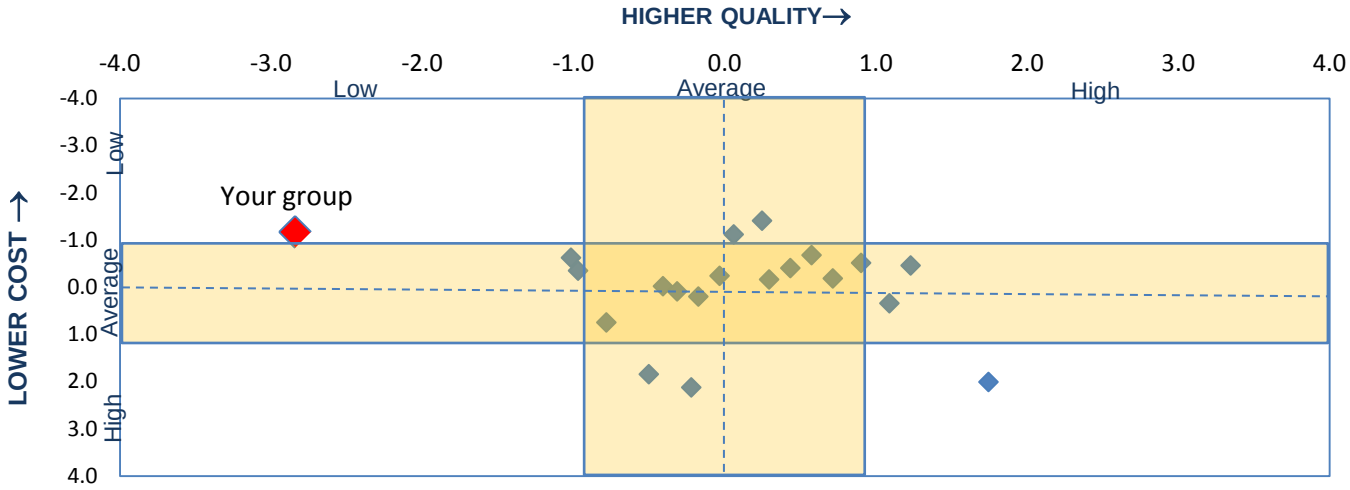


YOUR BENEFICIARIES' AVERAGE RISK SCORE: ##ST/ND/RD/TH PERCENTILE

- To account for your patients' higher-than-/lower-than- average risk, the overall per capita costs of your beneficiaries were risk adjusted downward/upward by # percent.
- Because your Medicare beneficiaries' average risk score is/is not at or above the 75th percentile of all beneficiary risk scores, your group would/would not be eligible for an additional upward adjustment under the **quality tiering** approach for serving high-risk beneficiaries.

YOUR QUALITY TIERING PERFORMANCE: HIGH/AVERAGE/LOW QUALITY, HIGH/AVERAGE/LOW COST/INSUFFICIENT DATA TO DETERMINE

{For groups with "insufficient data to determine," do not *display "Your Group" label or associated red diamond in the figure.}*



YOUR VALUE-BASED PAYMENT ADJUSTMENT BASED ON QUALITY TIERING

- Based on 2012 performance, electing the quality tiering approach would result in a payment adjustment of +/- #.# *x*% , including the additional upward adjustment of +1.0*x*% for treating high-risk beneficiaries.

Payment adjustments for each level of performance are shown below:

	Low Quality	Average Quality	High Quality
Low Cost	+0.0%	+1.0/2.0*x*%	+2.0/3.0*x*%
Average Cost	-0.5%	+0.0%	+1.0/2.0*x*%
High Cost	-1.0%	-0.5%	+0.0%

Note: x refers to a payment adjustment factor yet to be determined due to budget neutrality requirements.

INTRODUCTION

This report provides information on the quality and costs of care provided to Medicare beneficiaries by your **medical group practice**, as identified by Taxpayer Identification Number (TIN), and on beneficiaries' utilization of hospital services, compared to the average for # medical group practices with 25/100 or more **eligible professionals** (**peer group**). Based on Medicare claims, a total of # eligible professionals, of whom # were physicians, billed to your medical group practice's TIN for services provided to Medicare fee-for-service (FFS) beneficiaries in 2012.[1]

Terms and concepts **underlined and in boldface** are defined in the **Glossary of Terms** section of the report. *{Link all terms that are underlined and in blue, boldface type to their respective glossary items.}*

Attribution of Medicare Beneficiaries to Your Medical Group Practice

For the purposes of this report, responsibility for all costs and quality of care provided to each individual Medicare beneficiary has been **attributed** to the single medical group practice whose primary care physicians or non-primary care specialists provided the most primary care services for that beneficiary, based on Medicare allowed charges.

Exhibit 1. Number of Medicare Beneficiaries Attributed to Your Medical Group Practice and Basis for Attribution

	Total	Plurality of Primary Care Services Provided by Primary Care Physicians	Plurality Of Primary Care Services Provided By Non-Primary Care Specialists
Number of Medicare patients attributed to your medical group practice	#	#	#
Average percentage of primary care services provided by your group, per attributed beneficiary	#.#%	#.#%	#.#%

Exhibit 2 shows how many different **medical professionals** billed for services to the beneficiaries attributed to your medical group practice, on average, and what proportion of those professionals were outside of your group, compared to the average among all medical group practices in your peer group.

Exhibit 2. Medicare Beneficiaries Attributed to Your Medical Group Practice in 2012 and the Medical Professionals Treating Them, Compared to Peers

	Your Medical Group Practice	Mean Among All # Medical Group Practices with at Least 25/100 Eligible Professionals
Number of Medicare patients attributed to the medical group practice	#	#
Average percentage of primary care services provided by the medical group practice to each attributed beneficiary	#.#%	#.#%
Average number of eligible professionals in all care settings who treated each attributed beneficiary	#.#	#.#
Percentage of eligible professionals treating beneficiaries attributed to the medical group practice who did not bill under the group's TIN	#.#%	#.#%

[1] An interactive web-based tool providing downloadable data about all eligible professionals billing to your group's TIN and all beneficiaries attributed to your group is available at <insert URL>.

PERFORMANCE ON QUALITY

The **Quality Composite Score** summarizes a **medical group practice's** performance on quality indicators across up to six equally-weighted quality domains: Clinical Process/Effectiveness, Patient and Family Engagement, Population/Public Health, Patient Safety, Care Coordination, and Efficient Use of Healthcare Resources. Standardized scores reflect how much a group's performance differs from the national mean performance on a measure-by-measure basis.

To be considered either a high-quality or low-quality performer for the purposes of **value-based payment modifier** under the **quality tiering** approach in 2015, a group's performance in 2013 must be precisely measured and meaningfully different from average performance. Precise measurement means that a score must be statistically different from the mean at the five percent level of significance. Meaningful difference is performance at least one standard deviation above or below the mean. That is, a statistically significant standardized Quality Composite Score of +1.0 or higher would place a group in the high-quality performance category, while a score of -1.0 or lower would place it in the low-quality category.

Medical Group Practices Participating in the Physician Quality Reporting System (PQRS) Group Practice Reporting Option (GPRO)

For medical group practices that have satisfactorily reported data to the Physician Quality Reporting System (PQRS) via the **Group Practice Reporting Option (GPRO)** web-based interface, the Quality Composite Score reflects performance on the quality indicators reported within each quality domain for your samples of **attributed** patients. The Quality Composite Score also includes three outcomes measures in the Care Coordination domain that Medicare calculates from fee-for-service (FFS) claims submitted for Medicare beneficiaries attributed to your group in 2012.

{Only for non-GPRO groups with no physician PQRS participants :} Your medical group practice did not report PQRS data via the GPRO web interface in 2012. {*Skip to Medicare Claims-Based Quality Measures.*}

{Only for non-GPRO groups with physicians reporting PQRS data as individuals :} Although your medical group practice did not report PQRS data via the GPRO web interface in 2012, physicians in your group participated in PQRS as individuals in 2012. Detailed information about the PQRS performance at both the group and individual level is available at <insert URL>. {*Skip to Medicare Claims-Based Quality Measures.*}

{Only for GPRO groups:} Exhibit 3 shows your medical group practice's 2012 Quality Composite Score under the quality tiering approach based on the GPRO quality indicators. The quality indicators are grouped in four quality domains. Standardized scores are calculated only for measures with at least 20 cases. Your Quality Composite Score of [+/-] [#.##] [was/was not] statistically different from the national mean.

Exhibit 3. Your Medical Group Practice's Performance by Quality Domain in 2012

Quality Domain	Number of Quality Indicators	Standardized Score
Quality Composite Score	**32**	**-2.84* (Low)**
Clinical Process/Effectiveness	23	-3.86
Population/Public Health	4	-1.52
Patient Safety	2	-2.92
Care Coordination	3	-3.04

Note: Standardized scores indicate how many standard deviations from the national mean a medical group practice's performance rate falls, for measures within a domain. Standardized scores are calculated only for domains with at least one measure with at least 20 cases. Positive quality scores reflect performance better than the mean and negative scores reflect performance worse than the mean. The Quality Composite Score is an average of equally-weighted domain scores. Domains in which no quality measures were reported are not included in the calculation.

* Significantly different from the mean at the five percent level.

The following exhibits display your group's performance on the quality measures contributing to each domain score used to calculate the Quality Composite Score. **Only those measures for which you had 20 or more cases are included in the domain and quality composite scores.** Exhibits are displayed only for domains in which your group reported measures.

Exhibit 4-CPE. 2012 Performance on GPRO Quality Indicators in the Clinical Process/Effectiveness Domain

Clinical Process/Effectiveness Domain Score = +/- #.##

Performance Measures		Your Medical Group Practice's Performance		Performance of All PQRS Participants Reporting the Measure		
		Number of Eligible Cases	Performance Rate	Benchmark Rate	Average Range: Benchmark – 1 Standard Deviation	Average Range: Benchmark + 1 Standard Deviation
Chronic Obstructive Pulmonary Disease (COPD)						
COPD-1	COPD: Bronchodilator Therapy*	#	#.#%	#.#%	#.#%	#.#%
Coronary Artery Disease (CAD)						
CAD-1	CAD: Antiplatelet Therapy*					
CAD-2	CAD: Lipid Control†					
CAD-7	CAD: ACE Inhibitor or ARB Therapy for Patients with CAD and Diabetes and/or LVSD†					
Diabetes Mellitus (DM)						
DM-2	DM: Hemoglobin A1c Poor Control in DM (>9.0)‡					
DM-3	DM: High Blood Pressure Control in DM†					
DM-5	DM: LDL-C Control in DM†					
DM-7	DM: Dilated Eye Exam*					
DM-8	DM: Foot Exam*					
DM-10	DM: Hemoglobin A1c Control (< 8.0)†					
DM-11	DM: Daily Aspirin Use for Patients with Diabetes and Ischemic Vascular Disease†					
DM-12	DM: Tobacco Non-Use†					
Heart Failure (HF)						
HF-1	HF: LVEF Assessment*					
HF-2	HF: LVF Testing*					
HF-5	HF: Patient Education*					
HF-6	HF: Beta Blocker Therapy for LVSD					
HF-7	HF: ACE Inhibitor or ARB Therapy for LVSD*					
Hypertension (HTN)						
HTN-2	HTN: Controlling High Blood Pressure					
Ischemic Vascular Disease (IVD)						
IVD-1	IVD: Complete Lipid Profile and LDL-C Control					
IVD-2	IVD: Use of Aspirin or Another Antithrombotic					
Preventive Care Measures (Prev)						
Prev-5	Prev: Screening Mammography					
Prev-6	Prev: Colorectal Cancer Screening					
Prev-8	Prev: Pneumonia Vaccination for Patients ≥ 65					

* Indicates a 2012 GPRO measure that is not included in Quality Composite Score computations because it will not be included in the 2013 web interface set of measures.

† Indicates a measure that will be included with one or more other measures for the same condition as part of an "all-or-nothing" composite when computing Quality Composite Scores for Program Year 2013 and following. However, the Quality Composite Score displayed in this report treats these measures as distinct.

‡ Lower performance rates on this measure indicate better performance. However, the domain score for this domain has been calculated such that positive (+) scores indicate better performance and negative (-) scores indicate worse performance.

Exhibit 4-PPH. 2012 Performance on GPRO Quality Indicators in the Population/Public Health Domain
Population/Public Health Domain Score = +/- #.##

Performance Measures		Your Medical Group Practice's Performance		Performance of All GPRO Groups		
		Number of Eligible Cases	Performance Rate	Benchmark Rate	Average Range: Benchmark – 1 Standard Deviation	Average Range: Benchmark + 1 Standard Deviation
Prev-7	Prev: Influenza Immunization	#	#.#%	#.#%	#.#%	#.#%
Prev-9	Prev: BMI Screening and Follow-Up					
Prev-10	Prev: Tobacco Use: Screening and Cessation Intervention					
Prev-11	Prev: Screening for High Blood Pressure					
Prev-12	Prev: Screening for Clinical Depression*					

* Although not a 2012 GPRO measure, this measure will be included in both the GPRO beginning in 2013 and the value-based payment modifier.

Exhibit 4-PS. 2012 Performance on GPRO Quality Indicators in the Patient Safety Domain
Patient Safety Domain Score = +/- #.##

Performance Measures		Your Medical Group Practice's Performance		Performance of All GPRO Groups		
		Number of Eligible Cases	Performance Rate	Benchmark Rate	Average Range: Benchmark – 1 Standard Deviation	Average Range: Benchmark + 1 Standard Deviation
Care-1	Medication Reconciliation: Reconciliation After Discharge from an Inpatient Facility	#	#.#%	#.#%	#.#%	#.#%
Care-2	Falls: Screening for Future Fall Risk					

Exhibit 4-CC. 2012 Performance on Quality Indicators in the Care Coordination Domain
Care Coordination Domain Score = +/- #.##

Performance Measures		Your Medical Group Practice's Performance		Performance of All GPRO Groups		
		Number of Eligible Patients	Performance Rate*	Benchmark Rate	Average Range: Benchmark – 1 Standard Deviation	Average Range: Benchmark + 1 Standard Deviation
Hospitalization Rate for Ambulatory Care Sensitive Conditions						
CMS-1	Acute Conditions Composite	#	#.#%	#.#%	#.#%	#.#%
	PQI-11 Bacterial Pneumonia					
	PQI-12 Urinary Tract Infection					
	PQI-10 Dehydration					
CMS-2	Chronic Conditions Composite					
	Diabetes (composite of 4 indicators)					
	PQI-5 Chronic Obstructive Pulmonary Disease					
	PQI-8 Congestive Heart Failure					
Hospital Readmissions						
CMS-3	All-Cause Hospital Readmissions					

* Lower performance rates on these measures indicate better performance. However, the domain score for this domain has been calculated such that positive (+) scores indicate better performance and negative (-) scores indicate worse performance.

{Only for GPRO groups: skip to Hospitals Admitting Your Patients.}

{Only for non-GPRO groups:}

Medicare Administrative Claims-Based Quality Indicators

In 2013, medical group practices that do not select the PQRS web interface or registry group reporting mechanism will be able to request that Medicare compute their performance on a set of 17 administrative claims-based quality indicators. Performance on these indicators is derived from FFS Medicare claims submitted for Medicare beneficiaries attributed to your group in 2012.

Please note that these indicators would *only* be used to calculate the value-based payment modifier using the quality tiering approach if your medical group chose the PQRS administrative claims option reporting mechanism.

{Only for non-GPRO groups with at least 20 cases for at least one administrative claims-based quality measure.} Exhibit 3 shows your medical group practice's 2012 Quality Composite Score under the quality tiering approach based on the 17 administrative claims-based quality indicators. The quality indicators are grouped in three quality domains. Standardized scores are calculated only for measures with at least 20 cases. Your Quality Composite Score of [+/-] [#.##] [was/was not] statistically different from the national mean.

Exhibit 3. Your Medical Group Practice's Performance by Quality Domain in 2012

{Display a domain's standardized score only if the domain contains at least one measure with at least 20 cases. Display the Quality Composite Score Standardized Score only if a standardized score is displayed for at least one domain.}

Quality Domain	Number of Quality Indicators	Standardized Score
Quality Composite Score	**17**	**-2.84* (Low)**
Clinical Process/Effectiveness	11	-3.86
Patient Safety	2	-1.62
Care Coordination	4	-3.04

Note: Standardized scores indicate how many standard deviations from the national mean a medical group practice's performance rate falls, for measures within a domain. Standardized scores are calculated only for domains with at least one measure with at least 20 cases. Positive quality scores reflect performance better than the mean and negative scores reflect performance worse than the mean. The Quality Composite Score is an average of equally-weighted domain scores. Domains in which no quality measures were reported are not included in the calculation.

* Significantly different from the mean at the five percent level. *{Skip to next page: "The following exhibits display your group's performance…."}*

{Only for non-GPRO groups with no administrative claims-based measure with at least 20 cases:}

Exhibit 3. Your Medical Group Practice's Performance by Quality Domain in 2012

Performance is assessed only for quality domains containing at least one measure with at least 20 cases. Because your medical group practice did not have at least one administrative claims-based quality indicator with at least 20 cases, there were insufficient data to calculate performance for any quality domain, and consequently Exhibit 3 is not displayed.

The following exhibits display your group's performance on the administrative claims-based quality measures contributing to each domain score used to calculate the Quality Composite Score. **Only those measures for which you had 20 or more cases are included in the domain and quality composite scores.** Exhibits are displayed onlyfor domains in which measures for your group could be calculated.

Exhibit 4-CPE. 2012 Performance on Claims-Based Quality Indicators in the Clinical Process/Effectiveness Domain

Clinical Process/Effectiveness Domain Score = +/- #.##

Performance Measures	Your Medical Group Practice's Performance		Performance of All # Groups with at Least 25/100 Eligible Professionals		
				Average Range	
	Number of Eligible Cases	Performance Rate	Benchmark Rate	Benchmark – 1 Standard Deviation	Benchmark + 1 Standard Deviation
Bone, Joint, and Muscle Disorders					
Osteoporosis Management in Women ≥ 67 Who Had a Fracture	#	#.#%	#.#%	#.#%	#.#%
Chronic Obstructive Pulmonary Disease (COPD)					
Use of Spirometry Testing to Diagnose COPD					
Diabetes Mellitus					
Dilated Eye Exam for Beneficiaries ≤ 75 with Diabetes					
Hba1c Testing for Beneficiaries ≤ 75 with Diabetes					
Urine Protein Screening for Beneficiaries ≤ 75 with Diabetes					
Lipid Profile for Beneficiaries ≤ 75 with Diabetes					
Ischemic Vascular Disease					
Lipid Profile for Beneficiaries with Ischemic Vascular Disease					
Adherence to Statin Therapy for Beneficiaries with Coronary Artery Disease					
Mental Health					
Antidepressant Treatment for Depression:					
1. Acute Phase Treatment (at least 12 weeks)					
2. Continuation Phase Treatment (at least 6 months)					
Medication Management					
Lipid Profile for Beneficiaries Who Started Lipid-Lowering Medications					
Preventive Care Measures					
Breast Cancer Screening for Women ≤ 69					

Exhibit 4-PS. 2012 Performance on Claims-Based Quality Indicators in the Patient Safety Domain

Patient Safety Domain Score = +/- #.##

Performance Measures	Your Medical Group Practice's Performance		Performance of All # Groups with at Least 25/100 Eligible Professionals		
	Number of Eligible Patients	Performance Rate*	Benchmark Rate	Average Range: Benchmark – 1 Standard Deviation	Average Range: Benchmark + 1 Standard Deviation
Medication Management					
Use of High-Risk Medications in the Elderly	#	#.#%	#.#%	#.#%	#.#%
1. Patients Who Receive At Least One Drug to be Avoided					
2. Patients Who Receive At Least Two Different Drugs to be Avoided					
Lack of Monthly INR Monitoring for Beneficiaries on Warfarin					

* Lower performance rates on these measures indicate better performance. Domain scores are calculated such that positive (+) scores indicate better performance and negative (-) scores indicate worse performance.

Exhibit 4-CC. 2012 Performance on Quality Indicators in the Care Coordination Domain

Care Coordination Domain Score = +/- #.##

Performance Measures	Your Medical Group Practice's Performance		Performance of All # Groups with at Least 25/100 Eligible Professionals		
	Number of Eligible Patients	Performance Rate	Benchmark Rate	Average Range: Benchmark - 1 Standard Deviation	Average Range: Benchmark + 1 Standard Deviation
Mental Health					
Follow-Up After Hospitalization for Mental Illness	#	#.#%	#.#%	#.#%	#.#%
1. Percentage of Patients Receiving Follow-Up Within 30 Days					
2. *Percentage of Patients Receiving Follow-Up Within 7 Days*					
Hospitalization Rate for Ambulatory Care Sensitive Conditions*					
CMS-1 Acute Conditions Composite					
PQI-11 Bacterial Pneumonia					
PQI-12 Urinary Tract Infection					
PQI-10 Dehydration					
CMS-2 Chronic Conditions Composite					
Diabetes (Composite of 4 indicators)					
PQI-5 Chronic Obstructive Pulmonary Disease					
PQI-8 Congestive Heart Failure					
Hospital Readmissions*					
CMS-3 All-Cause Hospital Readmissions					

* Lower performance rates on these measures indicate better performance. However, the domain score for this domain has been calculated such that positive (+) scores indicate better performance and negative scores indicate worse performance.

Hospitals Admitting Your Patients

Based on all Medicare Part A claims submitted in 2012, at least five percent of your attributed Medicare beneficiaries' inpatient stays were at the hospitals shown in Exhibit 5. Information on hospital performance is available on the Hospital Compare website (http://www.hospitalcompare.hhs.gov).

Exhibit 5. Hospitals Admitting Medicare Beneficiaries Attributed to Your Medical Group Practice in 2012

{Only for groups with at least one hospital accounting for at least five percent of beneficiary stays: Display the following exhibit as a dynamic table with the number of rows displayed (other than the Total row) equal to the number of hospitals accounting for at least five percent of the group's attributed Medicare beneficiaries' inpatient stays.}

Hospital		Medicare Beneficiaries Attributed to Your Medical Group Practice	
Name	**Location**	**Number of Inpatient Stays**	**Percentage of All Inpatient Stays**
Total		**#**	**#.#%**
Hospital Name	City, State	#	#.#%

{Only for groups with no hospital accounting for at least five percent of beneficiary stays:}
Exhibit 5 is not displayed because no hospital accounted for at least five percent of your attributed Medicare beneficiaries' inpatient stays.

PERFORMANCE ON COSTS

The **Cost Composite Score** summarizes a **medical group practice**'s performance on costs across two equally-weighted cost domains: **Per Capita Costs for All Attributed Beneficiaries** and **Per Capita Costs for Beneficiaries with Specific Conditions** (diabetes, coronary artery disease, chronic obstructive pulmonary disease, and heart failure). Standardized scores reflect how much a group's performance differs from the national mean performance on a measure-by-measure basis.

All comparative cost data have been **risk adjusted** to account for differences in patient characteristics that may affect costs, including age, gender, Medicare eligibility status, history of medical conditions, and ESRD status. In addition, all comparative cost data use **payment standardization** to account for differences in Medicare payments across geographic regions due to differences in such factors as wages or rents. This information is derived from payments for all Medicare Parts A and B claims submitted by all providers who treated Medicare FFS patients attributed to your medical group practice, including providers who are not affiliated with your group. Outpatient prescription drug (Part D) costs are not included.

To be considered either a high-cost or low-cost performer for the purposes of calculating the **value-based payment modifier** under the **quality tiering** approach in 2015, a group's performance in 2013 must be precisely measured and meaningfully different from average performance. Precise measurement means that a score must be statistically different from the mean at the five percent level of significance. Meaningful difference is performance at least one standard deviation above or below the mean. That is, a statistically significant standardized Cost Composite Score of +1.0 or higher would place a group in the high-cost performance category, while a score of -1.0 or lower would place it in the low-cost category.

Your Cost Composite Score of # was/was not statistically different from the national mean. Performance within each domain, expressed in terms of standardized scores, is shown in Exhibit 6.

Exhibit 6. Your Medical Group Practice's Performance by Cost Domain in 2012

{Display a domain's standardized score only if the domain contains at least one measure with at least 20 cases. Display the Cost Composite Score Standardized Score only if a standardized score is displayed for at least one domain.}

Cost Domain	Standardized Score
Cost Composite Score	**-1.17* (Low)**
Per Capita Costs for *All* Attributed Beneficiaries	-2.45
Per Capita Costs for Beneficiaries *with Specific Conditions*	+0.12

Note: Standardized scores indicate how many standard deviations from the national mean a medical group practice's cost performance falls. Positive scores reflect costs higher than the mean and negative scores reflect costs lower than the mean. Standardized scores are calculated only for domains containing at least one measure with at least 20 cases. The Cost Composite Score is an average of equally-weighted domain scores.

* Significantly different from the mean at the five percent level.

{Only for groups with no administrative claims-based measure with at least 20 cases:}

Exhibit 6. Your Medical Group Practice's Performance by Cost Domain in 2012

Performance is assessed only for cost domains containing at least one measure with at least 20 cases. Because your medical group practice did not have at least one cost measure with at least 20 cases, there were insufficient data to calculate performance for either cost domain, and consequently Exhibit 6 is not displayed.

Exhibit 7 shows how the payment standardized per capita costs of your Medicare patients, before and after risk adjustment, compared to the mean per capita costs among medical group practices with at least 25/100 eligible professionals, for each of the cost domains and categories.[2] **Only those measures for which you had 20 or more cases are included in the domain and cost composite scores.**

Exhibit 7. Per Capita Costs for Medicare Beneficiaries Attributed to Your Medical Group Practice Medicare in 2012

Cost Categories	Your Medical Group Practice's Performance			Performance of All # Groups with at Least 25/100 Eligible Professionals		
	Number of Eligible Cases	Per Capita Costs Before Risk Adjustment	Per Capita Costs After Risk Adjustment	Benchmark Per Capita Costs (Risk-Adjusted)	Average Range: Benchmark – 1 Standard Deviation	Average Range: Benchmark + 1 Standard Deviation
Per Capita Costs for All Attributed Beneficiaries (Domain Score = +/- #.##)						
All Beneficiaries	#	$##,###	$##,###	$##,###	$##,###	$##,###
Per Capita Costs for Beneficiaries with Specific Conditions (Domain Score = +/- #.##)						
Diabetes						
COPD						
Coronary Artery Disease						
Heart Failure						

Note: Per capita costs are based on payments for Medicare Part A and Part B claims submitted in 2012 by all providers (including medical professionals, hospitals, and post-acute care facilities) for Medicare beneficiaries attributed to a medical group practice. Outpatient prescription drug costs are not included.

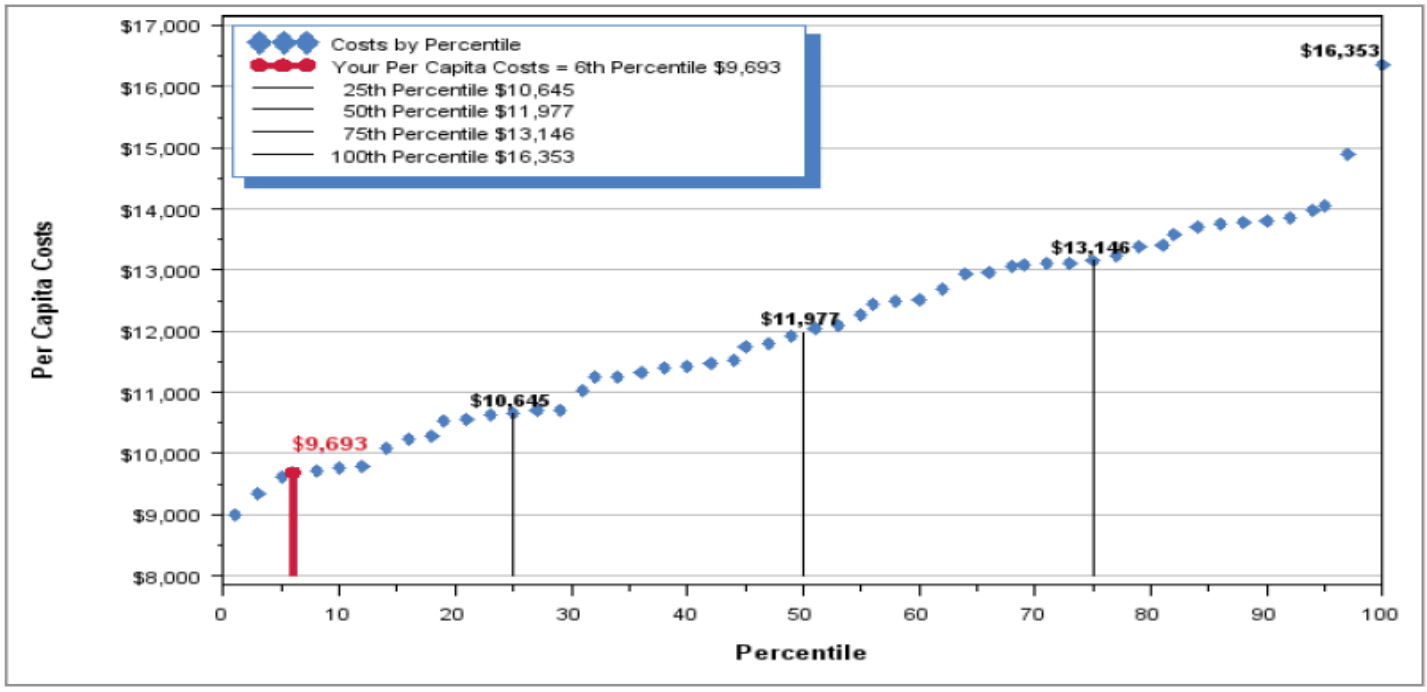
[2] For medical group practices that have a higher than average proportion of patients with costly medical conditions or other risk factors, unadjusted costs will be higher than adjusted costs. For medical group practices with a healthier patient population, unadjusted costs will be lower than adjusted costs. See the Glossary of Terms for a description of risk adjustment used for this report.

Per Capita Costs for All Attributed Beneficiaries

This section provides more detailed information about the total per capita costs of care provided to all Medicare FFS patients attributed to your medical group practice.

Per capita costs for the medical group practices in your peer group ranged from a low of $##,### to a high of $##,###. Total per capita costs for your group were at the #st/nd/rd/th percentile of total per capita costs among all groups with at least 25/100 eligible professionals (Exhibit 8).

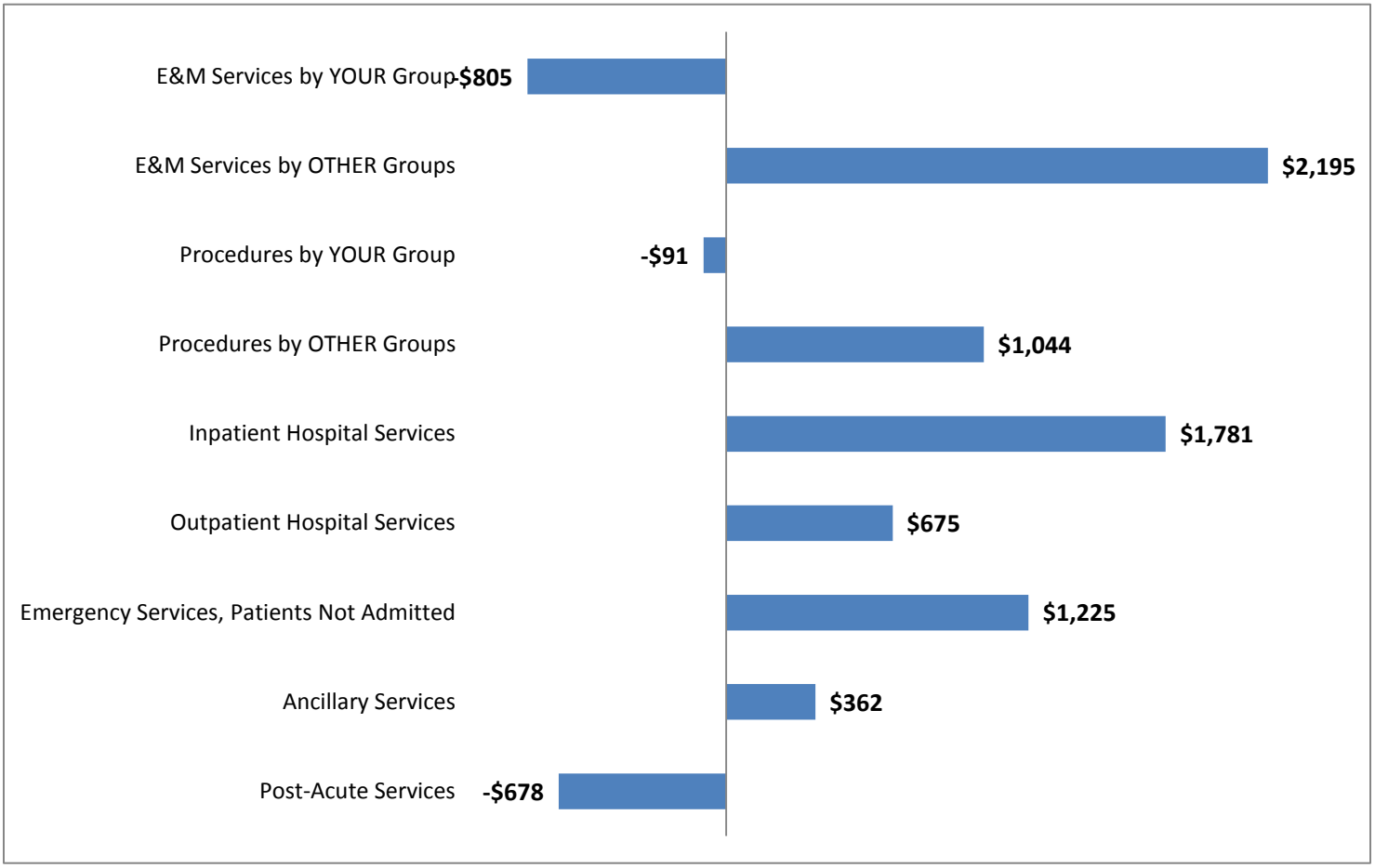
Exhibit 8. Per Capita Costs of Medicare Beneficiaries Attributed to Your Medical Group Practice in 2012, Compared to All # Medical Group Practices with at Least 25/100 Eligible Professionals



Note: Per capita costs are risk adjusted and payment standardized and are based on payments for Medicare Part A and Part B claims submitted in 2012 by all providers (including medical professionals, hospitals, and post-acute care facilities) for Medicare beneficiaries attributed to a medical group practice. Outpatient prescription drug (Part D) costs are not included.

Exhibit 9 shows the difference between the per capita costs of specific types of services for all Medicare patients attributed to your medical group practice and the mean among all medical group practices in your peer group.

Exhibit 9. Difference Between Per Capita Costs for Specific Services for Your Group's Attributed Beneficiaries in 2012 and Mean Per Capita Costs Among All # Groups with at Least 25/100 Eligible Professionals



Note: Per capita costs are based on payments for Medicare Part A and Part B claims submitted in 2012 by all providers (including medical professionals, hospitals, and post-acute care facilities) for Medicare beneficiaries attributed to your group. Outpatient prescription drug (Part D) costs are not included. All per capita costs are payment standardized and risk adjusted. In calculating service-specific per capita costs, the numerator is the total costs for a category of service used by attributed patients; the denominator is the total number of Medicare patients attributed to a medical group, not just those who used the service.

Exhibit 10 on the following page shows additional detail on per capita costs of services for Medicare patients attributed to your medical group practice, compared to average costs among all medical group practices in your peer group.

Exhibit 10. Medicare Patients' Per Capita Costs for Specific Services in 2012

Service Category	Your Medical Group Practice			Mean for All # Groups with at Least 25/100 Eligible Professionals		Amount by Which Your Group's Costs Were Higher or (Lower) than Peer Group Mean
	Your Medicare Patients Using Any Service in This Category		Risk-Adjusted Per Capita Costs	Medicare Patients Using Any Service in This Category	Risk-Adjusted Per Capita Costs	
	Number	Percentage				
All Services	**#**	**100.0%**	**$##,###**	**100.0%**	**$##,###**	**$/($)**
Evaluation and Management (E&M) Services in All Non-Emergency Settings						
All E&M Services Provided by YOUR Group	**#**	**#.#%**	**$##,###**	**#.#%**	**$##,###**	**$/($)**
Primary Care Physicians						
Medical Specialists						
Surgeons						
Other Medical Professionals						
All E&M Services Provided by OTHER Groups	**#**	**#.#%**	**$##,###**	**#.#%**	**$##,###**	**$/($)**
Primary Care Physicians						
Medical Specialists, Surgeons, and Other Medical Professionals						
Procedures in All Non-Emergency Settings						
All Procedures Performed by YOUR Group						
Primary Care Physicians						
Medical Specialists						
Surgeons						
Other Medical Professionals						
All Procedures Performed by OTHER Groups						
Primary Care Physicians						
Medical Specialists, Surgeons, and Other Medical Professionals						
Hospital Services (Excluding Emergency Outpatient)						
Inpatient Hospital Facility Services						
Outpatient Hospital Facility Services						
Emergency Services That Did Not Result in a Hospital Admission						
All Emergency Services						
Emergency Visits						
Procedures						
Laboratory and Other Tests						
Imaging Services						
Services in Non-Emergency Ambulatory Settings						
All Ancillary Services						
Laboratory and Other Tests						
Imaging Services						
Durable Medical Equipment						
Post-Acute Care						
All Post-Acute Services						
Skilled Nursing Facility						
Psychiatric, Rehabilitation, or Other Long-Term Facility						
Hospice						
Home Health						
Other Services Billed by Non-Institutional Providers						
All Other Services						
Ambulance Services						
Chemotherapy and Other Part B–Covered Drugs						
All Other Services Not Otherwise Classified						

Note: In calculating service-specific per capita costs, the numerator is the total costs for a category of service used by attributed patients; the denominator is the total number of Medicare patients attributed to a medical group practice and whose costs were risk adjusted, not just those who used the service. See Appendix A for list of physician specialties assigned to each specialty category.

APPENDIX A

Exhibit A-1. Specialties Associated with Eligible Professional, Physician, and Provider Stratification Categories

Provider or Supplier Specialty Description	CMS Specialty Code	Eligible Professional?	Physician?	Provider Stratification Category
Primary Care Specialties				
Family Practice	08	Yes	Yes	Primary Care Physicians
General Practice	01	Yes	Yes	Primary Care Physicians
Geriatric Medicine	38	Yes	Yes	Primary Care Physicians
Internal Medicine	11	Yes	Yes	Primary Care Physicians
All Other Specialties				
Addiction Medicine	79	Yes	Yes	Medical Specialists
All Other Suppliers (e.g., Drug Stores)	87	No	No	Not Applicable
Allergy/Immunology	03	Yes	Yes	Medical Specialists
Ambulance Service Supplier (e.g., Private Ambulance Companies, Funeral Homes)	59	No	No	Not Applicable
Ambulatory Surgical Center	49	No	No	Not Applicable
Anesthesiologist Assistant	32	Yes	No	Other Medical Professionals
Anesthesiology	05	Yes	Yes	Other Medical Professionals
Audiologist (Billing Independently)	64	Yes	No	Other Medical Professionals
Cardiac Electrophysiology	21	Yes	Yes	Medical Specialists
Cardiac Surgery	78	Yes	Yes	Surgeons
Cardiology	06	Yes	Yes	Medical Specialists
Certified Clinical Nurse Specialist	89	Yes	No	Other Medical Professionals
Certified Nurse Midwife	42	Yes	No	Other Medical Professionals
Certified Registered Nurse Anesthesiologist	43	Yes	No	Other Medical Professionals
Chiropractor, Licensed	35	Yes	Yes	Other Medical Professionals
Clinical Laboratory (Billing Independently)	69	No	No	Not Applicable
Clinical Psychologist	68	Yes	No	Other Medical Professionals
Clinical Psychologist (Billing Independently)	62	Yes	No	Other Medical Professionals
Colorectal Surgery (Formerly Proctology)	28	Yes	Yes	Surgeons
Critical Care (Intensivists)	81	Yes	Yes	Medical Specialists
Department Store (For DMERC Use)	A7	No	No	Not Applicable
Dermatology	07	Yes	Yes	Medical Specialists
Diagnostic Radiology	30	Yes	Yes	Other Medical Professionals
Emergency Medicine	93	Yes	Yes	Other Medical Professionals
Endocrinology	46	Yes	Yes	Medical Specialists
Gastroenterology	10	Yes	Yes	Medical Specialists
General Surgery	02	Yes	Yes	Surgeons
Geriatric Psychiatry	27	Yes	Yes	Medical Specialists
Grocery Store (For DMERC Use)	A8	No	No	Not Applicable
Gynecologist/Oncologist	98	Yes	Yes	Surgeons
Hand Surgery	40	Yes	Yes	Surgeons
Hematology	82	Yes	Yes	Medical Specialists
Hematology/Oncology	83	Yes	Yes	Medical Specialists
Home Health Agency (DMERCs Only)	A4	No	No	Not Applicable
Hospice and Palliative Care	17	Yes	Yes	Medical Specialists
Hospital	A0	No	No	Not Applicable
Independent Diagnostic Testing Facility	47	No	No	Not Applicable

Specialty Description	CMS Specialty Code	Eligible Professional?	Physician?	Provider Stratification Category
Individual Certified Orthotist	55	No	No	Other Medical Professionals
Individual Certified Prosthetist	56	No	No	Other Medical Professionals
Individual Certified Prosthetist-Orthotist	57	No	No	Other Medical Professionals
Infectious Disease	44	Yes	Yes	Medical Specialists
Intensive Cardiac Rehabilitation	31	No	No	Not Applicable
Intermediate Care Nursing Facility (DMERCs Only)	A2	No	No	Not Applicable
Interventional Pain Management	09	Yes	Yes	Medical Specialists
Interventional Radiology	94	Yes	Yes	Other Medical Professionals
Licensed Clinical Social Worker	80	Yes	No	Other Medical Professionals
Mammography Screening Center	45	No	No	Not Applicable
Mass Immunization Roster Biller	73	No	No	Not Applicable
Maxillofacial Surgery	85	Yes	Yes	Surgeons
Medical Oncology	90	Yes	Yes	Medical Specialists
Medical Supply Company For DMERC	54	No	No	Not Applicable
Medical Supply Company with Certified Orthotist	51	No	No	Not Applicable
Medical Supply Company with Certified Prosthetist	52	No	No	Not Applicable
Medical Supply Company with Certified Prosthetist-Orthotist	53	No	No	Not Applicable
Medical Supply Company with Pedorthic Personnel	B3	No	No	Not Applicable
Medical Supply Company with Registered Pharmacist	58	No	No	Not Applicable
Medical Supply Company with Respiratory Therapist (DMERCs Only)	A6	No	No	Not Applicable
Nephrology	39	Yes	Yes	Medical Specialists
Neurology	13	Yes	Yes	Medical Specialists
Neuropsychiatry	86	Yes	Yes	Medical Specialists
Neurosurgery	14	Yes	Yes	Surgeons
Nuclear Medicine	36	Yes	Yes	Other Medical Professionals
Nurse Practitioner	50	Yes	Yes	Other Medical Professionals
Nursing Facility, Other (DMERCs Only)	A3	No	No	Not Applicable
Obstetrics/Gynecology	16	Yes	Yes	Surgeons
Occupational Therapist (Independently Practicing)	67	Yes	No	Other Medical Professionals
Ocularist	B5	No	No	Not Applicable
Ophthalmology	18	Yes	Yes	Surgeons
Optician	96	No	No	Not Applicable
Optometrist	41	Yes	Yes	Other Medical Professionals
Oral Surgery (Dentists Only)	19	Yes	Yes	Surgeons
Orthopedic Surgery	20	Yes	Yes	Surgeons
Osteopathic Manipulative Therapy	12	Yes	Yes	Medical Specialists
Otolaryngology	04	Yes	Yes	Surgeons
Pain Management	72	Yes	Yes	Other Medical Professionals
Pathology	22	Yes	Yes	Other Medical Professionals
Pediatric Medicine	37	Yes	Yes	Other Medical Professionals
Pedorthic Personnel	B2	No	No	Not Applicable
Peripheral Vascular Disease	76	Yes	Yes	Surgeons
Pharmacy (DMERCs Only)	A5	No	No	Not Applicable
Physical Medicine and Rehabilitation	25	Yes	Yes	Medical Specialists
Physical Therapist (Independently Practicing)	65	Yes	No	Other Medical Professionals

Specialty Description	CMS Specialty Code	Eligible Professional?	Physician?	Provider Stratification Category
Physician Assistant	97	Yes	No	Other Medical Professionals
Plastic and Reconstructive Surgery	24	Yes	Yes	Surgeons
Podiatry	48	Yes	Yes	Other Medical Professionals
Portable X-Ray Supplier	63			Not Applicable
Preventive Medicine	84	Yes	Yes	Medical Specialists
Psychiatry	26	Yes	Yes	Medical Specialists
Public Health or Welfare Agencies (Federal, State, and Local)	60	No	No	Not Applicable
Pulmonary Disease	29	Yes	Yes	Medical Specialists
Radiation Oncology	92	Yes	Yes	Other Medical Professionals
Radiation Therapy Centers	74			Not Applicable
Registered Dietician/Nutrition Professional	71	Yes	No	Other Medical Professionals
Rehabilitation Agency	B4	No	No	Not Applicable
Rheumatology	66	Yes	Yes	Medical Specialists
Single or Multispecialty Clinic or Group Practice	70	Yes	Yes	Other Medical Professionals
Skilled Nursing Facility	A1	No	No	Not Applicable
Sleep Medicine	C0	Yes	Yes	Medical Specialists
Slide Preparation Facilities	75	No	No	Not Applicable
Speech Language Pathologists	15	Yes	No	Other Medical Professionals
Sports Medicine	23	Yes	Yes	Other Medical Professionals
Surgical Oncology	91	Yes	Yes	Surgeons
Thoracic Surgery	33	Yes	Yes	Surgeons
Unassigned	95	No	No	Not Applicable
Unknown Physician	99	Yes	Yes	Other Medical Professionals
Unknown Supplier/Provider	88	No	No	Not Applicable
Urology	34	Yes	Yes	Surgeons
Vascular Surgery	77	Yes	Yes	Surgeons
Voluntary Health or Charitable Agencies (e.g., National Cancer Society, National Heart Association, Catholic Charities)	61	No	No	Not Applicable

{Only for non-GPRO groups: skip to Glossary of Terms.}

{Only for GPRO groups:}

APPENDIX B

Earned Incentive Under the Physician Quality Reporting System Group Practice Reporting Option

{Only for GPRO participants that earned an incentive:} Based on a review of all data submitted for your medical group practice as a participant in the 2012 Group Practice Reporting Option (GPRO), your medical group practice qualified to earn an incentive payment of $#, equivalent to #.#% of your group's total estimated allowed Medicare Part B Physician Fee Schedule charges.

Exhibit B-1. Summary of GPRO Earned Incentive, 2012

Total Earned Incentive Amount	Total Estimated Allowed Medicare Part B Physician Fee Schedule Charges	Distribution of Total Incentive Earned Among Medicare Administrative Contractors (MACs) or Carriers		
		MAC or Carrier Identification Number	Earned Incentive Amount	Proportion for This MAC or Carrier
$	$	#	$	#.#%

{Only for GPRO participants that did not earn an incentive:} Based on a review of all data submitted for your medical group practice as a participant in the 2012 Group Practice Reporting Option (GPRO), your medical group practice did not qualify for an incentive.

GLOSSARY OF TERMS

ALL-CAUSE HOSPITAL READMISSIONS. The all-cause hospital readmissions measure is a MEDICAL GROUP PRACTICE–specific all-cause 30-day rate of acute care hospital readmissions (defined as an unplanned readmission for any cause within 30 days from the date of discharge of an index admission in 2012) for beneficiaries discharged from an acute care or critical access hospital. The measure does not apply to ATTRIBUTED beneficiaries who were under age 18 on January 1, 2012, discharged against medical advice, or transferred to another acute care hospital. Beneficiaries who died within 30 days of discharge and those without continuous enrollment in Medicare Part A for at least one month following discharge are likewise excluded. Certain hospitalizations, such as those related to treatment of cancer or primary psychiatric disease, are excluded from the set of index admissions considered. Index admissions are grouped into five specialty cohorts—surgery/gynecology, cardiorespiratory, cardiovascular, neurology, and medicine—based on the presumption that admissions treated by similar teams of clinicians are likely to have similar risks of readmission. Readmissions are RISK ADJUSTED via hierarchical logistic regression models that estimate a series of ratios (one for each specialty cohort) of the number of readmissions predicted for the specific medical group practice, given its case mix, to the number of readmissions expected among all medical group practices in the peer group with a similar case mix. A case-weighted geometric mean of these ratios is then computed and multiplied by the overall readmission rate for all beneficiaries across all groups.

ALL OTHER SERVICES. Exhibit 10 displays seven categories of Medicare-covered services: evaluation and management in non-emergency settings, procedures in non-emergency settings, inpatient hospital, outpatient hospital (excluding emergency outpatient), emergency services that did not result in a hospital admission, ancillary services in non-emergency ambulatory settings, and post-acute care services. All other Medicare-covered services (with the exception of Medicare Part D prescription drug costs) not included in those seven categories are captured in Exhibit 10 as "All Other Services." This includes anesthesia, ambulance services, chemotherapy, other Part B drugs, chiropractic, enteral and parenteral nutrition, some vision services, some hearing and speech services, and influenza immunization.

AMBULATORY CARE SENSITIVE CONDITIONS (ACSCS). ACSCs are conditions for which good outpatient care can prevent complications or more serious disease. The Agency for Healthcare Research and Quality (AHRQ) developed measures of potentially avoidable hospitalizations for ACSCs as part of a larger set of Prevention Quality Indicators (PQIs). The measures rely on hospital discharge data but are not intended to measure hospital quality. Rather, high or increasing rates of hospitalization for these conditions in a defined population of patients may indicate inadequate access to high-quality ambulatory care.

The Care Coordination quality domain includes two composite measures of hospital admissions for acute and chronic ACSCs, as shown in Exhibit 4-CC. The admission rates are calculated from 2012 Medicare Part A claims data, based on the individual PQIs shown in Exhibit G-1.

Exhibit G-1. AHRQ Prevention Quality Indicators Used to Calculate ACSC Rates

Acute Conditions Composite	
PQI #11	Bacterial Pneumonia Admission Rate
PQI #12	Urinary Tract Infection Admission Rate
PQI #10	Dehydration Admission Rate
Chronic Conditions Composite	
PQI #01	Diabetes Short-Term Complications Admission Rate (included in diabetes composite)
PQI #03	Diabetes Long-Term Complications Admission Rate (included in diabetes composite)
PQI #14	Uncontrolled Diabetes Admission Rate (included in diabetes composite)
PQI #16	Rate of Lower-Extremity Amputation Among Patients With Diabetes (included in diabetes composite)
PQI #05	Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate
PQI #08	Heart Failure Admission Rate

Source: Agency for Healthcare Research and Quality and Mathematica Policy Research.

The ACSC measures are RISK ADJUSTED by comparing the MEDICAL GROUP PRACTICE's actual rate of potentially avoidable hospitalizations to an expected rate. The numerator of the actual rate is the number of beneficiaries ATTRIBUTED to the medical group who were identified as having been hospitalized for each of the individual PQI conditions in 2012. Only those admissions where the measure of interest is listed as the primary diagnosis are counted. The denominators for the rates have been modified from the original PQI population-based measures to include only those Medicare beneficiaries attributed to the medical group practice being assessed. The denominator for measures in the Chronic Conditions Composite (diabetes, COPD/asthma, heart failure) is restricted to patients diagnosed with the specific condition. For measures in the Acute Conditions Composite (bacterial pneumonia, urinary tract infection, dehydration), the denominator includes all Medicare patients attributed to the medical group practice.

For each measure, the expected rate reflects the average experience of Medicare beneficiaries in the same age category and of the same gender as those attributed to the group. The risk-adjusted rate is calculated as the ratio of the actual rate to the expected rate multiplied by the average actual rate per 1,000 beneficiaries. Each of the composite rates is the weighted sum of the component rates, with each component's weight equal to the percentage of all attributed beneficiaries included in the component rate's denominator. The PQI measure specifications, including numerator diagnoses, are available on AHRQ's website at http://www.qualityindicators.ahrq.gov/Modules/pqi_resources.aspx.

ATTRIBUTION OF BENEFICIARIES TO MEDICAL GROUP PRACTICES. Medicare beneficiaries are considered for assignment to a MEDICAL GROUP PRACTICE, identified by Taxpayer Identification Number (TIN), in a two-step process based on primary care services (Exhibit G-2) provided by the group, as captured in 2012 Part B Medicare claims.

1. The first step assigns a beneficiary to a group if the beneficiary receives the plurality of his or her primary care services from primary care physicians within the group. Primary care physicians are those with one of four specialty designations: family practice, general practice, geriatric medicine, or internal medicine.

2. The second step applies only to beneficiaries who did not receive a primary care service from any primary care physician in 2012. Under this second step, a beneficiary is assigned to a group if the beneficiary (a) received at least one primary care service from a physician within the group and (b) received a plurality of his or her primary care services from specialist physicians and certain non-physician practitioners (nurse practitioners, clinical nurse specialists, and physician assistants) within the group.

Beneficiaries were not attributed to any medical group practice if, for any month in 2012, any of the following situations applied to them: they were enrolled in Part A only or Part B only; they were enrolled in Medicare managed care; they resided outside the United States, its territories, and its possessions; or they did not have any Medicare allowed charges in 2012.

The same population of beneficiaries attributed to a medical group practice is used for calculating the denominators of all non–PHYSICIAN QUALITY REPORTING SYSTEM (PQRS) quality and cost measures displayed in this report. Performance on any displayed GROUP PRACTICE REPORTING OPTION (GPRO) quality indicators, however, is based on a sample of beneficiaries who had at least two office or other outpatient visits with the medical group practice and for whom the medical group practice provided the plurality of all office and other outpatient services during approximately the first ten months of 2012; Medicare Advantage enrollees and beneficiaries for whom Medicare was not the primary payer for all of 2012 are excluded.

Exhibit G-2. Healthcare Common Procedure Coding System (HCPCS) Primary Care Service Codes Criteria

HCPCS Codes	Brief Description
99201–99205	New patient, office or other outpatient visit
99211–99215	Established patient, office or other outpatient visit
99304–99306	New patient, nursing facility care
99307–99310	Established patient, nursing facility care
99315–99316	Established patient, discharge day management service
99318	Established patient, other nursing facility service
99324–99328	New patient, domiciliary or rest home visit
99334–99337	Established patient, domiciliary or rest home visit
99339–99340	Established patient, physician supervision of patient (patient not present) in home, domiciliary or rest home
99341–99345	New patient, home visit
99347–99350	Established patient, home visit
G0402	Initial Medicare visit
G0438	Annual wellness visit, initial
G0439	Annual wellness visit, subsequent

Note: Labels are approximate. See the American Medical Association's Current Procedural Terminology and the Centers for Medicare & Medicaid Services website (http://www.cms.gov) for detailed definitions.

CHRONIC HEALTH CONDITIONS. Chronic health conditions are diseases or illnesses that are commonly expected to last at least six months, require ongoing monitoring to avoid loss of normal life functioning, and are not expected to improve or resolve without treatment. For this report, PER CAPITA COSTS FOR BENEFICIARIES WITH SPECIFIC CONDITIONS were calculated for four conditions common to the Medicare population: diabetes, coronary artery disease, chronic obstructive pulmonary disease, and heart failure.

COST COMPOSITE SCORE. The Cost Composite Score is one of two composite scores used to calculate the VALUE-BASED PAYMENT MODIFIER under the QUALITY TIERING option. It summarizes a MEDICAL GROUP PRACTICE'S performance on costs across two equally-weighted cost domains: PER CAPITA COSTS FOR ALL ATTRIBUTED BENEFICIARIES and PER CAPITA COSTS FOR BENEFICIARIES WITH SPECIFIC CONDITIONS (diabetes, coronary artery disease, chronic obstructive pulmonary disease, and heart failure). Standardized scores reflect how much a group's performance differs from the national mean performance on a measure-by-measure basis within each domain. For groups attributed fewer than 20 beneficiaries with diabetes, coronary artery disease, chronic obstructive pulmonary disease, or heart failure, the Cost Composite Score is based solely on Per Capita Costs for All Attributed Beneficiaries.

ELIGIBLE PROFESSIONALS. An eligible professional is an individual provider, as identified by his or her individual National Provider Identifier (NPI), who is either a physician, a practitioner, a physical or occupational therapist or qualified speech-language pathologist, or a qualified audiologist. A physician is one of the following: doctor of medicine, doctor of osteopathy, doctor of dental surgery or dental medicine, doctor of podiatric medicine, doctor of optometry, or chiropractor. A practitioner is any of the following: certified registered nurse anesthetist, anesthesiology assistant, certified nurse-midwife, clinical social worker, clinical psychologist, or registered dietician or nutrition professional. An eligible professional's medical specialty was determined from the specialty listed by the provider in the Provider Enrollment, Chain, and Ownership System (PECOS); in cases where multiple specialties are listed for a provider in PECOS, the provider is assigned the specialty recorded most often on those 2012 Part B claims for which the professional was the performing provider.

GROUP PRACTICE REPORTING MECHANISMS. MEDICAL GROUP PRACTICES participating in the PHYSICIAN QUALITY REPORTING SYSTEM (PQRS) through the GROUP PRACTICE REPORTING OPTION (GPRO) may report quality measures through one of three options: (1) a qualified registry, (2) the GPRO web interface, or (3) the administrative claims reporting method. Only group practices with 25 or more ELIGIBLE PROFESSIONALS may use the web interface as a reporting method. Under the administrative claims reporting method, the Centers for Medicare & Medicaid Services (CMS) will calculate performance on quality measures based on Medicare Part B claims data submitted by the group. Groups may elect the administrative claims reporting option in 2013 for the purpose of 2015 value-based payment adjustment, but not for 2013 GPRO incentive payments.

GROUP PRACTICE REPORTING OPTION (GPRO). In accordance with section 1848(m)(3)(C) of the Social Security Act, the Centers for Medicare & Medicaid Services (CMS) created a new group practice reporting option (GPRO) for the PHYSICIAN QUALITY REPORTING SYSTEM (PQRS) in 2010. MEDICAL GROUP PRACTICES that satisfactorily report data on specified PQRS quality indicators for a particular reporting period are eligible to earn a PQRS incentive payment equal to a specified percentage of the group practice's total estimated Medicare Part B physician fee schedule allowed charges for covered professional services furnished during the reporting period. For purposes of determining whether a group practice satisfactorily submits PQRS quality measures data for 2012, each selected GPRO participant is required to report 29 quality measures. More complete information about GPRO, including descriptions of each of the 29 measures, is available from the GPRO website at https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/PQRS/Group_Practice_Reporting_Option.html**.**

MEASURE POPULATIONS. All administrative claims-based measures—including any claims-based quality measures, AMBULATORY CARE SENSITIVE CONDITION (ACSC) rates, ALL-CAUSE HOSPITAL READMISSION RATES, and PER CAPITA COST measures—in this report are calculated based on all Medicare fee-for-service (FFS) beneficiaries ATTRIBUTED to the medical group practice. In contrast, any PHYSICIAN QUALITY REPORTING SYSTEM (PQRS) quality measures are calculated based on a sample of Medicare FFS beneficiaries attributed to the MEDICAL GROUP PRACTICE. Each participating medical group practice is required to report clinical data for at least the first 218 or 411 beneficiaries (depending on the group's size) on their list of assigned beneficiaries that the Centers for Medicare & Medicaid Services (CMS) has determined meet criteria for specific measures, or on 100 percent of the beneficiaries on their list for that measure, whichever is smaller.

MEDICAL GROUP PRACTICE. Medical group practice refers to a single provider entity, identified by its Taxpayer Identification Number (TIN), to which at least 25 ELIGIBLE PROFESSIONALS reassigned their billing rights in 2012.

MEDICAL PROFESSIONALS. Medical professionals are individual providers, as identified by individual National Provider Identifier (NPI), who are eligible for payment from Medicare for Medicare-covered services. These include all ELIGIBLE PROFESSIONALS, as well as orthotists, prosthetists, orthotist-prosthetists, opticians, and

ocularists. A medical professional's medical specialty was determined from the specialty listed by the provider in the Provider Enrollment, Chain, and Ownership System (PECOS); in cases where multiple specialties are listed for a provider in PECOS, the provider is assigned the specialty recorded most often on those 2012 Part B claims for which the professional was the performing provider.

MEDICARE CLAIMS DATA USED IN THE COST MEASURES. The cost measures displayed in this report use 2012 Part A and Part B Medicare claims data to provide feedback to MEDICAL GROUP PRACTICES about selected cost measures related to the care provided to Medicare beneficiaries ATTRIBUTED to their group. These data include inpatient hospital, outpatient hospital, hospice, skilled nursing facility, home health, and durable medical equipment claims, as well as claims submitted by individual (non-institutional) providers and suppliers to their Part B Medicare Administrative Contractors (MACs). Part D prescription drug costs are not included in the cost measures.

PAYMENT STANDARDIZATION. Payment standardization equalizes the costs associated with a specific service, such that a given service is priced at the same level across all providers of the same type, regardless of geographic location, differences in Medicare payment rates among facilities, or the year in which the service was provided. These may include discrete services (such as physician office visits or consultations) or bundled services (such as hospital stays).

For most types of medical services, Medicare adjusts payments to providers to reflect differences in local input prices (for example, wage rates and real estate costs). The costs reported in this report are therefore payment standardized to allow for comparisons to peers who may practice in locations or facilities where reimbursement rates are higher or lower. Payment standardization is performed prior to calculating per capita payment-adjusted and RISK-ADJUSTED cost measures.

PEER GROUP. To provide a comparative context for the information in this report, a MEDICAL GROUP PRACTICE'S performance on cost, utilization, and quality measures is compared to that of its peers. For the PHYSICIAN QUALITY REPORTING SYSTEM (PQRS) GROUP PRACTICE REPORTING OPTION (GPRO) quality indicators displayed in this report, the peer group is defined as all medical group practices participating in GPRO in 2012. A list with the name and state of group practices who satisfactorily reported the GPRO quality indicators for the 2012 program year is available at <insert URL>. For all other measures displayed in this report, medical group practices with at least 25 but less than 100 ELIGIBLE PROFESSIONALS are compared to all medical group practices nationwide with at least 25 eligible professionals; medical group practices with at least 100 eligible professionals are compared to all medical group practices nationwide with at least 100 eligible professionals. All peer group totals include data for the specific medical group practice profiled in the QRUR.

PER CAPITA COSTS FOR ALL ATTRIBUTED BENEFICIARIES. Per capita costs are the average (mean) of all 2012 Medicare fee-for-service (FFS) Parts A and B payments to all providers for beneficiaries ATTRIBUTED to a MEDICAL GROUP PRACTICE. A medical group's per capita cost measures are presented in the report compared to all other medical group practices nationwide of similar size (see PEER GROUP).

Per capita cost measures in this report were calculated using 2012 Medicare Part A (Hospital Insurance) and Part B (Medical Insurance) claims for all FFS Medicare beneficiaries attributed to the medical group practice. Medicare costs were obtained from 2012 administrative claims data using inpatient, outpatient, skilled nursing facility, home health, hospice, durable medical equipment, and non-institutional provider/supplier claims. Outpatient prescription drug (Part D) claims were not included in the 2012 cost measure calculations. Payments to providers from Medicare are the primary component of costs. To the extent that Medicare claims contain information on beneficiary copayments and deductibles and third-party private payers, those amounts are also included in costs.

PAYMENT-STANDARDIZED *but non-RISK-ADJUSTED* per capita costs were calculated by first summing the payment-standardized Medicare Parts A and B costs during the 2012 calendar year for all Medicare

beneficiaries who were attributed to the medical group (the numerator) and then dividing by the number of beneficiaries attributed to the medical group (the denominator). Part-year beneficiaries who became eligible for Medicare or died during the year were included. However, beneficiaries who were enrolled in Part A only (no Part B) or Part B only for one or more months in 2012, as well as those who were enrolled in a Medicare Advantage program for part of the year, were excluded along with the costs associated with their care.

Payment-standardized *and risk-adjusted* per capita costs were computed by dividing the medical group practice's actual payment-standardized but non-risk-adjusted per capita costs by the group's expected payment-standardized costs for all attributed beneficiaries. Expected costs were computed by multiplying the coefficients of the risk adjustment model (see RISK ADJUSTMENT) by the characteristics of the medical group practice's attributed beneficiaries. This ratio was then multiplied by the mean per capita cost of all beneficiaries attributed to any medical group practices in the sample.

To provide more detail on the per capita cost measures displayed in the reports, additional breakdowns by category of service are provided for the following categories:

- All professional evaluation and management (E&M) services provided by primary care physicians, medical specialists, surgeons, and other medical professionals in non-emergency settings (Appendix A shows how medical professionals were grouped into one of these four categories)
- All procedures performed in non-emergency settings by primary care physicians, medical specialists, surgeons, and other medical professionals
- Hospital facility services, including inpatient and outpatient services but excluding emergency department services that did not result in an inpatient hospital admission
- Emergency department services for beneficiaries not admitted to a hospital, including visits, procedures, laboratory and other tests, and imaging services
- Services provided in non-emergency ambulatory settings, including laboratory and other tests, imaging services, and durable medical equipment
- Post-acute services including skilled nursing care; psychiatric, rehabilitation, or other long-term facility care; and home health care
- All other Medicare-covered services not captured in other categories, such as anesthesia, ambulance services, chemotherapy, other Part B drugs, chiropractic, enteral and parenteral nutrition, vision services, hearing and speech services, and influenza immunization

PER CAPITA COSTS FOR BENEFICIARIES WITH SPECIFIC CONDITIONS. Per capita costs for Medicare beneficiaries with specific conditions are the average of 2012 Medicare FFS Parts A and B standardized payments per attributed beneficiary with one of four specific CHRONIC HEALTH CONDITIONS: diabetes, coronary artery disease, chronic obstructive pulmonary disease, and heart failure.

The per capita costs for beneficiaries with each condition were computed in the same manner as the PER CAPITA COSTS FOR ALL ATTRIBUTED BENEFICIARIES, except that expected costs for beneficiaries with a specific condition were computed based on a risk adjustment model that included only beneficiaries with that condition. These condition-specific per capita costs include all costs and are not limited to costs associated with treating the condition itself.

The four chronic health conditions are not mutually exclusive. Beneficiaries with two or more conditions are counted (as are their per capita costs) within each of the condition subgroups. For each chronic condition

subgroup, the separate condition-specific risk adjustment model estimated for that subgroup captures other chronic and acute co-morbidities associated with beneficiaries in the particular subgroup.

PHYSICIAN QUALITY REPORTING SYSTEM (PQRS). The PQRS is a reporting program that uses a combination of incentive payments and payment adjustments to promote reporting of quality information by ELIGIBLE PROFESSIONALS. The program provides an incentive payment to practices with eligible professionals who satisfactorily report data on quality measures for covered Physician Fee Schedule (PFS) services furnished to Medicare Part B FFS beneficiaries (including Railroad Retirement Board and Medicare Secondary Payer). Beginning in 2015, the program also applies a negative payment adjustment to eligible professionals who do not satisfactorily report data on quality measures for covered professional services (see VALUE-BASED PAYMENT MODIFIER). Physicians may participate in PQRS as individuals or, at the group level, through the GROUP PRACTICE REPORTING OPTION (GPRO). Physician quality reporting is mandated by federal legislation. CMS implements the program through regulations published in the Federal Register.

QUALITY COMPOSITE SCORE. The Quality Composite Score is one of two composite scores used to calculate the VALUE-BASED PAYMENT MODIFIER under the QUALITY TIERING option. It summarizes a MEDICAL GROUP PRACTICE'S performance on quality up to six equally-weighted quality domains: Clinical Process/Effectiveness, Patient and Family Engagement, Population/Public Health, Patient Safety, Care Coordination, and Efficient Use of Healthcare Resources. Only domains containing at least one quality measure with at least 20 eligible cases are included in the quality composite score. Standardized scores reflect how much a group's performance differs from the national mean performance on a measure-by-measure basis within each quality domain.

QUALITY TIERING. MEDICAL GROUP PRACTICES participating in the PHYSICIAN QUALITY REPORTING SYSTEM (PQRS) will have the option of having their 2015 VALUE-BASED PAYMENT MODIFIER calculated using a quality-tiering approach based on 2013 performance. Groups electing this option will have the opportunity to earn an upward payment adjustment for performance in the higher quality and lower cost tiers but will also be at risk for a downward payment adjustment for lower quality and higher cost performance. To be considered either a high or a low performer, a qualifying group's score must be at least one standard deviation above or below the national mean performance score and statistically different from the mean score at the five percent level of significance.

The basic structure of value-based payment modification under the quality tiering option is displayed below. Because the modifier must be budget neutral, the precise size of the reward for higher performing groups—those that are at least average on both quality and cost and better than average on at least one—will depend on the projected billings of these groups relative to lower performing groups (as captured in the table by the variable *x*), which will vary from year to year with differences in actuarial estimates and in the number and relative performance of medical group practices electing the quality tiering option. Higher performing groups treating beneficiaries with an average risk exceeding the risk of the 75th percentile beneficiary in the Medicare population receive an additional 1.0 percent incentive payment on top of the standard upward adjustment.

	Low Quality	Average Quality	High Quality
Low Cost	+0.0%	+1.0x%*	+2.0x%*
Average Cost	-0.5%	+0.0%	+1.0x%*
High Cost	-1.0%	-0.5%	+0.0%

Note: *x* refers to a payment adjustment factor yet to be determined.

* Higher performing groups serving high-risk beneficiaries (based on average risk scores) are eligible for an additional adjustment of +1.0*x*%.

RISK ADJUSTMENT. Risk adjustment accounts for differences in patient characteristics that can affect their medical costs or utilization, regardless of the care provided. For PEER GROUP comparisons, a MEDICAL GROUP PRACTICE'S per capita costs are risk adjusted based on the unique mix of patients ATTRIBUTED to the group. For medical group practices that have a higher than average proportion of patients with serious medical conditions

or other higher-cost risk factors, risk-adjusted per capita costs will be lower than unadjusted costs (because costs associated with higher-risk patients are adjusted downward). For medical group practices that treat comparatively lower-risk patients, risk-adjusted per capita costs will be higher than unadjusted costs and admissions (because costs for lower-risk patients are adjusted upwards).

For these reports, risk adjustment was based on the hierarchical condition categories (HCC) model developed for the Centers for Medicare & Medicaid Services (CMS) that assigns ICD-9 diagnosis codes (each with similar disease characteristics and costs) to 70 clinical conditions. For each Medicare beneficiary attributed to a medical group practice in 2012, the HCC model generates a 2012 score based on the presence of these conditions in 2011—and on sex, age, original reason for Medicare entitlement (either age or disability), and Medicaid entitlement—as a predictor of beneficiary costs in 2012. Risk adjustment of 2012 costs also takes into account the presence of end-stage renal disease (ESRD) in 2011.

A statistical risk adjustment model estimates the independent effects of these factors on absolute beneficiary costs and adjusts 2012 annual beneficiary costs for each beneficiary prior to calculating per capita risk-adjusted cost measures for a medical group practice. To ensure that extreme outlier costs do not have a disproportionate effect on the cost distributions, costs below the 1st percentile are eliminated from the cost calculations, and costs above the 99th percentile are rounded down to the 99th percentile.

VALUE-BASED PAYMENT MODIFIER. The value-based payment modifier is an adjustment to payments under the Medicare physician fee schedule that will reward higher quality care delivered at lower cost, as required under Section 3007 of the Affordable Care Act. As described in the 2013 Physician Fee Schedule Notice of Final Rulemaking, the Centers for Medicare & Medicaid Services (CMS) will initially apply the value-based payment modifier only to physicians practicing in a MEDICAL PRACTICE GROUP with 100 or more ELIGIBLE PROFESSIONALS billing under a single Taxpayer Identification Number (TIN) as of October 15, 2012. CMS will separate these groups into two categories, based on their registration and participation in the PHYSICIAN QUALITY REPORTING SYSTEM (PQRS) in 2013. Groups may participate under one of three PQRS reporting options: (1) the GROUP PRACTICE REPORTING OPTION (GPRO) web interface, (2) a qualified registry, or (3) CMS-calculated administrative claims. Groups choosing not to register and participate in PQRS in one of these three ways will have a value-based payment modifier set at -1.0 percent, applied to all of the group's Medicare physician fee schedule payments in 2015. Groups that register and participate in PQRS via one of the three reporting options will have their value-based payment modifier set at 0.0 percent, meaning that they will incur no negative adjustment to their 2015 physician fee schedule payments. During the registration period, groups participating in PQRS can request, instead, that CMS calculate their 2015 value-based payment modifier using a QUALITY TIERING approach based on 2013 performance.

CMS will not apply the value-based payment modifier for 2015 and 2016 to groups of physicians that are participating in the Medicare Shared Savings Program, the testing of the Pioneer ACO Model, or the Comprehensive Primary Care Initiative.

Cost and Resource Use 2012

Total Per Capita Cost Measure for Medicare Fee-for-Service Beneficiaries – Table for Section H. Related and Competing Measures

Table H.1.2.1. Areas in Which the Specifications Are Not Completely Harmonized: Differences, Rationale, and Impact on Interpretability

Description of Measure Specifications in Which Harmonization Is Not Complete	Rationale and Impact of Interpretability	Total Per Capita Cost Measure for Medicare Fee-for-Service Beneficiaries	NQF #1598 Total Resource Use Population-Based Per Member Per Month Index
Target Population	CMS's measure focuses on total per capita cost for Medicare fee-for-service (FFS) beneficiaries. The measure has been tested and validated, specifically for the Medicare FFS population to evaluate the total per capita cost of beneficiaries attributed to medical group practices. The measure is not intended to be applied to the commercial or Medicaid population.	Medicare FFS	Commercial
Exclusions	**Age Limitation:** We do not set any age limitations so as to provide a comprehensive measure of resource use for all Medicare FFS beneficiaries. **Enrollment Period:** Because our measure is an annual measure of per capita cost, continuous enrollment during the performance year enables us to evaluate costs without having to impute costs.	**Age limitation:** None (all Medicare FFS beneficiaries are included) **Enrollment Period:** Beneficiaries enrolled in both Medicare FFS Parts A and B for all 12 months	**Age Limitation:** Age < 1 or > 64 **Enrollment Period:** Commercial health plan members enrolled in plan for at least 9 months

Description of Measure Specifications in Which Harmonization Is Not Complete	Rationale and Impact of Interpretability	Total Per Capita Cost Measure for Medicare Fee-for-Service Beneficiaries	NQF #1598 Total Resource Use Population-Based Per Member Per Month Index
Types of Services or Costs	Costs related to Part D drugs are excluded from our measure. Only 60 percent of beneficiaries were enrolled in Part D plans in 2011. CMS does not have prescription drug data, as these are private plans. In addition, some beneficiaries who do not have Medicare Part D might have prescription drug coverage through other insurance sources or the retiree subsidy, for which Medicare does not have claims data.	Exclude prescription drugs (due to data limitations of Part D) and lack of access to prescription drug data from private plans	Include prescription drugs within a commercial health plan
Attribution Approach	The attribution method for the proposed measure of per capita cost is closely aligned with the beneficiary attribution methods used across several CMS programs targeting Medicare FFS populations and the physicians who serve them: the Medicare Shared Savings Program, the Physician Quality Reporting System, the Quality and Resource Use Reports, and the Physician Value-Based Payment Modifier. Applying consistent attribution methods across these programs allows CMS to streamline processes and reduce confusion	Medicare beneficiaries are attributed via a two-step process. The attribution method emphasizes primary care provided by primary care physicians (PCPs) through the first step attribution rule, while also acknowledging the role that physicians of other specialties and other eligible professionals have in providing primary care services (PCS) through the second step of the method.	Commercial health plan members are attributed to a PCP based on the PCP claims. Members are attributed to PCPs with whom they had the greatest number of primary care visits.

Description of Measure Specifications in Which Harmonization Is Not Complete	Rationale and Impact of Interpretability	Total Per Capita Cost Measure for Medicare Fee-for-Service Beneficiaries	NQF #1598 Total Resource Use Population-Based Per Member Per Month Index
	among group practices. Through this attribution approach, CMS is focusing on primary care and addressing care fragmentation, which is common in traditional Medicare. This differs from the commercial health plan environment, in which primary care physicians have a more prominent role.		
Payment-Standardization	CMS's payment-standardization approach equalizes the costs associated with a specific service, such that a given service is paid at the same level across all providers of the same type. More specifically, the measure adjusts for observed payments for Medicare FFS geographic adjustment factors, such as the hospital wage index and geographic cost index. Payment standardization also removes supplemental payments CMS makes to academic medical centers and providers that treat a disproportionate share of low-income patients.	Payments are standardized for the same type of services provided in a given health care setting regardless of when and where it was provided, and regardless of differences in Medicare payment rates among the same class of providers. The methodology is based specifically on CMS payment systems and payment rates.	Standardized costing code table: Total Care Relative Resource Values (TCRRVs)

Description of Measure Specifications in Which Harmonization Is Not Complete	Rationale and Impact of Interpretability	Total Per Capita Cost Measure for Medicare Fee-for-Service Beneficiaries	NQF #1598 Total Resource Use Population-Based Per Member Per Month Index
Risk-Adjustment	CMS applies a risk-adjustment approach developed specifically for Medicare beneficiaries. The methodology has been tested, validated, and tailored for the Medicare patient population. Using a common, publicly available methodology increases transparency and usability of this measure across the Agency and providers.	CMS-HCC risk score	Johns Hopkins ACG System Version 9.0 (diagnoses from claims, age, gender); uses ACG weights

NATIONAL QUALITY FORUM

Resource Use Measure Evaluation 1.0
January 2011

This form contains the measure information submitted by stewards. Blank fields indicate no information was provided. Attachments also may have been submitted and are provided to reviewers. The subcriteria and most of the footnotes from the evaluation criteria are provided in Word comments within the form and will appear if your cursor is over the highlighted area. Hyperlinks to the evaluation criteria and ratings are provided in each section.

Resource Use Definition:

- Resource use measures are broadly applicable and comparable measures of input counts—(in terms of units or dollars)-- applied to a population or population sample
- Resource use measures count the frequency of specific resources; these resource units may be monetized, as appropriate.
- The approach to monetizing resource use varies and often depends on the perspective of the measurer and those being measured. Monetizing resource use allows for the aggregation across resources.

NQF Staff: NQF staff will complete a preliminary review of the measure to ensure conditions are met and the form has been completed according to the developer's intent. Staff comments have been highlighted in green.

TAP/Workgroup (if utilized)**:** Complete all yellow highlighted areas of the form. Evaluate the extent to which each subcriterion is met. Based on your evaluation, summarize the strengths and weaknesses in each section.

Note: *If there is no TAP or workgroup, the SC also evaluates the subcriteria (yellow highlighted areas).*

Steering Committee: Complete all pink highlighted areas of the form. Review the workgroup/TAP assessment of the subcriteria, noting any areas of disagreement; then evaluate the extent to which each major criterion is met; and finally, indicate your recommendation for the endorsement. Provide the rationale for your ratings.

Evaluation ratings of the extent to which the subcriteria are met (TAP or Steering Committee)
High (H) – based on the information submitted, there is high confidence (or certainty) that the criterion is met
Moderate (M) – based on the information submitted, there is moderate confidence (or certainty) that the criterion is met
Low (L) - based on the information submitted, there is low confidence (or certainty) that the criterion is met
Insufficient (I) – there is insufficient information submitted to evaluate whether the criterion is met, e.g., blank, incomplete, or information is not relevant, responsive, or specific to the particular question (unacceptable)
Not Applicable (NA) - Not applicable (only an option for a few subcriteria as indicated)

Evaluation ratings of whether the measure met the overall criterion (Steering Committee)
Yes (Y)- The overall criteria has been met
No (N)-The overall criterion has NOT been met
High (H) – There is high confidence (or certainty) that the criterion is met
Moderate (M) – There is moderate confidence (or certainty) that the criterion is met
Low (L) - There is low confidence (or certainty) that the criterion is met

Recommendations for endorsement (Steering Committee)
Yes (Y) – The measure should be recommended for endorsement
No (N)-The measure should NOT be recommended for endorsement
Abstain (A)- Abstain from voting to recommend the measure

TAP/Workgroup Reviewer Name:
Steering Committee Reviewer Name:

Staff Reviewer Name(s):
NQF Review #: 1598 **NQF Project:** Endorsing Resource Use Standards-Phase II
BRIEF MEASURE INFORMATION
Measure Title: Total Resource Use Population-based PMPM Index
Measure Steward (IP Owner): «steward_intellectual_property_organizati»
Brief description of measure: The Resource Use Index (RUI) is a risk adjusted measure of the frequency and intensity of services utilized to manage a provider group's patients. Resource use includes all resources associated with treating members including professional, facility inpatient and outpatient, pharmacy, lab, radiology, ancillary and behavioral health services.
Resource use service categories: Inpatient services: Inpatient facility services Inpatient services: Evaluation and management Inpatient services: Procedures and surgeries Inpatient services: Imaging and diagnostic Inpatient services: Lab services Inpatient services: Admissions/discharges Inpatient services: Labor (hours, FTE, etc.) Ambulatory services: Outpatient facility services Ambulatory services: Emergency Department Ambulatory services: Pharmacy Ambulatory services: Evaluation and management Ambulatory services: Procedures and surgeries Ambulatory services: Imaging and diagnostic Ambulatory services: Lab services Ambulatory services: Labor (hours, FTE, etc.) Durable Medical Equipment (DME)
Brief description of measure clinical logic: Not applicable. This is a population-based measure that applies to all service categories, care settings and conditions.
If included in a composite or paired with another measure, please identify composite or paired measure:
Subject/ Topic Areas: «topic_area»
Type of resource use measure: Cost/Resource Use
Data Type: Administrative claims Other

CONDITIONS FOR CONSIDERATION BY NQF	
Four conditions must be met before proposed measures may be considered and evaluated for suitability as voluntary consensus standards:	**NQF Staff**
A. Measure Steward Agreement. ***The measure is in the public domain or an intellectual property (measure steward agreement) is signed. Public domain only applies to governmental organizations. All non-government organizations must sign a measure steward agreement even if measures are made publicly and freely available.***	**A**
A.1.Do you attest that the measure steward holds intellectual property rights to the measure? (If no, do not submit)	**Y☐ N☐**

«steward_ip_rights» **A.2. Please check if either of the following apply:** **A.3. Measure Steward Agreement.** «condition_agreement» **A.4. Measure Steward Agreement attached:** «agreement_attach»	
B. Maintenance. ***The measure owner/steward verifies there is an identified responsible entity and process to maintain and update the measure on a schedule that is commensurate with the rate of clinical innovation, but at least every 3 years. (If no, do not submit)*** Yes, I have read and accept the conditions as specified above	**B** **Y☐** **N☐**
C. Actual/Planned Use ***(Check all the planned uses for which the measure is specified and tested:*** «purpose_pr_qi»	**C** **Y☐** **N☐**
D. Testing. ***The measure is fully specified and tested for reliability and validity (See guidance on measure testing).*** «condition_tested»	**D** **Y☐** **N☐**
E. Harmonization and Competing Measures. ***Have NQF-endorsed measures been reviewed to identify if there are related or competing measures? (List the NQF # and title in the section on related and competing measures)*** «reviewed_measures» ***E.1.*** **Do you attest that measure harmonization issues with related measure (either the same measure focus or the same target population) have been considered and addresses as appropriate? (List the NQF # and title in the section on related and competing measures)** «harmonization_addressed» *E.2.Do you attest that competing measures (both the same measure focus and the same target population) have been considered and addressed where appropriate?* «competing_measure_addressed»	**E** **Y☐** **N☐**
F. Submission Complete. ***The requested measure submission information is complete and responsive to the questions so that all the information needed to evaluate all criteria is provided.***	**F** **Y☐** **N☐**
Have all conditions for consideration been met? **Staff Notes to Steward** (*if submission returned*)**:**	**Y ☐** **N ☐**
Staff Notes to Reviewers (*issues or questions regarding any criteria*)**:**	

File Attachments Related to Measure/Criteria:
«attach_general_approach»
Attachment:
Attachment:
«attach_dataprotocol»
«attach_datasource_intsrument»
Attachment:
Attachment:
Attachment:
«attach_riskadjustment»
«attach_score_samplereport»
«attach_testing»

IMPORTANCE TO MEASURE AND REPORT	
Extent to which the specific measure focus is important to making significant gains in health care quality (safety, timeliness, effectiveness, efficiency, equity, patient-centeredness) and improving health outcomes for a specific high impact aspect of healthcare where there is variation in performance. **Importance to Measure and Report is a threshold criterion that must be met in order to recommend a measure for endorsement. All subcriteria must be met to pass this criterion.**	**Eval Rating**
High Impact **IM1. Demonstrated high impact aspect of healthcare:** Affects large numbers High resource use Patient/societal consequences of poor quality Severity of illness **IM1.1. Summary of evidence of high impact:** In 2007, health care spending represented 16 percent of US gross domestic product (GDP); this is the largest percentage of any developed nation in the world.1 Rising costs prohibit many from being able to afford insurance coverage and contribute to personal bankruptcies. Consequently, affordability of care has become an increasingly discussed issue but in spite of this, few publically available cost measures exist.2 Aware of this issue, HealthPartners has developed a total cost of care index (TCI) to make providers and patients more aware of the cost of care and healthcare spending. However, total cost reflects a mix of complicated factors including market-related discrepancies, service utilization, and negotiated prices.2 By separating out and also reporting the relative resource use index (RUI) HealthPartners creates a more complete picture of the drivers of health care costs. Non-condition specific resource use measures can provide valuable information on how to make health care more affordable because health plans and providers can use the data to identify areas where they can lower cost by improving resource use or a shift to less expensive resources (for example, use of a surgery center instead of a hospital where medically appropriate). Evidence supports the idea that improving use of resources can lead to lower costs with no loss in quality. Turbyville, et al (2011) found that medical resource use has no relationship with quality of care for diabetes.3 Fisher, et al (2004) performed a study that showed a similar result for resource use and quality of care in Academic Medical Centers.4 The Medicare Payment Advisory Commission in a report to congress in 2006 also reported that they found no correlation between higher resource use and higher quality of care across six metropolitan statistical areas (MSAs).5 Similarly, in February 2011, Kralewski, et al showed that quality of care in provider group practices in Minnesota does not improve as costs increase.6 Several resource use measures have been developed by various health plans and national organizations. NCQA has created condition-specific relative resource use (RRU) measures which they use to complement their HEDIS quality measurements and report on the value of dollars spent in health care. They measure RRU for six chronic conditions -	**1a** **H☐** **M☐** **L☐** **I☐**

diabetes, COPD, asthma, cardiovascular conditions, hypertension, and low back pain - and the scores are reported as a ratio of observed resource use relative to average use.2 Lake, Colby, and Peterson compiled a report of physician-level resource use measures used by various commercial health plans in 2007.7 These plans agreed that resource use measures provide valuable data on the cost of health care but note the importance of providing actionable feedback to the physicians.7 One problem this study found with physician-level resource use measures was that there were not enough volume at the individual physician level.

The advancement of the Accountable Care Organization (ACO) in the market place may drive higher clout in provider practices as articulated by Berenson, et al. Total Cost of Care and Resource Use measurements are tools that can be used to optimize resource use.8 These measures can be used to support a comprehensive measurement system.9 Glass, et al call for reporting of resource use in ACO models as a recommended tool to improve value, they also suggest the use of resources measurement to set targets for payment incentives, by tying payments to quality and resource use improvements.10,11

Overuse of health care services has led to wide variation in health care cost and use across geographies. Studies suggest that Medicare spending would decrease by almost 30 percent if medium and high spending geographies consumed health care services comparable to that of lower spending regions.4 Experts agree that reducing overuse can make care safer and more efficient.12,13 The Resource Use Index, which controls for both cost and illness burden, can be used to identify areas of overuse in health care as well as measure targeted improvement efforts.

IM1.2. Citations for evidence of high impact cited in IM1.1.:

1.Partnership to Fight Chronic Disease, Almanac of Chronic Disease 2009 Edition, 2009, http://www.fightchronicdisease.org/pdfs/2009_PFCDAlmanac.pdf.
2.National Committee for Quality Assurance, Insights for Improvement - Measuring Health Care Value: Relative Resource Use, 2010, http://www.ncqa.org/portals/0/hedisqm/RRU/BI%20NCQA_RRU_Publication_FINAL.pdf (February 15, 2011).
3.Turbyville, Sally E., Meredith B. Rosenthal, L. Gregory Pawlson, and Sarah Hudson Scholle, Health Plan Resource Use – Bringing Us Closer to Value-Based Decision Making, The American Journal of Managed Care, 2011. Vol. 1, no. 1, p. 68-74. http://www.ajmc.com/issue/managed-care/2011/2011-1-vol17-n1/AJMC_2011jan_Turbyville_68to74
4.Fisher, Elliot S., David E. Wennberg, Therese A. Stukel, and Daniel J. Gottlieb, Variations in the Longitudinal Efficiency of Academic Medical Centers, Health Affairs, 2004. doi:10.1377/hlthaff.var.19.
5.Medicare Payment Advisory Committee, Report to the Congress: Increasing the Value of Medicare, 2006. http://www.medpac.gov/documents/jun06_entirereport.pdf
6.Kralewski, John E, Dowd, Bryan E, Xu, Yi (Wendy). Differences in the Cost of Health Care Provided by Group Practices in Minnesota. February 2011. Minnesota Medicine. http://www.minnesotamedicine.com/tabid/3678/Default.aspx
7.Lake, Timothy, Margaret Colby, and Stephanie Peterson, Health Plans' Use of Physician Resource Use and Quality Measures, Mathematica Policy Research Institute, 2007, http://www.medpac.gov/documents/6355%20MedPAC%20Final%20Report%20with%20Appendices%201-24-08.pdf
8.Berenson, Robert A., Ginsburg, Paul B., Kemper, Nicole. Unchecked Provider Clout in California Foreshadows Challenges to Health Reform. Health Affairs, April 2010. doi: 10.1377/hlthaff.2009.0715. http://content.healthaffairs.org/content/29/4/699.full?sid=f53c960e-8ad4-41d5-8921-00274d44919e
9.Fisher, Elliot S.; Shortell, Stephen M. Accountable Care Organizations: Accountable for What, to Whom and How. Journal of American Medical Association. October 20, 2010. http://jama.ama-assn.org/content/304/15/1715.full
10.Glass, David; Stensland, Jeff. Accountable Care Organizations. April 9, 2008. http://www.medpac.gov/transcripts/0408_ACO_public_pres.pdf
11.Glass, David; Stensland, Jeff. Accountable Care Organizations. March 12, 2009. http://www.medpac.gov/transcripts/ACO%203%2009.pdf
12.National Quality Forum Issue Brief. Waste Not, Want Not: The Right Care for Every Patient. June 2009
13.National Priorities and Goals. National Priorities Partnership convened by the National Quality Forum. November 2008. http://www.nationalprioritiespartnership.org/uploadedFiles/NPP/08-253-NQF%20ReportLo[6].pdf

Last Accessed 2/24/2011

IM2. Opportunity for Improvement

IM2.1. Briefly explain the benefits envisioned by use of this measure:

By measuring population based relative resource use, health plans and providers can improve the affordability of health care without sacrificing quality. HealthPartners' RUI gives provider groups valuable information on resource use and, when viewed in conjunction with quality metrics, information on the efficiency of care. The HealthPartners RUI measure is a population-based, patient-centered, total resource use measure, created with Total Care Relative Resource Values that cross all categories of health services. This is in contrast to the many, episodic based resource use measures available in the market today. Both population based and episodic based resource use measures are important and complimentary but a key benefit of population based measures is helping to better understand potential overuse & underuse (e.g., although efficient at spine surgery, may be performing too many).

IM2.2. Summary of data demonstrating variation across providers or entities:

The Dartmouth Atlas has been an eye-opening look at the variation in health care spending and resource use across regions for the Medicare population. The measurement of resource use is as widely varied in the commercial population across geographies.1 While HealthPartners has applied the measure on the commercial population, the measure could as easily be applied across all populations.

A recent study of the Minnesota market further highlighted the significant variation in cost and efficiency ranging from $2,400 to $4,700 PMPY. Additional findings found no relation to quality or type of practice (large, small, integrated, etc).2 These findings are further confirmed based on HealthPartners own experience and analyses.

Existing resource use measures are largely condition or episode specific measures. There is not an existing total population resource use measure in the market today that crosses all care services.3 A Total Cost of Care measure is being implemented by the Integrated Healthcare Association in California for 2010 measurement of the Pay for Performance Program.4 HealthPartners uses Total Care Relative Resource Values, which plots all health care services, regardless of service category on a grand linear scale. Therefore, resource use can be compared across service categories where services are relative to each other. Resource use indices can be drilled down to the service category or condition to help identify areas of opportunity, especially when paired with utilization data.

IM2.3. Citations for data on variation:

1.Dartmouth Atlas. http://www.dartmouthatlas.org/
2.Kralewski, John E, Dowd, Bryan E, Xu, Yi (Wendy). Differences in the Cost of Health Care Provided by Group Practices in Minnesota. February 2011. Minnesota Medicine. http://www.minnesotamedicine.com/tabid/3678/Default.aspx
3.Berwick, Donald M., Nolan, Thomas W., Whittington, John, The Triple Aim: Care, Health and Cost. Health Affairs, May/June 2008. doi: 10.1377/hlthaff.27.3.759. http://content.healthaffairs.org/content/27/3/759.full?sid=f3d381e8-76ef-415f-9080-de97c1273fa6
4.Integrated Healthcare Association (IHA) California Pay for Performance Program Draft Year 2011 P4P Manual, December 30, 2010. http://www.iha.org/pdfs_documents/p4p_california/DraftMY2011P4PManual123010.pdf

1b

IM2.4. Summary of data on disparities by population group:

Not Applicable

IM2.5. Citations for data on disparities cited in IM2.4:

Not Applicable

H☐ M☐ L☐ I☐

IM3. Measure Intent

1c

IM3.1. Describe intent of the measure and its components/ Rationale (including any citations) for analyzing variation in resource use in this way

H☐ M☐ L☐

1. The Resource Use measurement is a population-based, person-centered, primary care-focused measurement system that quantifies a provider's effectiveness at managing the population of patients they care for. -As an integrated health care organization, HealthPartners has thoughtfully brought together the perspectives of multiple stakeholder groups to the Resource Use measure development 2. The measure is a comprehensive reflection of a provider's resource use, intensity, appropriateness and efficiency. - Reporting the resource use index (RUI) provides a more complete picture of population based drivers of health care costs 3. The measure can be used to support comprehensive ACO evaluation and help identify improvement opportunities. -HealthPartners is changing the payment model by establishing total cost of care agreements with providers that base payment on quality, patient experience outcomes and affordability 4. Existing resource use measures are largely condition or episode specific. This approach complements condition and episode based resource use measures. - Partnering resource use measures with utilization, quality, cost and patient experience measures can drive greater health care value for purchasers and patients As noted by Berwick, et al, the Institute for Healthcare Improvement (IHI) Triple Aim, improving quality of care can raise costs as new technologies are used, however, reducing waste (overuse) in healthcare can reduce costs and improve outcomes.1 Key considerations when constructing the measure: • The purpose of population-based measurement is to better understand overuse, underuse, and person-centered management and accountability • Population based-measurement nicely complements condition and episode-base measures, combined they depict a complete picture of a provider's total cost and resource use • Risk adjustment is a critical component to the measure to allow for fair comparisons • Use these measures as part of a Triple-aim approach where Total Cost of Care and Resource Use measures are complements to quality and patient experience. • Removing price via Total Care Relative Resource Values (TCRRVs) allows for a clear picture of resource use opportunities. • Total Cost Index and Resource Use Index measures when used together help to better understand cost and resource use opportunities. 1. Berwick, Donald M., Nolan, Thomas W., Whittington, John, The Triple Aim: Care, Health and Cost. Health Affairs, May/June 2008. doi: 10.1377/hlthaff.27.3.759. http://content.healthaffairs.org/content/27/3/759.full?sid=f3d381e8-76ef-415f-9080-de97c1273fa6	I☐
IM4. Resource use service categories are consistent with measure construct *Refer to IM3.1. & all S9 items to evaluate this criteria.*	**1d** **H☐** **M☐** **L☐** **I☐**
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Importance to Measure and Report*?	
Steering Committee: Was the threshold criterion, *Importance to Measure and Report*, met? **Rationale:**	**Y☐** **N☐**

SCIENTIFIC ACCEPTABILITY OF MEASURE PROPERTIES

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented.

MEASURE SPECIFICATIONS

Eval Rating 2a1/2b1

S1. Measure Web Page:
Do you have a web page where current detailed measure specifications can be obtained?

«current_url»
<WebPageURL>Yes</WebPageURL><WebPageURLExists>www.healthpartners.com/tcoc</WebPageURLExists>

S2. General Approach
If applicable, summarize the general approach or methodology to the measure specification. This is most relevant to measures that are part of or rely on the execution of a measure system or applies to multiple measures.

«general_approach»

«attach_general_approach»

S3. Type of resource use measure:

Per capita (population- or patient-based)

S4. Target Population:

«target_population»

S4.1. Subject/Topic Areas:

«topic_area»

S4.2. Cross Cutting Areas *(HHS or NPP National health goal/priority)*

Care Coordination
Overuse
Population Health

S5. Data dictionary or code table
Please provide a web page URL or attachment if exceeds 2 pages. NQF strongly prefers URLs. Attach documents only if they are not available on a web page and keep attached file to 5MB or less.

Data Dictionary:

URL:
Please supply the username and password:
Attachment:

Code Table:

URL: http://www.healthpartners.com/files/56341.pdf -- OR -- www.healthpartners.com/tcoc. Click "Total Care Relative Resource Values (TCRRV)" open the link at that states: "TCRRV code table"
Please supply the username and password:
Attachment:

S6.Data Protocol (Resource Use Measure Module 1)
The measure developer must determine which of the following data protocol steps: data preparation, data inclusion criteria, data exclusion criteria, and missing data, are submitted as measure specifications or as guidelines. Specifications limit user options and flexibility and must be

strictly adhered to; whereas guidelines are well thought out guidance to users while allowing for user flexibility. If the measure developer determines that the requested specification approach is better suited as guidelines, please select and submit guidelines, otherwise specifications must be provided.

Data Protocol Supplemental Attachment or URL:
If needed, attach document that supplements information provided for data protocol for analysis, data inclusion criteria, data exclusion criteria, and missing data (Save file as: S6_Data Protocol). All fields of the submission form that are supplemented within the attachment must include a summary of important information included in the attachment and its intended purpose, including any references to page numbers, tables, text, etc.

«data_protocol_url_provided»
«data_protocol_url_password»
«attach_dataprotocol»

S6.1. Data preparation for analysis
Detail (specify) the data preparation steps and provide rationale for this methodology.

«data_preparation_for_analysis»«data_preparation_for_analysis_specificat»
«data_preparation_for_analysis_guidelines»«data_preparation_for_analysis_rationale»

S6.2.Data inclusion criteria
Detail initial data inclusion criteria and rationale(related to claim-line or other data quality, data validation, e.g. truncation or removal of low or high dollar claim)

We do not provide measure specifications or guidelines for data inclusion criteria :
«data_inclusion_criteria_specifications»«data_inclusion_criteria_guidelines» Paid medical and pharmacy administrative claims for the measurement year (e.g. between January 1 and December 31), allowing for three months of run out for claims lag.
Members are excluded from measures if they meet one of the following criteria:

1. Members over age 64
2. Members under age 1
3. Member enrollment less than nine months during the one year measurement time window
4. Members who are not attributed to a primary care provider

Member claims are truncated at $100,000
1. For an individual member, when the sum of all claims for the measurement year totals more than $100,000, claims are truncated to $100,000 for the measurement time window. A factor reduces an individual member's claims to a total $100,000, e.g. if member claims for an individual totaled $125,000, the factor would be 0.80. This factor is applied to all claims for that measurement period. This preserves all claim lines to ensure claims can be proportionally allocated to the appropriate service category.

S6.3. Data exclusion criteria
Detail initial data exclusion criteria and rationale (related to claim-line or other data quality, data validation, e.g. truncation or removal of low or high dollar claim)

«data_exclusion_criteria»«data_exclusion_criteria_specifications»«data_exclusion_criteria_guidelines»
«data_exclusion_criteria_rationale»

S6.4. Missing Data
Detail steps associated with missing data and rationale(e.g., any statistical techniques used)

We do not provide measure specifications or guidelines for missing data :
«missing_data_specifications»«missing_data_guidelines»There is no missing data, it is the health plan full population,

all claims are used

S7. Data Type: Administrative claims
Other

S7.1. Data Source or Collection Instrument
Identify the specific data source/data collection instrument (e.g. name of database, clinical registry, collection instrument, etc.)

- Users administrative claims data base
- Risk Adjustment Tool, Johns Hopkins ACG System Version 9.0,
- Standardized costing code table, Total Care Relative Resource Values (TCRRV) specification provided

S7.2. Data Source or Collection Instrument Reference
(Please provide a web page URL or attachment). NQF strongly prefers URLs. Attach documents only if they are not available on a web page and keep attached file to 5MB or less)

«datasource_instrument_url»
«datasource_instrument_url_login»
«attach_datasource_intsrument»

S8.Measure Clinical Logic (Resource Use Measure Module 2)
The measure's clinical logic includes the steps that identify the condition or event of interest and any clustering of diagnoses or procedures. For example, the diagnoses and procedures that qualifies for a cardiac heart failure episode, including any disease interaction, comorbid conditions, or hierarchical structure to the clinical logic of the model. (Some of the steps listed separately below may be embedded in the risk adjustment description, if so, please indicate NA and in the rationale space list 'see risk adjustment details.')

Clinical Logic Supplemental Attachment or URL:
If needed, provide a URL or document that supplements information provided for the clinical framework, co-morbid interactions, clinical hierarchies, clinical severity levels, and concurrency of clinical events

URL:
Please supply the username and password:
Attachment:

S8.1. Brief Description of Clinical Framework
Briefly describe your clinical logic approach including clinical topic area, whether or not you account for comorbid and interactions, clinical hierarchies, clinical severity levels and concurrency of clinical events.

Not applicable. This is a population-based measure that applies to all service categories, care settings and conditions.

S8.2. Clinical framework
Detail any clustering and the assignment of codes, including the grouping methodology, the assignment algorithm, and relevant codes and rationale for these methodologies.

Not applicable. This is a population-based measure that applies to all service categories, care settings and conditions.

S8.3. Comorbid and interactions
Detail the treatment of co-morbidities & disease interactions and provide rationale for this

methodology.

We do not provide specifications for co-morbidies and disease interactions.
This is accounted for in application of risk adjustment, Johns Hopkins, ACG version 9.0

S8.4. Clinical hierarchies
Detail the hierarchy for codes or condition groups used and provide rationale for this methodology.

We do not provide specifications for clinical hierarchies.
This is accounted for in application of risk adjustment, Johns Hopkins, ACG version 9.0

S8.5. Clinical severity levels
Detail the method used for assigning severity level and provide rationale for this methodology.

We do not provide specifications for clinical severity levels.
This is accounted for in application of risk adjustment, Johns Hopkins, ACG version 9.0

S8.6. Concurrency of clinical events (that may lead to a distinct measure)
Detail the method used for identifying concurrent clinical events, how to manage them, and provide the rationale for this methodology.

We do not provide specifications for concurrency of clinical events.
This is a population-based measure that applies to all service categories, care settings and conditions.

S9. Measure Construction Logic (Resource Use Measure Module 3)
The measure's construction logic includes steps used to cluster, group or assign claims beyond those associated with the measure's clinical logic. For example, any temporal or spatial (i.e., setting of care) parameters used to determine if a particular diagnosis or event qualifies for the measure of interest.

Construction Logic Supplemental Attachment or URL:
If needed, attach supplemental documentation (Save file as: S9_Construction Logic). All fields of the submission form that are supplemented within the attachment must include a summary of important information included in the attachment and its intended purpose, including any references to page numbers, tables, text, etc.)

URL: http://www.healthpartners.com/files/57444.pdf-- OR -- www.healthpartners.com/tcoc . Click "Technical Guidelines" open the link at that states: "Read more about Total Resource Use technical guidelines.
Please supply the username and password:
Attachment:

S9.1. Brief Description of Construction Logic
Briefly describe the measure's construction logic.

The measure examines total resource use of a commercial population between for a given measurement year (e.g. January 1 and December 31), for all members eligible for the measure

S9.2. Construction Logic
Detail logic steps used to cluster, group or assign claims beyond those associated with the measure's clinical logic.

- All claims included in the measure have a date of service in the measurement year (e.g. between January 1 and December 31)
- Members have a minimum 9 months enrollment in the measurement year
- Commercial population only
- Attribution (see section S11.1)
- Costing Method – Total Care Relative Resource Values TCCRVs (section S9.7 and S10.3)
- Risk Adjustment (S10.1)

S9.3. Measure Trigger and End mechanisms
Detail the measure's trigger and end mechanisms and provide rationale for this methodology.

All claims dates of service in the measurement year (e.g. January 1 – December 31)

S9.4.Measure redundancy or overlap
Detail how redundancy and overlap of measures can be addressed and provide rationale for this methodology.

«redundancy_overlap»
«no_redundancy_overlap»

S9.5.Complementary services
Detail how complementary services have been linked to the measure and provide rationale for this methodology.

We do not provide specifications for linking complementary services.
Not applicable. This is a population-based measure that applies to all service categories, care settings and conditions.

Eval Rating 2a1

H☐ M☐ L☐ I☐

Eval Rating 2b1

S9.6.Resource Use Service Categories

Inpatient services: Inpatient facility services
Inpatient services: Evaluation and management
Inpatient services: Procedures and surgeries
Inpatient services: Imaging and diagnostic
Inpatient services: Lab services
Inpatient services: Admissions/discharges
Inpatient services: Labor (hours, FTE, etc.)
Ambulatory services: Outpatient facility services
Ambulatory services: Emergency Department
Ambulatory services: Pharmacy
Ambulatory services: Evaluation and management
Ambulatory services: Procedures and surgeries
Ambulatory services: Imaging and diagnostic
Ambulatory services: Lab services
Ambulatory services: Labor (hours, FTE, etc.)
Durable Medical Equipment (DME)

H☐ M☐ L☐ I☐

S9.7.Identification of Resource Use Service Categories
For each of the resource use service categories selected above, provide the rationale for their selection and detail the method or algorithms to identify resource units, including codes, logic and definitions.

Health Care Industry

Within the health care industry the measurement of price and resource use is not readily available due to the lack of an underlying relative weighting system that crosses all medical services, procedures and places of service. Each available relative payment system is created independently and is not relative across the full spectrum of medical care (e.g.: inpatient diagnostic related groups (MSDRG), outpatient ambulatory payment classifications (APC), professional relative value units (RVU) and pharmacy).

Total Care Relative Resource Values (TCRRVs) are a grand linear scale of relative resource values designed to evaluate resource use across all types of medical services, procedures and places of service. The values are independent of price and therefore can be used to evaluate providers, hospitals, physicians and health plans against their peers on their

efficiency of resource use in treating like conditions.

The methodology considers the relativity within and across places and types of service and is sourced beginning with using the Centers for Medicare & Medicaid Services (CMS) payment systems. In areas where there is no weight based payment system available (e.g.: national drug code or NDC), the methodology creates a TCRRV for each medical procedure or product that is relative to the other payment systems.

This methodology has been applied to a national database PharMetrics, Inc. Watertown, MA and a relative weight lookup table has been created that includes base unit TCRRVs and validation thresholds. The TCRRV tables can be applied directly to service level data and treated in the same fashion as any monetary field. (e.g.: allowed amount)

Since these values are independent of price and are relative across the entire spectrum of the health care industry, resource use efficiency can be measured through comparing peer groups on predetermined baskets of care. A pure price metric can also be developed with the inclusion of the paid amount with the TCRRV being the common denominator.

Methodology

The Total Care Relative Resource Values (TCRRV) measures resources consumed by medical procedures, services or substances that are independent of price. Resources are the common units of cost that are included (make up) in every service or product in the free market. The TCRRVs are relative across and within each of the components of care; inpatient, outpatient surgery & ER, scheduled outpatient & professional and pharmacy.

CMS has developed 3 sets of relative weight systems that are independent of each other and each covers a different practice setting: inpatient (MSDRG weights using MSDRG grouper version number 25), outpatient (APC weights using 2008 weights), and professional office based care (RBRVS weights using 2008 CMS RVU weights, supplemented with Ingenix RBRVS). However, CMS does not include all types of services in its weighting systems – it has focused on the prospective pricing payment methodologies covered by Medicare. For instance, pharmacy is excluded.

Provider payments vary dramatically in price. Provider payments are often applied at a case rate – and not connected to the discrete services (inpatient care, MH, outpatient care). Utilization patterns and methods of treatment also vary dramatically between providers. The aforementioned factors make it difficult to accurately distinguish utilization from price, place of service and type of service cost drivers.

All available weights, MSDRGs, APCs & RVUs, will be utilized to determine the resource use consumed within each of their respective payment components. The aggregated billed amount for each payment component will achieve relativity across components. An adjustment will be made to the TCRRVs to calibrate the values to a total paid relativity between payment components.

If a relative weight scale does not exist for medical procedures or medical items within a cost component, a common billed amount for each medical procedures or medical items is leveraged to create a relative weight scale.

The billed amount (versus paid amount) is utilized at the medical procedure or medical item level as it is most representative of resource use at that specific level. The billed amount is not affected by contract rates, payment discounts, or payment methodologies. The final adjustment of the values creates a paid relationship between the respective payment components (Inpatient MSDRGs – Outpatient APCs – Professional RVUs – Pharmacy NDCs)

Application

The TCRRVs are a set of tables that are applied to each of the components of care (inpatient, outpatient, professional and pharmacy) through a unique key; MSDRG for inpatient, revenue CPT and modifier if applicable for outpatient; place of service, CPT and modifier for professional; NDC for pharmacy. An upper and lower range is created for each MSDRG, CPT or NDC that is used as a check to make sure that the resources assigned to the service is in-line with what was actually billed. This can be viewed as a test of the resources assigned to the service and should not be considered an outlier identification process for claims analysis.

Billed to Paid Adjustment

Since the TCRRVs are developed using the billed amount, the billed amount relationship between the components of care will be reflected in the TCRRVs. The billed to paid adjustment factors are applied to the TCRRVs at the components of care level to create the desired paid relativities between the components.

Individual Component Specifics

Inpatient

The CMS MSDRG weight scale is based on a case rate payment methodology. The MSDRG grouper version 25 was used. This values an inpatient stay at a standard rate for a common MSDRG. In terms of resources consumed a hospital will expend additional resources on a patient depending on the number of days spent at the hospital. It is for this reason that the CMS MSDRG weights are recalibrated to a day one weight and an all subsequent days weight (day one, day two plus weight scale). This allows for the TCRRV to measure hospitals efficiency at treating a selected MSDRG. At the aggregated MSDRG level the Day One, Day Two Plus weight scale has the same relativity as the CMS MSDRG weight scale.

The TCRRV value is determined by creating an aggregate billed per weight conversion factor. This conversion factor is then multiplied by each of the MSDRGs in the Day One, Day Two Plus weight scale.

The normal range of resource consumption is calibrated for each of the MSDRGs, these ranges measure if the resources assigned via the TCRRV weight tables are in-line with what actually transpired in the inpatient admission. If an admission has an abnormally high or low billed amount, then the billed amount on the admission is used as a substitute for the TCRRV. This allows for the number of resources consumed to stay in-line with the reality of the "real world".

Outpatient

The CMS Outpatient Prospective Payment System combines the APC and RVU weight scales. The services that have an APC weight or are determined to be incidental to the primary APC weighted service have their relative resources assigned through the APC weight scale. The 2008 CMS OP Addendum B file was used for the APC weighted services. The laboratory, radiology and all RVU services (as defined by the Addendum B) are reclassified as professional and follow the professional TCRRV assignment process. These services are reclassified as professional as the actual service performed is the same regardless of place of service and moreover the same amount of resources is consumed for these services. The underlying reasoning for combining these services with the professional data is the number of resources assigned to a service should not be dependent upon the place of service. The services that are not included in the APC or RVU weighting scales have a weight imputed through the billed per unit relativity.

All services associated to the APC weight scale are calibrated to the other components of care through the APC aggregate billed amount conversion factor. The services associated to RVUs are calibrated in the same fashion. The services not assigned to a weight scale are calibrated to the other components of care through the imputed weight development billed per unit process.

Professional

The CMS RVUs weight scale creates relativities between the varying types of services within the spectrum of professional services using CPT and HCPCS codes that come in on both CMS 1450 and CMS 1500 claim forms. The RVU weights are dependent upon the type of service as well as where the service was performed.

The professional TCRRVs are calibrated to the other component of care through the aggregate billed amount conversion factor being applied to each of the RBRVS service weights. The services that are not included in the RBRVS weight scale have a weight imputed through the billed per unit relativity.

Pharmacy

Since there is no relative weighting scale for prescription drugs the median billed amount per day for each NDC is leveraged to create the relativities between NDCs. The pharmacy component's relativity to the other components of care is created through the use of the billed amount per unit.

If needed, provide specifications URL (preferred) or as an attachment:

URL: http://www.healthpartners.com/files/56500.pdf -- OR -- www.healthpartners.com/tcoc. Click "Total Care Relative Resource Values (TCRRV)" open the link at that states "TCRRV methodology and application" on page 1
Please supply the username and password:
Attachment:

S9.8. Care Setting; ***provides information on which care settings the measure encompasses.***

Ambulatory Care : Ambulatory Surgery Center (ASC)
Ambulatory Care : Clinician Office/Clinic
Ambulatory Care : Urgent Care
Behavioral Health/Psychiatric : Inpatient
Behavioral Health/Psychiatric : Outpatient
Dialysis Facility
Emergency Medical Services/Ambulance
Home Health
Hospice
Hospital/Acute Care Facility
Imaging Facility
Laboratory
Pharmacy
Post Acute/Long Term Care Facility : Nursing Home/Skilled Nursing Facility
Post Acute/Long Term Care Facility : Rehabilitation

S10.Adjustments for Comparability (Resource Use Measure Module 4)
External factors can mingle and affect or confound a measure's result. Confounding occurs if an extraneous factor causes or influences the outcome (e.g., higher resource use) and is associated with the exposure of interest (e.g., episode of diabetes with multiple co-morbidities). Measure developers often include steps to adjust the measure to increase comparability of results among providers, employers, and health plans.

S10.1. Risk adjustment method
Define risk adjustment variables and describe the conceptual, statistical, or other relevant aspects of the model and provide rationale for this methodology.

«riskadjustment»
«no_riskadjustment_rationale»

If needed, provide supplemental information via a web URL (preferred) or attachment with the risk adjustment specifications.

«riskadjustment_url»
«riskadjustment_url_login»
«attach_riskadjustment»

S10.2. Stratification Method
Detail the stratification method including all variables, codes, logic or definitions required to stratify the measure and rationale for this methodology

This is a population-based measure that is fully inclusive.
«no_stratification_rationale»

S10.3. Costing Method
Detail the costing method including the source of cost information, steps to capture, apply or

estimate cost information, and provide rationale for this methodology.

«no_costing_rationale»

S11. Measure Reporting (Resource Use Measure Module 5)
The measure developer must determine which of the following Measure Reporting functions: attribution approach, peer group, outliers and thresholds, sample size, and benchmarking and comparative estimates, are submitted as measure specifications or as guidelines. Specifications limit user options and flexibility and must be strictly adhered to; whereas guidelines are well thought out guidance to users while allowing for user flexibility. If the measure developer determines that the requested specification approach is better suited as guidelines, please select and submit guidelines, otherwise specifications must be provided.

S11.1. Detail attribution approach
Detail the attribution rule(s) used for attributing costs to providers and rationale for this methodology (e.g., a proportion of total measure cost or frequency of visits during the measure's measurement period) and provide rationale for this methodology.

To determine which members to include in the Total Resource Use measure, there are several options available depending upon your business purpose and unit of measure. If the unit of measure is an entire health plan or employer group, all members will be included in the Total Resource Use measure. If the unit of measure is a provider and members are required to select a primary care provider, we recommend using the member selected provider.

When the member is not required to select a primary care provider, we recommend the use of an attribution algorithm to identify the member's primary care provider. The measure was tested using this methodology. The primary care attribution uses only primary care provider claims for the same period as the Total Resource Use measurement year (e.g. January 1 – December 31). The attributed provider is determined by the primary care provider for which the member has the most primary care office based services during the measurement period. In the event of a tie the provider with the most recent visit is attributed the member. Members who do not have a primary care office visit during the measurement time period are not attributed to a primary care provider and are not included in the Total Resource Use measure.

Attribution Algorithm:
• Include twelve months based on first date of service for the measurement year (e.g. January 1 – December 31) of professional claims experience, with three months of paid claims run out to allow for claims lag.
• Exclude all services that are not office based (place of service code not equal to 11)
• Exclude convenience care clinic visits and hospice services
• Exclude providers that are not a physician, physician assistant or nurse practitioner
• Assign each service line a specialty based on the servicing physician's practicing specialty or credential specialty if practicing specialty is not available.
• Include only the following specialties:
- Family Medicine - Internal Medicine
- Pediatrics - Geriatrics
- OB/GYN

http://www.healthpartners.com/files/57444.pdf-- OR -- www.healthpartners.com/tcoc . Click "Technical Guidelines" open the link at that states: "Read more about Total Resource Use technical guidelines.
Attribution is addressed on page 2

S11.2.Identify and define peer group
Identify the peer group and detail how peer group is identified and provide rationale for this methodology

«peergroup»«peergroup_specifications»«peergroup_guidelines»«no_peergroup_rationale»

S11.3. Level of Analysis:

«level_analysis»

S11.4.Detail measure outliers or thresholds
Detail any threshold or outlier rules and decisions based on measure resource use and provide rationale for this methodology

«outliers»«outliers_specifications»«outliers_guidelines»«no_outliers_rationale»

S11.5.Detail sample size requirements
Detail the sample size requirement including rules associated with the type of measure

«samplesize»«samplesize_specifications»«samplesize_guidelines»«no_samplesize_rationale»

S11.6.Define benchmarking or comparative estimates
Detail steps to produce benchmarking and comparative estimates and provide rationale for this methodology

«benchmarking»«benchmarking_specifications»«benchmarking_guidelines»«no_benchmarking_rationale»

S12.Type of Score:

«type_score» «type_score_other»

If available, please provide a sample report:

«attach_score_samplereport»

S12.1. Interpretation of Score.
(Classifies interpretation of score (s) according to whether higher or lower resource use amounts is associated with a higher or lower score, a score falling within a defined interval, or a passing score, etc)

«score_rationale»

S12.2. Detail Score Estimation
Detail steps to estimate measure score.

Data sources and inputs:
• All claims included in the measure have a date of service in the measurement year (e.g. between January 1 and December 31)
• Members have a minimum 9 months enrollment in the measurement year
• Commercial population only
• Attribution (see section S11.1)
• Costing Method – Total Care Relative Resource Values TCCRVs (section S9.7 and S10.3)
• Risk Adjustment (S10.1)

Resource Use Index (RUI):
Numerator: Total Resource PMPM = (Total Medical TCRRV / Medical Member Months) + (Total Pharmacy TCRRV / Pharmacy Member Months)

Denominator: ACG Risk Score

ACG Adjusted Total Resource Use PMPM = Total Resource Use PMPM / ACG Risk Score
Resource Use Index = Provider ACG Adjusted Total Resource Use PMPM / Peer Group ACG Adjusted Total Resource

Use PMPM **S12.3. Describe discriminating results approach** ***Detail methods for discriminating differences (reporting with descriptive statistics--e.g., distribution, confidence intervals)*** This is a full population-based measure, therefore, confidence intervals are not applicable. The results can be analyzed by minimum, maximum, mean, standard deviation and percentile ranks, this is dependent upon the business application of the measure. A provider Resource Use Index (RUI) score of 1.10 equates to 10% more resource use than the peer group average. Similarly, a provider TCI or RUI score of 0.90 equates to 10% less resource use than the peer group average. A score of 1.0 is equivalent to the peer group average.	

TESTING/ANALYSIS	
Measure testing must demonstrate adequate reliability and validity in order to be recommended for endorsement. Testing may be conducted for data elements and/or the computed measure score. See guidance on measure testing.	**Eval Rating**
TESTING ATTACHMENT (5MB or less) or URL: ***If needed, attach supplemental documentation (Save file as: SA_Reliability_Validity Testing) All fields of the submission form that are supplemented within the attachment must include a summary of important information included in the attachment and its intended purpose, including any references to page numbers, tables, text, etc.*** «testing_url» «testing_url_login» «attach_testing»	
SA1. Reliability Testing ***For each module tested or for the overall measure score:*** **SA1.1. Data/sample** ***(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*** «reliabilty_testing_data» **SA1.2. Analytic Methods** ***(Describe method of reliability testing and rationale)*** «reliabilty_testing_analysis» **SA1.3.Testing Results** ***(reliability statistics, assessment of adequacy in the context of norms for the test conducted)*** «reliabilty_testing_results» **SA1.4.Finding statement(s)—*(i.e., is the measure deemed reliable, limitations identified)***	**2a2** **H☐** **M☐** **L☐** **I☐**

«reliabilty_testing_finding»	
SA2.Validity Testing ***For each module tested or for the overall measure score:*** **SA2.1. Data/Sample** ***(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*** «validity_testing_data_sample» **SA2.2.Analytic Method** ***(Describe method of validity testing and rationale; if face validity, describe systematic assessment)*** «validity_testing_analysis» **SA2.3.Testing Results** ***(statistical results, assessment of adequacy in the context of norms for the test conducted; if face validity, describe results of systematic assessment)*** «validity_testing_results» **SA2.4. Finding statement(s)—(*i.e., is the measure deemed reliable, limitations identified)*** «validity_testing_finding»	**2b2** **H☐** **M☐** **L☐** **I☐**
SA3.Testing for Measure Exclusions **SA3.1. Describe how the impact of exclusions (if specified) is transparent as required in the criteria** «exclusions_evidence» **SA3.2. Data/sample for analysis of exclusions** ***(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*** «exclusions_data_sample» **SA3.3. Analytic Method** ***(Describe type of analysis and rationale for examining exclusions, including exclusion related to patient preference)*** «exclusions_analysis» **SA3.4. Results** ***(statistical results for analysis of exclusions, e.g., frequency, variability, sensitivity analyses)*** «exclusions_testing_results» **SA3.5. Finding statement(s)-- *(i.e., is the measure deemed reliable, limitations identified)*** «exclusions_testing_finding» **SA4. Testing Population**	**2b3** **H☐** **M☐** **L☐** **I☐**

Which populations were included in the testing data? (Check all that apply) «testing_population» «testing_population_other»	
SA5. Risk adjustment strategy ***Refer to items S10.1 and S10.2 to rate this criterion.***	**2b4** **H☐** **M☐** **L☐** **I☐**
SA6. Data analysis and scoring methods ***Refer to items S12-S12.3 to rate this criterion.***	**2b5** **H☐** **M☐** **L☐** **I☐**
SA7. Multiple data sources ***Refer to S7 & all SA1 items to evaluate this criterion.***	**2b6** **H☐** **M☐** **L☐** **I☐** **NA☐**
SA6. Stratification of Disparities (if applicable) ***Refer to item S10.2 to rate this criterion.***	**2c** **H☐** **M☐** **L☐** **I☐**
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Scientific Acceptability of Measure Properties*?	
Steering Committee: Overall, was the criterion, *Scientific Acceptability of Measure Properties*, met? **Rationale:**	**Y☐** **N☐**
USABILITY	
Extent to which intended audiences (e.g., consumers, purchasers, providers, policy makers) can understand the results of the measure and are likely to find them useful for decision making.	**Eval Rating**
Meaningful, Understandable, and Useful Information **U1. Current Use:** «current_use» **U1.1. Use in Public Reporting Initiative Use in Public Reporting.** ***Disclosure of performance results to the public at large (If used in a public reporting program, provide name of program(s), locations, Web page URL(s). If not publicly reported in a national or community program, state the plans to achieve public reporting, potential reporting programs or commitments, and timeline, e.g., within 3 years of endorsement)***	**3a** **H☐** **M☐** **L☐**

«current_use_public_reporting» **U1.2. Use in QI** ***(If used in improvement programs, provide name of program(s), locations, Web page URL(s)).*** «current_use_other» **U1.3. Use for other Accountability Functions (payment, certification, accreditation)** ***(If used in a public accountability program, provide name of program(s), locations, Web page URL(s).*** «current_accountability_functions»	**I☐**
U2. Testing of Interpretability ***(Provide a rationale for why the measure performance results are meaningful, understandable, and useful to the intended audience(s) for both public reporting and quality improvement).*** **U2.1. If understanding or usefulness was demonstrated** ***(e.g., through systematic feedback from users, focus group, cognitive testing, analysis of quality improvement initiatives) describe the data, methods, and results.*** «interpretability_data»	**3b** **H☐** **M☐** **L☐** **NA☐**
U2.2. Resource use data and result can be decomposed for transparency and understanding. ***Refer to items S11 -S12.3.***	**3c** **H☐** **M☐** **L☐** **I☐**
U3. If there are similar or related measures (either same measure focus or target population) measures (both the same measure focus and same target population), list the NQF # and title of all related and/or similar measures. **U3.1. If this measure has EITHER the same measure focus OR the same target population as NQF-endorsed measure(s): Are the measure specifications completely harmonized?** **U3.2. If the measure specifications are not completely harmonized identify the differences, rationale, and impact on interpretability and data collection burden.** ***Describe why this measure is superior to competing measures (e.g., a more valid or efficient way to measure quality); OR provide a rationale for the additive value of endorsing an additional measure. (Provide analyses when possible.)*** «no_harmonization_rationale»	 **3d** **H☐** **M☐** **L☐** **I☐** **NA☐**
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Usability*?	
Steering Committee: Overall, to what extent was the criterion, *Usability*, met? **Rationale:**	**H☐** **M☐** **L☐**
FEASIBILITY	

Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement.	Eval Rating
F1. Data Elements Generated as Byproduct of Care Processes ***How are the data elements needed to compute measure scores generated? Data used in the measure are:*** Other Health Plan Claims data system	**4a** **H☐** **M☐** **L☐** **I☐**
F2. Electronic Sources ***Are the data elements needed for the measure as specified available electronically? (Elements that are needed to compute measure scores are in defined, computer-readable fields)*** ALL data elements are in defined fields in a combination of electronic sources **F2.1. If ALL data elements are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources.**	**4b** **H☐** **M☐** **L☐** **I☐**
F3. Susceptibility to Inaccuracies, Errors, or Unintended Consequences ***Identify susceptibility to inaccuracies, errors, or unintended consequences of the measurement identified during testing and/or operational use and strategies to minimize or prevent. If audited, provide results.*** HealthPartners mitigates risk through the following steps: •Claims data integrity procedures prior to loading data warehouse through HealthPartners Data Integrity Dept •Internal Audit Dept review of processes & procedures for generating measure •Provider contracts allow ability to request external audit •HealthPartners Provider Measurement Policy allows for a 45-day comment period before results are used in any business applications (incentive, public display, etc). Any identified errors ore issues are resolved & correctedHealthPartners mitigates risk through the following steps: •Claims data integrity procedures prior to loading data warehouse through HealthPartners Data Integrity Dept •Internal Audit Dept review of processes & procedures for generating measure •Provider contracts allow ability to request external audit •HealthPartners Provider Measurement Policy allows for a 45-day comment period before results are used in any business applications (incentive, public display, etc). Any identified errors ore issues are resolved & corrected	**4c** **H☐** **M☐** **L☐** **I☐**
F4. Data Collection Strategy ***Describe what you have learned/modified as a result of testing regarding barriers to operational use of the measure (e.g., availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, cost of proprietary measures).*** Not applicable	**4d** **H☐** **M☐** **L☐** **I☐**
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Feasibility*?	
Steering Committee: Overall, to what extent was the criterion, *Feasibility*, met? **Rationale:**	**H☐** **M☐** **L☐**

RECOMMENDATION

Steering Committee: Do you recommend for endorsement? **Comments:**	**Y☐** **N☐** **A☐**

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner)

Co.1 Organization

«steward_intellectual_property_organizati»

Co.2 Point of Contact

Sue, Knudson, Susan.M.Knudson@healthpartners.com, 952-883-6185-

Measure Developer If different from Measure Steward

Co.3 Organization

HealthPartners

Co.4 Point of Contact

Sue, Knudson, Susan.M.Knudson@healthpartners.com, 952-883-6185-

Co.5 Submitter If different from Measure Steward POC

«submitter_contact»

Co.6 Additional organizations that sponsored/participated in measure development
«developer_other_orgs»

ADDITIONAL INFORMATION

Workgroup/Expert Panel involved in measure development
Ad.1 Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.

Measure Developer/Steward Updates and Ongoing Maintenance
Ad.2 Year the measure was first released:

2003

Ad.3 Month and Year of most recent revision:

04, 2010

Ad.4 What is your frequency for review/update of this measure?

Annual

Ad.5 When is the next scheduled review/update for this measure?

04, 2011

Ad.6 Copyright statement:

Ad.7 Disclaimers:

Ad. 7 Date of Submission (*MM/DD/YY*)**:**

03/01/2011

Total Cost Resource Use Measure Comparison Table

	(1598) Total Resource Use PMPM – HealthPartners	**(2165) Total Cost FFS - CMS**	**(2158) Medicare Spending Per Beneficiary – CMS**
Measure Type	Total resource use per capita	Total resource use per capita	Total cost per episode
Data Source	Administrative Claims	Administrative Claims	Administrative Claims
Timeframe	1 year	1 year	3 days preadmission to 30 days post discharge
Target population	Commercial (1-64 years with primary care providers)	Medicare enrollees	Medicare enrollees (65+ years)
Lowest level of analysis	Physician group	Physician group	National/population
Care setting	• Ambulatory Care: Ambulatory Surgery Center (ASC) • Ambulatory Care: Clinician Office/Clinic • Ambulatory Care: Urgent Care • Behavioral Health/Psychiatric: Inpatient • Behavioral Health/Psychiatric: Outpatient • Dialysis Facility • Emergency Medical Services/Ambulance • Home Health • Hospice • Hospital/Acute Care Facility • Imaging Facility • Laboratory • ***Pharmacy*** • Post Acute/Long Term Care Facility: Nursing Home/Skilled Nursing Facility	• Ambulatory Care: Ambulatory Surgery Center (ASC) • Ambulatory Care: Clinician Office/Clinic • **Ambulatory Care: Outpatient Rehabilitation** • Ambulatory Care: Urgent Care • Behavioral Health/Psychiatric: Inpatient • Behavioral Health/Psychiatric: Outpatient • Dialysis Facility • Emergency Medical Services/Ambulance • Home Health • Hospice • Hospital/Acute Care Facility • Imaging Facility • Laboratory • ***Other: Pharmacy: Drugs covered by Medicare Part B are included***	• Hospital/Acute Care Facility

	• Post Acute/Long Term Care Facility: Rehabilitation (renamed to "Inpatient Rehabilitation Facility")	***in the measure (that is drugs administered in an ambulatory setting or used with durable medical equipment [DME] are included).*** • Post Acute/Long Term Care Facility: Inpatient Rehabilitation Facility • **Post Acute/Long Term Care Facility: Long Term Acute Care Hospital** • **Post Acute/Long Term Care Facility: Nursing Home/Skilled Nursing Facility**	
Risk Adjustment Approach	Johns Hopkins ACGs	HCCs	HCCs
Resource Use Service Categories	• Inpatient services: Inpatient facility services • Inpatient services: Evaluation and management • Inpatient services: Procedures and surgeries • Inpatient services: Imaging and diagnostic • Inpatient services: Lab services • Inpatient services: Admissions/discharges • Inpatient services: Labor (hours, FTE, etc.) • Ambulatory services: Outpatient facility services • Ambulatory services: Emergency Department	• Inpatient services: Inpatient facility services • Inpatient services: Evaluation and management • Inpatient services: Procedures and surgeries • Inpatient services: Imaging and diagnostic • Inpatient services: Lab services • Inpatient services: Admissions/discharges • Inpatient services: Labor (hours, FTE, etc.) • Ambulatory services: Outpatient facility services • Ambulatory services: Emergency Department	• Inpatient services: Inpatient facility services • Inpatient services: Evaluation and management • Inpatient services: Procedures and surgeries • Inpatient services: Imaging and diagnostic • Inpatient services: Lab services • Inpatient services: Admissions/discharges • Ambulatory services: Outpatient facility services • Ambulatory services: Emergency Department • Ambulatory services: Evaluation and management

	• **Ambulatory services: Pharmacy** • Ambulatory services: Evaluation and management • Ambulatory services: Procedures and surgeries • Ambulatory services: Imaging and diagnostic • Ambulatory services: Lab services • **Ambulatory services: Labor (hours, FTE, etc.)** • Durable Medical Equipment (DME)	• Ambulatory services: Evaluation and management • Ambulatory services: Procedures and surgeries • Ambulatory services: Imaging and diagnostic • Ambulatory services: Lab services • Durable Medical Equipment (DME) • Other services not listed **Home health; skilled nursing facility; Anesthesia; Ambulance services; Chemotherapy; Drugs administered in an ambulatory setting or used with DME (covered by Medicare Part B); Orthotics, chiropractic, enteral and parenteral nutrition; some vision services; some hearing and speech services; immunizations**	• Ambulatory services: Procedures and surgeries • Ambulatory services: Imaging and diagnostic • Ambulatory services: Lab services • Durable Medical Equipment (DME)
Costing Approach	Standardized Prices	Standardized Prices	Standardized prices

PROPOSED CHANGES TO NQF's HARMONIZATION AND COMPETING MEASURES PROCESS

Information for Measure Developers

October 2012

Background

Resolving issues around harmonizing measures and handling competing measures remains one of the key challenges in NQF measure endorsement projects. The current quality landscape contains a proliferation of measures, including some that could be considered duplicative or overlapping, and others that measure similar concepts and/or patient populations somewhat differently. Such duplicative measures and/or those with similar but not identical specifications may increase data collection burden and create confusion in interpreting performance results for those who implement and use performance measures.

As a consensus standards-setting organization, NQF is uniquely positioned to help guide measure harmonization efforts and the selection of a superior competing measure. These efforts can collectively move the field toward a more parsimonious set of national performance standards. Recognizing that NQF can take on more of a facilitator role while accounting for the needs of measure developers, NQF has proposed a revised process to ensure harmonization and competing measures issues are adequately addressed. Building upon the Guidance for Measure Harmonization[1] Consensus Report and Guidance on Competing Measures[2], NQF performance measures staff consulted with multiple

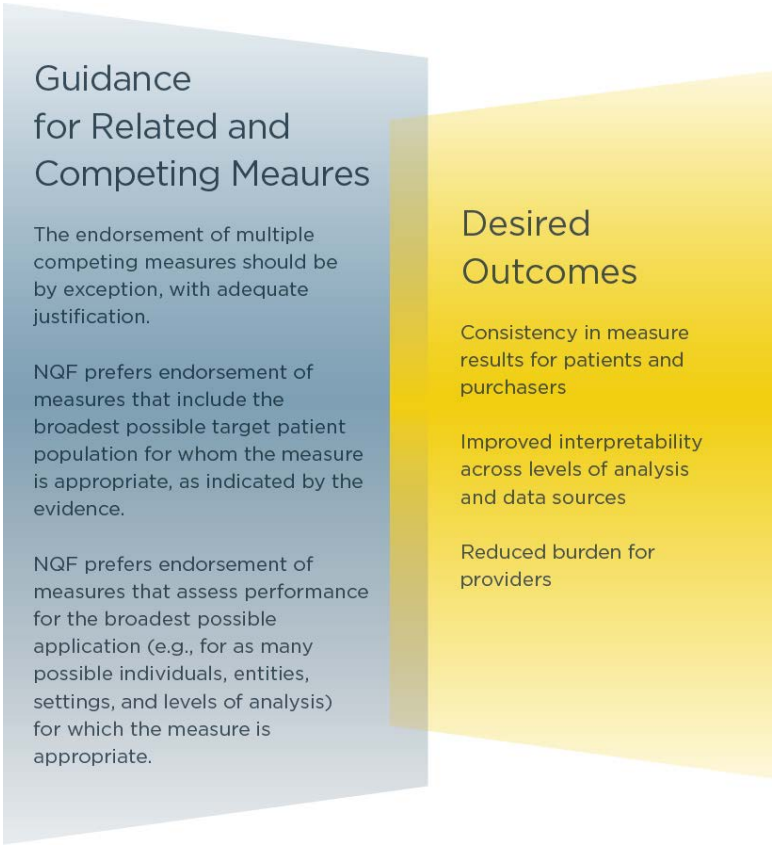


Figure 1: Principles for related and competing measures

[1] National Quality Forum (NQF), Guidance for Measure Harmonization: A Consensus Report, Washington, DC: NQF; 2010.
[2] National Quality Forum (NQF), Guidance on Competing Measures, Washington, DC: NQF; 2011.

stakeholders impacted by these issues (including measure developers and implementers) to identify challenges to our current process and potential solutions.

What is the Problem?

NQF's current process for resolving issues of related measures needs to be enhanced to support measure harmonization throughout the measure development lifecycle and across NQF consensus development projects. Additionally, the process to select between competing measures has been challenging for Steering Committee members. Since related and competing measure issues are often addressed within the Consensus Development Process (CDP), significant time delays can be created by requesting that developers accomplish harmonization within project timelines. Throughout NQF's discussions with key stakeholders several overarching problems have been identified below.

What are the Challenges Related to the Measure Development Process when Addressing Related and Competing Issues?

- NQF recognized that, from the perspective of the developer, achieving harmonization does not mean that measure must be completely identical. By making measures identical, both developers and users recognized that important evidence-based elements of measures addressing smaller patient populations may be lost.

- Not all developers have a process to ensure they are not inadvertently creating a similar or competing measure.

- Developers will proceed with a competing measure if their workgroups and staff feel strongly that they need a clinician-level measure for the same measure focus as an existing facility-level measure. They don't view measures on the same topic but at different levels of accountability to be truly "competing."

- Developers are often unaware of what measures exist in the field, prior to submission. This remains a challenge as there are no reliable processes to notify individuals of measures in development to enable proactive identification of related or duplicative measures.

Improvement Methodology

Prior to the improvement event, NQF solicited internal staff, developers, and users for feedback on their perceptions of the current NQF harmonization and competing measures process. Through these sensing sessions, NQF learned that responders believe NQF policy lacks a clear direction and process in part due to inconsistencies across NQF staff and project steering committees. The results of the sensing sessions were presented to the CSAC, where CSAC members reviewed 5 critical areas:

1. **Perception of NQF harmonization and competing measures process**
   Respondents identified that the current process is not clear and consistent across steering committees.
2. **Recommendations for improving the process**
   Respondents believe that NQF needs clear criteria for defining related/competing measures.

3. **Developer processes for addressing harmonization**
   Respondents understood that developers lack consistent processes when addressing harmonization issues.
4. **Role of Steering Committee vis-à-vis NQF staff**
   Respondents identified that the role of NQF should be to identify related/competing measures at start of project, and actively facilitate the steering committee's discussion.
5. **Information NQF staff needs to provide**
   Respondents expressed the need for NQF to more clearly identify aspects of the measures needing harmonization before the measures go to the steering committee for consideration. Also, more guidance is needed for steering committees to select a superior measure, when there are two competing measures.

Overview of In-Person Improvement Event

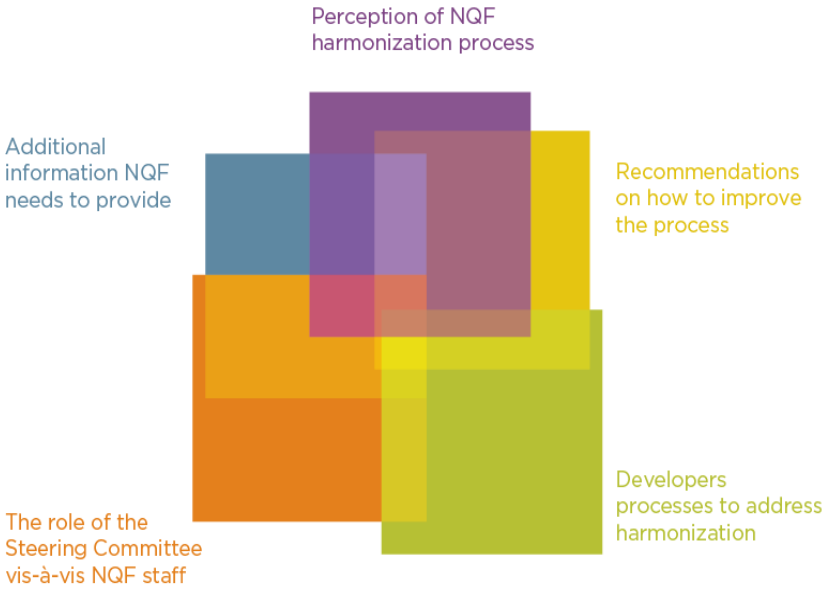


Figure 2: Five Critical Areas reviewed by the CSAC

NQF staff and external measure developers were invited to participate in a week long CDP improvement event focused on related and competing efforts undertaken within the current CDP. Using a Lean/Six-Sigma workout, this workgroup was tasked with developing process enhancements to the current CDP.

Keeping in mind, the five critical areas identified by the CSAC, the workgroup developed detailed process enhancements and strategies for implementation. Participants in the improvement event walked through existing harmonization and competing measures guidance, while identifying problems and assumptions associated with the guidance. Through a process mapping exercise and case study, the participants identified salient process enhancement opportunities and were tasked with identifying critical areas for improvement. These critical areas are identified in the table below.

Participants in the improvement event also noted significant challenges when measures outside of an ongoing CDP project are identified as competing or requiring harmonization. Developers found it challenging when their measures were pulled into a related or competing discussion without sufficient lead time. Unable to compare differences in the measures, developers are left unprepared to provide justification for those differences or begin to address how measures could be harmonized.

Critical Area	Description
Definitions	NQF needs to provide clearer, more consistent definitions for: Harmonization, Related, Competing, Conceptual harmonization, Superior, Best-in-class, and Alignment.
NQF's role in supporting harmonization	▪ NQF is a facilitator and final arbiter with regards to harmonization and selecting superior measures ▪ Developers should be brought in earlier in the process to provide input on what measures should be considered related and competing ▪ A Harmonization Advisory Subcommittee is needed to provide guidance on overarching issues
Data Burden	▪ Reduce burden of data collection and improve interpretability of measure results for patients and users ▪ Balance the value of multiple measures vs. data burden ▪ Consider the transition period required for changes in measure specifications
Timing of harmonization within NQF processes	▪ Prior to the project launch, NQF staff should compile a list of related/competing measures and provide to developers and the steering committee well in advance of the Steering Committee meeting ▪ A plan for Harmonization should be identified early between developers, allowing developers time to make smaller changes before the next annual update. For more significant changes, endorsement should continue with an expectation that updates will take place, based on the agreed upon plans for harmonization, before the measure returns for maintenance.
Consistency of measure results	▪ Improve the interpretability of measure results for consumers and purchasers ▪ Allow measures with different settings and levels of analysis to be complementary, not competing ▪ Looking at data sources and considering the quality of information received from different data sources and the quantity entities who can report using the different data sources

Considering these critical areas, the improvement team developed the following 6 solutions each of which is explained in detail in the following section.

- Decision Logic
- Structured Discussion Guide
- Annual Update
- Early Identification/Triage
- Re-Convening of Steering Committee
- Harmonization Advisory Subcommittee

Figure 3: Proposed Improvements

What are some of the Major Improvements Proposed to the Harmonization and Competing Measures Process?

Decision Logic

Building on the existing NQF guidance, this document would provide more clarity for processing related / competing measures. The decision logic would include shortcuts to quickly identify competing measures and would empower staff to identify potential issues earlier in the project. The decision logic would also help project committees apply NQF guidance more consistently.

Early Identification/Triage

Using the decision logic, early identification and triaging of measures that are deemed related or competing would allow developers to have a venue and time to respond to a staff initiated list. At the same time notification to developers whose measures are outside of a current project will occur earlier in the consensus development process. This process enhancement would allow developers more time to provide justification for their measure and allow the project team to facilitate dialogue with developers earlier.

Structured Discussion Guide

The purpose of the guide would be to provide staff with a consistent framework to lead steering committee discussions on related and competing measures. The guide will lay out the general format of these discussions, identify the main areas or specifications the group should discuss, and define how to capture these deliberations in real time.

Re-Convening of Steering Committee to Discuss Harmonization

Reconvening the committee after the endorsement decision allows for measures that were not part of the CDP review period to be sufficiently reviewed for harmonization along with those under consideration in the previous project. This process change allows developers with competing or related measures more time to develop a harmonization plan. Dialogue between the developers would be facilitated by NQF and after the measures are ratified the committee would reconvene, to review responses to the harmonization plan and make a final determination.

Harmonization Advisory Subcommittee

This committee will be comprised of measure developers and CSAC members who will provide guidance and regular review of definitions and processes for harmonization and selecting between competing measures. Policy issues, such as whether 30-day and inpatient mortality measures are truly competing, would be addressed by this group and would allow for consistent application of NQF guidance throughout all CDP projects.

NATIONAL QUALITY FORUM

Standard Definitions for Related and Competing Measures

Key Term	Definition
Harmonization	The standardization of specifications for related measures with the same measure focus (e.g., **influenza immunization** of patient in hospitals or nursing homes), or related measures for the same target population (e.g., eye exam and HbA1c for **patients with diabetes**), or definitions applicable to many measures (e.g., age designation for children) so that they are uniform or compatible, unless differences are justified (e.g., dictated by the evidence). The dimensions of harmonization can include numerator, denominator, exclusions, calculation, and data source and collection instructions. The extent of harmonization depends on the relationship of the measures, the evidence for the specific measure focus, and differences in data sources.
Measure focus	Target process, condition, event, outcome (e.g., numerator).
Target population	The population (age, setting, time frame) being measured (e.g., denominator).
Related measures	Measures that are intended to address either the same measure focus or the same target population.
Competing measures	Measures that are intended to address both the same focus and the same target population.
Superior	Identifying the best measure (i.e., Best-in-Class), which assess performance for the broadest possible application for which the measure is appropriate (e.g., for as many possible individuals, entities, settings, and levels of analysis), for endorsement from among competing measures.
Alignment	Encouraging the use of similar, standardized performance measures across and within public and private sector efforts. Note: Alignment is not synonymous to harmonization.
Combining measures	To merge two or more measures together to construct a single measure.
Expanding measures	To broaden the measure focus or target population of a measure.
Joint ownership/shared stewardship	Two or more individuals or organizations that are the intellectual property (IP) owners of a measure and are responsible for maintaining the measure.
Usefulness and usability	Useful-capable of being put to use and serviceable for an end or purpose Usable-capable of being used by intended audiences; convenient and practicable for use.
Conceptual harmonization	Whether the measures are intended to address the same focus and target population; harmonizing the concepts or constructs being addressed in a measure (e.g., measure title, brief description, numerator and denominator statements, exclusions, and level of analysis).
Technical harmonization	Harmonizing the measure specifications (e.g., numerator details, denominator details, exclusion details, risk adjustment, stratification details, calculation algorithm, sampling methodology, definitions, data source, data elements, code sets, and code values).

MEMORANDUM

Subject: Summary of Rationale for Maintaining Key Differences between CMS's Payment-Standardized Total Per Capita Cost Measure for Medicare Fee-for-Service (FFS) Beneficiaries and HealthPartners' Total Resource Use Population-Based Per Member Per Month Index (#1598) Measure

From: CMS and HealthPartners

Date: April 11, 2013

Introduction

The National Quality Forum (NQF) requested that the Centers for Medicare & Medicaid Services (CMS) and HealthPartners identify areas where harmonization may be possible and provide a rationale for maintaining key differences between their respective total per capita resource use measures. In January 2012, NQF endorsed HealthPartners' Total Resource Use Population-Based Per Member Per Month Index (#1598). Although the HealthPartners measure and CMS's Payment Standardized Total Per Capita Cost Measure for Medicare Fee for Service (FFS) Beneficiaries both focus on total per capita resource use, the CMS measure is designed specifically for the Medicare FFS beneficiary population, while the HealthPartners measure is designed and endorsed for the commercially insured (fully insured and self insured) population. There are important differences in the target populations that preclude CMS and HealthPartners from merging or "harmonizing" our measures. The distinctions between the measures' target populations require necessary differences in risk adjustment, pharmacy data inclusion, payment standardization, and attribution methods. As we discuss below, we believe that these important differences require two distinct measures, one for the commercial population and one for the Medicare population, because no single measurement approach would produce valid and reliable results or be actionable for end users.

Target Population

The CMS and HealthPartners measures differ meaningfully in terms of their purposes, testing and calibration, and characteristics of their target populations. CMS specifically developed its measure to evaluate Medicare FFS beneficiaries to help assess, when combined with quality metrics, the value of care provided to Medicare FFS beneficiaries by medical group practices; all testing, therefore, has been performed on the Medicare FFS beneficiary population only. By contrast, HealthPartners specifically designed and tested its measure to be used in conjunction with quality measures to assess value for a commercially insured population. Medicare beneficiaries tend to be older than commercially insured consumers, and they have greater and vastly different health needs: in 2010, more than two-thirds of Medicare beneficiaries had two or more chronic conditions, and the number of beneficiaries with multiple chronic conditions increased with age.[1] By comparison, the share of commercially insured patients with multiple chronic conditions is much lower, at roughly 15 percent.[2] Medicare beneficiaries with multiple chronic conditions are more likely to have been hospitalized and have post-acute services, home health visits, emergency department visits, and doctor office visits than beneficiaries with at most one chronic condition.[3]

Given the differences in the populations on which the two measures have been evaluated, the measures' methodologies necessarily differ, so the two populations' measurement results should not be combined.

CMS and HealthPartners recommend maintaining the distinct target populations for which their measures were designed, rather than harmonizing by expanding the target population of one measure or the other.

Risk Adjustment Methodologies

Per NQF's Guidance for Measure Harmonization,[4] risk adjustment methodologies are not currently recommended areas for measure harmonization. CMS and HealthPartners agree that harmonization of risk adjustment between the Total Resource Use Population-Based Per Member Per Month Index and the Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries is not advisable. The HealthPartners measure uses a commercial risk adjustment methodology developed and calibrated specifically for the commercially insured population (and not for Medicare): namely, Johns Hopkins University's Adjusted Clinical Groups (ACG) Case Mix System.[5] The CMS measure, with its focus on Medicare FFS beneficiaries, employs the CMS Hierarchical Condition Category (CMS-HCC) risk adjustment methodology, which was specifically designed for, tested on, and calibrated to the health status and disease severity of Medicare FFS beneficiaries. CMS considered other risk adjustment methodologies but ultimately selected the CMS-HCC model for risk adjustment in Medicare because of its transparency, ease of modification, and clinical coherence.[6] In its 2011 evaluation of the CMS-HCC risk adjustment methodology, RTI found that the model is effective at predicting actual costs, even for beneficiaries with serious or multiple chronic illnesses.[7] Additionally, the CMS-HCC model is calibrated on the Medicare FFS population. The CMS-HCC risk adjustment methodology effectively captures the detail and nuances of CMS's numerous payment systems and its FFS Medicare population. The ACG approach is appropriate for risk adjustment for a commercial population because it addresses disease prevalence by including maternity, newborn, and other health status indicators that are specific to this population and not found in the Medicare population. For these reasons, CMS and HealthPartners strongly advise against harmonization.

Pharmacy Data

HealthPartners' Total Resource Use Population-Based Per Member Per Month Index includes comprehensive pharmacy data, whereas CMS's Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries does not. CMS and HealthPartners agree that pharmacy data are an important component of resource use and should be included where feasible and appropriate; however, its inclusion is not feasible for the CMS measure because a large percentage of Medicare FFS beneficiaries (over half in 2010) lack Medicare Part D prescription drug coverage. Although some of the beneficiaries lack any prescription drug coverage, the vast majority has prescription drug coverage from a source that is outside of Medicare (e.g., through retiree coverage from a former employer) but for which Medicare does not have access to the data. For the Medicare population, including pharmacy data in the CMS measure could incorrectly indicate higher costs among those beneficiaries with Part D coverage relative to otherwise comparable beneficiaries without Part D coverage and for whom prescription drug costs cannot be measured directly by CMS. Inclusion of pharmacy data in HealthPartners' measure, alternatively, is feasible and should be maintained to estimate total per capita resource use for commercial populations.

For this reason, CMS and HealthPartners recommend that pharmacy data continue to be included in the HealthPartners measure but not in the CMS measure.[*]

Payment Standardization Methodologies

The CMS payment standardization methodology is fundamentally different than the HealthPartners standardization approach. Each approach enhances the accuracy of the respective measures. Although consistent in many respects, they differ significantly due to the varied payment systems addressed by the respective standardization approaches. Consequently, the standardization methodologies do not lend themselves to harmonization.

In essence, the CMS method is a payment standardization methodology used to identify variations in Medicare payment that are attributable to providers' choices in the provision of care to Medicare beneficiaries, including the choice of setting in which that care is provided. In comparison, the standardization approach used in HealthPartners' resource use measure is designed to isolate differences in volume and intensity of services and is calibrated to a commercial population.

Each standardization method determines the relative values of services within and across sectors of care. The weighting across sectors is different for the commercial and Medicare populations, however, because the Medicare average payment rates for each sector are very different from commercial rates. Additionally, standardization for specific settings of care, such as skilled nursing facilities (SNFs), is another area where these measures cannot harmonize their standardization methods, again because Medicare and commercial payment methods differ due to differences in their populations' healthcare utilization patterns and needs. Blending the Medicare and commercial weightings would reduce each measure's effectiveness, accuracy, and reliability.

Medicare also has a wide variety of unique payment systems that do not have parallels in the commercial market. CMS's methodology accounts for the myriad payment systems invoked in Medicare reimbursement and the many special cases in Medicare payment rules in order to characterize relative prices for Medicare services more accurately.[8,9] For example, CMS's approach uses Resource Utilization Groups relative weights to standardize SNF payments. While SNF is not a large factor in commercial claims, it is a significant cost driver for Medicare, and it is important that CMS account for Medicare's unique SNF payment system. A similar approach is used for home health. The CMS model also explicitly accounts for several Medicare FFS-specific payment systems, each with their own unique weighting schemes and values. The HealthPartners measure includes a standardized approach for all of these unique situations as well, but they are calibrated to a commercial population.

As referenced above, pharmacy data is not included in the CMS measure. However, HealthPartners' measure includes pharmacy data and a pharmacy standardization process that is based on resources per day by NDC code, which allows the resource use measure to distinguish between the intensity and quantity of pharmacy usage on total cost of care. The inclusion of pharmacy data also plays a significant role in the relative resource value placed on each sector of care for the purposes of the HealthPartners' standardization method.

[*] We view this position as consistent with NQF's guidance on carve-out arrangements. The National Quality Forum. "National Voluntary Consensus Standards for Cost and Resource Use: Final Report." Washington, D.C.: NQF, April 2012.

Additionally, the HealthPartners' measure includes targeted areas of calibration that highlight variance in resource use consumption that might otherwise be masked, whereas the CMS methodology deliberately retains differences in resource use associated with choice of care setting. For example, within the inpatient setting, to align resources assigned with actual resources consumed, the HealthPartners approach uses the admission length of stay (as well as the MS-DRG) as a factor in resource assignment, so that admissions with longer lengths of stay within the same MS-DRG are assigned more resources. The CMS methodology, on the other hand, uses a bundled inpatient payment, since the true cost to Medicare does not vary with length of stay, except in special circumstances. Under the HealthPartners method, services that can be performed in either professional or outpatient settings, such as imaging and labs, or outpatient surgeries, which can take place in the outpatient hospital or freestanding surgery center, are assigned the same resources because the services that are performed are either identical or can be performed in either setting. The CMS methodology does not equalize across sites of service, in order to measure the costs associated with the choice of treatment location.

In summary, the CMS method is a payment standardization approach based on the CMS payment system, whereas the HealthPartners resource use measure is designed to isolate differences in volume and intensity of services and is calibrated to a commercial population. Given the substantial differences in populations and payment systems associated with the two measures, employing a common standardization method would diminish each measure's effectiveness at producing accurate, valid, and reliable results and would limit their usability either to the Medicare program or to the commercial market.

Attribution

The HealthPartners and CMS measures take different approaches to attribution. Whereas HealthPartners presents their approach as a guideline for measure implementers, the CMS attribution rule is an important component of the CMS measure specification because CMS intends to use the measure as a component of the Value-Based Payment Modifier. Also, and of significant importance, CMS has explicitly chosen to align its attribution methodologies across a number of key and related CMS initiatives, including the Medicare Shared Savings Program and the Medicare Physician Value Program. CMS and HealthPartners therefore recommend retaining their separate approaches to attribution.

Conclusions

CMS and HealthPartners believe that their measures differ in important ways, stemming from differences in the target populations and data sources. The health care needs and utilization patterns of Medicare FFS beneficiaries differ from those of the commercially insured population, and the risk adjustment and standardization methodologies employed by the two measures have been specifically designed to apply to their respective distinct target populations. Given the fundamental differences between ACGs and HCCs, harmonization in this area would lead to inaccurate results for either measure. Additionally, substantial differences in the standardization methodologies reflect the underlying differences in the payment structures and healthcare needs between the commercial and Medicare populations; thus, harmonization on the standardization methodology would undermine the accuracy or usability of either measure. Finally, the attribution approach used in CMS's measure reflects objectives that are specific to the Medicare FFS program and spans multiple agency initiatives. The Payment-Standardized Total Per Capita Cost Measure for Medicare FFS Beneficiaries provides valuable information to medical group practices

through the Medicare FFS Physician Feedback Reporting and will be integral to the calculation of the Value-Based Payment Modifier as mandated by the Affordable Care Act. HealthPartners' measure plays a critical role in understanding resource use in a meaningful way to inform practice redesign and support payment reform in the commercial market. Thus, CMS and HealthPartners agree that measure harmonization would undermine current efforts to accurately measure and report on resource use for our respective target populations and participating providers.

Sincerely,

\s John Pilotte
Director, Performance-Based Payment Policy Group
Centers for Medicare & Medicaid Services

\s Sue Knudson
Vice President, Health Informatics
HealthPartners

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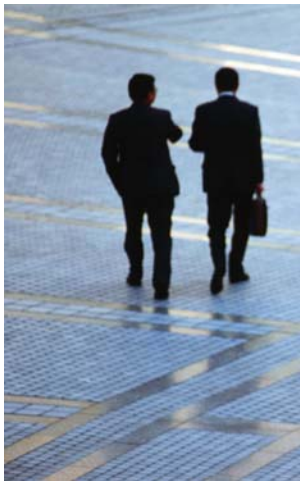
SOCIETY OF ACTUARIES



A Comparative Analysis of Claims-Based Tools for Health Risk Assessment

by: Ross Winkelman, FSA, Principal & Consulting Actuary, Milliman ■ Syed Mehmud, Actuarial Assistant, Milliman
Peer reviewed by: Leigh Wachenheim, FSA, Principal & Consulting Actuary, Milliman

April 20, 2007

Actuaries
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Acknowledgments

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Finally, we would also like to thank the teams that completed the 1996 and 2002 studies for laying such a strong foundation for our work. The researchers from those projects are listed to the right:

1996 Research Study

Daniel L. Dunn
Alice Rosenblatt, FSA
Deborah A. Taira
Eric Latimer
John Bertko, FSA
Thomas Stoiber, FSA
Peter Braun
Susan Busch

2002 Research Study

Robert B. Cumming, FSA
David Knutson
Brian A. Cameron, FSA
Brian Derrick

"We learned a great deal from everyone involved in this effort and enjoyed the collaboration immensely."

Ross Winkelman & Syed Mehmud
April 9, 2007

This Society of Actuaries research project builds on the work done for the 1996 and 2002 claims-based health risk assessment research projects. The purpose of this study is to evaluate the predictive accuracy of the commercially available claims-based risk assessment tools under different sets of conditions and with different sets of available information. It also provides some information on the tools' ease of use and other qualitative characteristics. Given the number of possible uses of risk adjusters, and the many different measures available to evaluate risk adjusters, this report does not attempt to identify which model is the best. It is intended primarily to provide useful quantitative information to assist individuals in selecting the appropriate risk-adjustment model for their given circumstances.

The substantial increase in the number of models available in the marketplace is primarily due to an increase in the number of models being offered by each vendor, but new vendors are also present in the marketplace. Overall, the models have become more tailored to the situation for which they are being used and more sophisticated in general.

Throughout this report, the risk-adjustment models are grouped together based on the similarities of their input data sources. This categorization allows for appropriate comparisons since the input data that a risk adjuster uses is a defining characteristic and often the first consideration a purchaser makes in narrowing down the choices for a particular risk-adjustment application. The abbreviations shown in the Inputs column in the tables are defined at the beginning of the results section of this report.

Table I.1, repeated in the results section of this report, summarizes the numeric R-squared and MAPE results of the study for the prospective (predicting future 12-month cost), nonlagged (without data or prediction lag) models.

In Table I.1, and throughout the report, "offered" refers to models as they were provided by the software vendors. "Optimized" means that the models were calibrated to the population and data used in the study, and prior costs were added as an independent variable. The term "optimized" is used in the context of the optimization methods that could be reasonably employed by most end users (including the researchers), not the methods that vendors could use to optimize their own models with the addition of a single (or several) prior cost input variable(s). It is also important to note that the results in this report (including results for models where prior costs were added) are based on member-level analysis, not analysis at the employer-group level. The parameters and results of optimal methods will change as the group size, type of population, data, and modeling conditions change.

TABLE I.1 R-Squared and MAPE for Prospective Nonlagged - Offered vs. Optimized (Recalibrated, with Prior Cost, 250k Claim Truncation)

			Offered Models		Optimized Models w/ Prior Costs	
Risk Adjuster Tool	**Developer**	**Inputs**	**R-2**	**MAPE %**	**R-2**	**MAPE %**
ACG	Johns Hopkins	Diag	19.2%	89.9%	23.0%	86.2%
CDPS	Kronick / UCSD	Diag	14.9%	95.3%	24.6%	85.6%
Clinical Risk Groups	3M	Diag	17.5%	90.9%	20.5%	86.6%
DxCG DCG	DxCG	Diag	20.6%	87.5%	26.5%	82.5%
DxCG RxGroups	DxCG	Rx	20.4%	85.3%	27.1%	80.7%
Ingenix PRG	Ingenix	Rx	20.5%	85.8%	27.4%	80.9%
MedicaidRx	Gilmer / UCSD	Rx	15.8%	89.6%	26.3%	81.9%
Impact Pro	Ingenix	Med+Rx+Use	24.4%	81.8%	27.2%	80.6%
Ingenix ERG	Ingenix	Med+Rx	19.7%	86.4%	26.5%	81.2%
ACG w/ Prior Cost	Johns Hopkins	Diag+$Rx	22.4%	85.6%	25.4%	82.1%
DxCG UW Model	DxCG	Diag+$Total	27.4%	80.4%	29.1%	78.3%
Service Vendor		**Inputs**	**R-2**	**MAPE**	**R-2**	**MAPE**
MEDai	MEDai	All	N/A	N/A	32.1%	75.2%

* The offered MEDai model was not tested in the study.

As shown in Table I.1, the optimized models perform very well (in the prior study, the greatest prospective R-squared was 21.8 percent). The MEDai methodology included in the study produces the highest R-squared and lowest MAPE among all models. The DCG model produces the highest R-squared and lowest MAPE of the diagnosis input data models. The RxGroups and PRG pharmacy (Pharmacy NDC-based) models generally had good measures, especially considering that they only use pharmacy data. MedicaidRx performs surprisingly well once it is calibrated for the study's commercial population and a prior cost variable is added, given that it was developed for a Medicaid population. The DxCG Underwriting Model performed well in the underwriting model category (those that include prior costs as inputs in offered model).

Predictive ratios included in the report show the ratio of predictions to actual costs by disease category and cost percentile. Table I.2 shows the predictive ratio results by medical condition:

TABLE I.2 Predictive Ratios by Medical Condition in 2003 (Offered Nonlagged Prospective, 250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	88.4%	100.0%	96.7%	103.1%	99.6%	92.3%
CDPS	Diag	95.0%	73.4%	84.8%	76.4%	67.3%	92.5%
Clinical Risk Groups	Diag	85.1%	94.7%	99.7%	99.5%	91.5%	89.0%
DxCG DCG	Diag	93.3%	98.3%	98.6%	103.2%	86.4%	95.9%
DxCG RxGroups	Rx	95.5%	76.9%	97.9%	89.4%	89.2%	88.6%
Ingenix PRG	Rx	94.9%	93.9%	98.2%	89.7%	79.6%	87.1%
MedicaidRx	Rx	90.1%	94.9%	92.7%	79.1%	90.8%	94.0%
Impact Pro	Med+Rx+Use	97.6%	115.4%	96.4%	99.8%	95.1%	98.0%
Ingenix ERG	Med+Rx	90.0%	99.2%	94.8%	92.9%	80.0%	91.9%
ACG w/ Prior Cost	Diag+$Rx	92.5%	109.0%	95.8%	97.5%	103.6%	91.0%
DxCG UW Model	Diag+$Total	93.2%	84.9%	91.1%	90.7%	103.6%	94.6%
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai*	All	N/A	N/A	N/A	N/A	N/A	N/A

* The offered MEDai model was not tested in the study.

Predictive ratios closer to 100 percent indicate higher accuracy. The results vary considerably by medical condition category. The Impact Pro model has the best predictive ratios for three of the medical condition categories. The ACG system has the best predictive ratio for two of the medical conditions and Clinical Risk Groups has the best ratio for diabetes. The pharmacy input only models have less accurate predictive ratios relative to the other models for heart disease.

The predictive ratio results by disease category highlight the importance of choosing a model that uses grouping criteria consistent with the intended application, especially where disease specific analysis is being employed.

Table I.3, on the opposite page, shows the predictive ratio results by cost percentile.

The predictive ratio results by percentile show the limitations in risk-adjuster predicted costs for the highest- and lowest-cost individuals. In general, results change significantly as cost percentile ranges change, and ranked results are different than in prior tables although MEDai had the best predictive ratios in multiple categories. Of the diagnosis input models, Clinical Risk Groups performed well for all but the middle two cost percentile categories.

The results presented in the Executive Summary represent a small subset of the full study results. Results under a large number of other conditions and scenarios are presented throughout the results section of this report and in Appendix A.

For all but one product, the researchers used the models and created the predictions in their offices. During the period of this study, MEDai did not have a product that could be tested in the researchers' offices. Therefore, MEDai was provided the calibration data and the input information for the testing phase. The other models may (or may not) have performed much better if the representatives from those companies had been given the opportunity to tailor and calibrate their

models to the population and data used in the study. In this report, MEDai is characterized as a service vendor as opposed to a software vendor and is illustrated separately, in fairness to the other vendors. MEDai provides models other than the one included in this study. Additional MEDai models (offered, concurrent, without prior costs, etc.) were not included in the study because of the logistics necessary to ensure a level playing field.

The 2002 SOA risk-adjuster study focused primarily on payment adjustment, although underwriting applications were discussed. This new study addresses the underwriting applications of risk adjusters in more depth. In particular, the effects of adding prior cost as an additional independent variable as well as incorporating data and prediction lag are quantified and discussed. The inclusion of a prior cost independent variable increases the accuracy of the models significantly and dampens differences in predictive accuracy between the models. Modeling data and prediction lag causes predictive measures to worsen overall, although less so for the prescription drug models that rely upon NDCs (national drug codes).

There are many important considerations in using a risk adjuster in a business situation where small differences in the tool and implementation method can have a substantial impact on the stakeholders in the health insurance marketplace. Readers should use the results in the tables in the Executive Summary carefully and are encouraged to review the full report for a complete understanding of how the different models performed under various conditions. Also, while the number of models has increased to address their many uses, it is important to consider what adjustment or customization is worthwhile in a particular situation.

The study was structured so that the playing field would be as level as possible. Vendors were given the opportunity to review and comment on the results of their particular products and to review the report prior to publication. Finally, the participating vendors were also given the opportunity to post their comments about the study methodology and report on the SOA Web site, www.soa.org.

Where appropriate, the study and this report have followed the structure of the 2002 study for consistency. The major differences in the methodology for this study were the addition of the lagged model testing, the addition of aggregate prior costs as an independent variable and different methods for recalibrating the models.

Disclosure Statement

Milliman is a consulting firm, and its technical work sometimes includes the direct use and review of risk adjusters and their application. Milliman has no ownership interest in any of the products tested. Milliman holds an Ingenix ERGs license, and has incorporated Ingenix products within MedInsight (a Milliman product). Milliman also holds a DxCG license for use and as a distributor, and has incorporated DxCG products within MedInsight. Milliman also has used CDPS and MedicaidRx in various offices. MEDai is a client of the Atlanta office of Milliman. Johns Hopkins is also a client of Milliman, but not for consulting services concerning risk-adjustment. The researchers who worked on this study were not involved with any client work for risk-adjuster vendors.

TABLE I.3
Prospective Optimized (Recalibrated, with Prior Costs), Nonlagged Predictive Ratios by Cost Percentile Groupings (Cost Groupings Defined for 2004)

	Percentile Ranges							
Risk Adjuster Tool	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
ACG	27.1%	46.7%	69.6%	99.1%	146.5%	249.9%	544.2%	8433.1%
CDPS	24.2%	43.8%	67.8%	98.6%	150.4%	256.7%	546.1%	8537.4%
Clinical Risk Groups	28.4%	49.2%	73.0%	103.5%	150.4%	238.8%	488.7%	6808.8%
DxCG DCG	25.2%	45.6%	70.4%	101.1%	149.7%	248.5%	528.7%	7780.7%
DxCG RxGroups	24.9%	48.0%	75.0%	105.4%	151.3%	237.3%	482.6%	7177.5%
Ingenix PRG	25.0%	48.0%	74.5%	104.4%	150.6%	238.0%	489.1%	7426.9%
MedicaidRx	24.2%	46.4%	73.4%	106.2%	155.8%	243.8%	478.5%	6773.7%
Impact Pro	29.7%	50.6%	74.9%	103.6%	149.5%	235.0%	470.1%	6587.2%
Ingenix ERG	24.3%	46.1%	73.6%	107.4%	156.4%	245.1%	482.0%	6226.3%
ACG w/ Prior Cost	27.2%	51.7%	76.5%	102.1%	141.7%	230.3%	510.3%	8146.4%
DxCG UW Model	26.8%	50.9%	77.4%	107.6%	150.4%	229.0%	452.4%	6427.8%
	Percentile Ranges							
Service Vendor	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	29.5%	52.5%	78.0%	106.5%	145.4%	216.2%	411.9%	5592.5%

SECTION II. Introduction

Definition of Adjustment

To provide a framework for this study, risk-adjustment is defined as the process of adjusting health plan payments, health care provider payments and individual or group premiums to reflect the health status of plan members. risk-adjustment is commonly described as a two-step process. The first step involves risk assessment, which refers to the method used to assess the relative risk of each person in a group. The relative risk reflects the predicted overall medical claim dollars for each person relative to the claim dollars for an average risk person. The second step in the risk-adjustment process is payment or rate adjustment, which refers to the method used to adjust payments or premium rates in order to reflect differences in risk, as measured by the risk assessment step. It is common to refer to a particular risk assessment method as a risk adjuster.[1]

Background: Why Is Risk-Adjustment Important?

Health claims–based risk assessment and adjustment tools are used in a number of applications, including the following:

- Renewal rating and underwriting of individuals and employer groups
- Provider capitation and risk-based reimbursement
- Health plan payment, especially in government programs such as Medicare and Medicaid
- Care management, for identifying and categorizing high-cost and/or highly impactable patients
- Assisting government agencies and consumers in accurately comparing competing insurance products.

The predictive models included in this report are also used for purposes other than risk-adjustment including trend analysis, rating and medical management.

Risk-adjustment is a powerful and much needed tool in the health insurance marketplace. Risk adjusters allow health insurance programs to measure the morbidity of the members within different groups and pay participating health plans fairly. In turn, health plans can better protect themselves against adverse selection and are arguably more likely to remain in the marketplace. Higher participation increases competition and choice.

Risk adjusters also provide a useful tool for health plan underwriting and rating. They allow health plans to predict more accurately future costs for the members and groups they currently insure.

Finally, risk adjusters provide a ready, uniform tool for grouping people within clinically meaningful categories. This categorization allows for better trend measurement, care management and outcomes measurement. The risk adjuster structure, like benchmarks for service category utilization, allows different departments within an insurance company to communicate with each other. In particular, medical management and actuarial and finance professionals can measure the impacts of their care management programs.

Other Considerations in Selecting a Risk Assessment Model

This study focuses on evaluating the predictive accuracy of health-based risk assessment models. While improved accuracy is the primary reason for implementing any health-based risk-adjustment model, other criteria should be considered when selecting a model. These include the following (in no particular order):

- Ease of use of the software
- Specificity of the model to the population to which it is being applied
- Cost of the software
- Transparency of the mechanics and results of the model
- Access to data of sufficient quality

[1] R. B. Cumming, D. Knutson, B. A. Cameron, and B. Derrick, "A Comparative Analysis of Claims Based Methods of Health Risk Assessment for Commercial Populations." A research study sponsored by the Society of Actuaries. May 24, 2002. This subsection is substantially the same as the referenced report; the current report provides additional detail and updates the definition of risk-adjustment.

- Underlying logic or perspective of a model that makes it best for a specific application
- Whether the model provides both useful clinical as well as financial information
- Whether the model will be used mostly for payment to providers and plans or for underwriting, rating and/or case management
- Reliability of the model across settings, over time or with imperfect data (models that are calibrated and tested on a single data set and population may or may not perform well on different data sets/populations)
- Whether the model is currently in use in the market or organization and
- Susceptibility of the model to gaming or upcoding.[2]

The study included testing of models using lagged data. Other real world conditions faced by health plans or other stakeholders using risk adjusters include rating restrictions from small group regulation and the impact of employee and group turnover. The researchers involved in this study also completed a separate study on the effects of real world conditions on predictive performance, entitled the "Optimal Renewal Guidelines" study.[3] This study was focused on small group renewal rating, but the results are helpful in considering real world conditions encountered in other situations. Some results from this study are included and discussed in Section VII of this report, "Limitations and Factors Impacting Risk Adjuster Performance."

Important Notes

A number of competing methods are used to perform health risk assessment using diagnosis, procedure and/or pharmacy data. The number of methods that could be included in this study was restricted because of the availability of resources and time. In addition to the vendors and products included in this study, other vendors and products are currently available in the marketplace. The performance of these other products has not been evaluated, and the exclusion of a particular product from this study does not indicate any judgment about that product's performance or characteristics.

Research Team

The research team was comprised of consultants from Milliman. Ross Winkelman, FSA, and Syed Mehmud were the primary investigators for this study. Leigh Wachenheim, FSA, peer reviewed the analysis and report. Significant contributions were also made by other Milliman consultants, including Jonathan Shreve, FSA, Craig Johns, PhD, Paul Sahkrani and Karan Rustagi.

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[2] Cumming et al., "A Comparative Analysis of Claims Based Methods." This subsection is substantially the same as the referenced report; the current report updates the criteria for model selection.

[3] Conclusions and excerpts from this study have been published. Please feel free to contact the researchers of this study for copies of the excerpts or for more information.

SECTION III. Study Design

The number of approaches that can be used for risk-adjustment has been increasing over the last decade. This study focuses on models that use medical diagnosis codes and/or pharmacy codes in administrative claim data in the assessment of risk. For this study, 12 health risk assessment models were evaluated, including four diagnosis-based models, three pharmacy-based models, two models based on diagnosis and pharmacy data and three models that use prior cost data.

The risk-adjustment models have changed in the following primary ways from those available in the marketplace during the 2002 study:

- Some companies are offering a greater number of model variations than previously offered to address the variety of applications for which the models are being used. For instance, several companies now offer models based on claims data with and without data and prediction lag, at different claims truncation levels (i.e., pooling), and for specific purposes (provider payment versus underwriting). The model variations evaluated in the study do not include all of those available from the vendors represented.
- The modeling techniques have become more sophisticated; some vendors are using techniques to capture nonlinear relationships including neural networks and clustering methods.
- Some models now incorporate prior costs directly in their predictions. Use of prior costs is not appropriate for all circumstances (provider payment and premium risk-adjustment are two obvious examples), but including them is not only potentially appropriate, but also greatly enhances a model's predictive capability for a number of actuarial and underwriting purposes.

The following models were evaluated:

- Adjusted Clinical Groups (ACGs) Version 7.1 (with prior year's pharmacy cost as input)
- Adjusted Clinical Groups (ACGs) Version 7.1 (without prior year's pharmacy cost as input)
- Chronic Illness and Disability Payment System (CDPS) Version 2.5
- Clinical Risk Grouping (CRG) Version 1.4
- Diagnostic Cost Groups (DCGs), RiskSmart Version 2.1.1
- Episode Risk Groups (ERGs) Version 5.3
- Impact Pro
- MEDai
- MedicaidRx
- Pharmacy Risk Groups (PRGs) Version 5.3
- RxGroups, RiskSmart Version 2.1.1
- Underwriting Model, RiskSmart Version 2.1.1.

Inclusion of Medicare's Hierarchical Condition Categories (HCC) model was considered but not included because of concerns with the project scope and technical support during the Medicare bid season.

The ACGs, CDPS, DCGs and CRG use diagnosis data available from administrative claim records. MedicaidRx, RxGroups and PRGs use pharmacy data. The ERGs, Impact Pro, MEDai and DxCG underwriting model use diagnosis and pharmacy data. The model versions referenced above were the most recently available when the study began in May 2006.

The following briefly describes each of the risk adjusters. These descriptions are summarized from documentation provided by the software vendors. Where appropriate, the descriptions are substantially similar to those included in the 2002 report.

Adjusted Clinical Groups (Vendor: Johns Hopkins University, School of Public Health)

Adjusted Clinical Groups (ACGs) is a diagnosis-based risk assessment model developed by Jonathan Weiner and other researchers at the Johns Hopkins University. The ACG System includes a suite of predictive models developed to identify high cost cases. ACG Case-Mix System 7.1 was used for this study. The model incorporates the morbidity-based ACG categories; selected, high-impact, disease-specific Expanded Diagnosis Clusters (EDCs); and diagnostic indicators of the likelihood of future hospitalizations and of being medically frail.

The concurrent model used in this study is based on an actuarial cell approach (ACG actuarial cells are clinically defined, mutually exclusive groupings of patients that have a similar level of risk) as opposed to being regression based. All else being equal, this approach usually lowers predictive accuracy. However, actuarial cells are recommended by the ACG Team for payment applications based on their characteristics with respect to implementation, understanding and stability.

Chronic Illness and Disability Payment System

The Chronic Illness and Disability Payment System (CDPS) is a diagnosis-based risk assessment model developed by Richard Kronick and other researchers at the University of California, San Diego. CDPS Version 2.5 was used for this study. This model was originally developed for use with Medicaid populations, including disabled and Temporary Aid for Needy Families (TANF) populations. The CDPS model is an update and expansion of a prior model developed by Kronick and published in 1996 called the Disability Payment System (DPS). The DPS model was developed for the Medicaid disabled population.

The CDPS model assigns each member to one or more of 67 possible medical condition categories based on diagnosis codes. Each member is also assigned to one of 16 age/gender categories. For each member, the model predicts total medical costs based on the medical condition categories and age/gender category assigned. The model provides two sets of risk weights: one set calibrated for a TANF population and another set calibrated for a disabled population. In this analysis the weights for the TANF population were used, since a TANF population is more similar to the commercial population used for this analysis. The model also provides different sets of risk weights for adults and children, both of which were used for this analysis.

Clinical Risk Groups (Vendor: 3M)

CRG Version 1.4 was used for this study, which was released by 3M in 2006. CRG is a diagnosis-based risk assessment model. CRGs can be used for risk-adjustment in capitated payment systems and as a management tool for managed care organizations (MCOs). The design and development was influenced by the Medicare Inpatient Prospective Payment System (PPS). Every enrollee is assigned to a single risk group based on clinical criteria. CRGs offer the user the choice of three models for both prospective and retrospective applications. All have about 1,100 unique groups. Since CRGs are clinically based, they are designed to serve as the foundation of management systems that support care pathways, product line management and case management.

Diagnosis Cost Groups (Vendor: DxCG)

Diagnosis Cost Groups (DCG) is a component of the RiskSmart Models, which is a product of DxCG. DCG research began in 1984 at Boston University, with numerous refinements and extensions implemented under the leadership of Arlene Ash and Randall Ellis of Boston University in the subsequent 20 years. DCG is a diagnosis-based risk assessment model with many variations depending on the type of population being analyzed (commercial, Medicaid, Medicare), source of the data (inpatient only versus all encounters) and purpose of the model (payment versus explanation).

For the purpose of this analysis, RiskSmart Version 2.1.1 was used. The DCG model is a commercial all-encounter model used to identify the total payment (medical cost and pharmacy cost) both prospectively and concurrently. In the prior study, there was no model to predict the total payment concurrently.

DxGroups are fundamental building blocks of DCG models. All diagnosis codes are grouped into 781 clinically homogeneous groups (DxGroups). These groups are further mapped into 184 hierarchical condition categories. Each patient is also assigned to one of 32 age/gender categories. The model predicts the total medical cost for each patient based upon the HCC and the age/gender category.

Episode Risk Groups (Vendor: Ingenix)

The Episode Risk Groups (ERGs) is a risk assessment model developed by Symmetry Health Data Systems, a subsidiary of Ingenix, Inc. ERGs are based on the Episode Treatment Groups (ETGs) models, also developed by Symmetry, which group medical services into episodes of care. The ERGs were developed and released in 2001. Those used in this analysis are based on Version 5.3 of the ETGs.

The ERG model assigns each member to one or more of the 120 possible medical condition categories (called episode risk groups) based on diagnostic and procedural information available on medical and pharmacy claims. An ERG profile for each member is created by considering age, gender and the ERGs to which they have been assigned. Prospective and retrospective risk scores are assigned using that profile.

Impact Pro (Vendor: Ingenix)

Impact Pro was developed by IHCIS, which is a subsidiary of Ingenix, Inc. This is a combination reporting system and risk-adjustment algorithm, incorporating enrollment information, medical claims and pharmacy claims. The system groups claims into unique episodes of care and other diagnosis-based Impact Clinical Categories (ICCs). These categories describe a member's observed mix of diseases and conditions and underlying co-morbidities and complications. The ICCs are further grouped into homogenous risk categories ("base-markers"). Each member may be grouped into one or more base-markers and one demographic marker. The risk weights are then output, specific to several different possible applications and settings (i.e., truncation levels).

MEDai (Vendor: MEDai, Inc.)

Risk Navigator Clinical™ is a predictive modeling solution and reporting tool developed by MEDai, Inc. Risk Navigator Clinical™ forecasts cost, inpatient stays, emergency room visits, Rx cost and savings utilizing medical and pharmacy claims, demographics, lab results and health risk assessments (HRAs). Individual predictions per member are made using a combination of clinical factors including disease episodes (Symmetry ETGs), drug categories, age, sex, insurance type and other risk markers such as timing and frequency of treatment or diagnosis.

Risk Navigator Clinical™ utilizes two years of data to construct, refine and test models. Gathered and validated data are run through MEDai's prediction engine, Multiple Intelligent Tasking Computer Heuristics (MITCH), which incorporates linear and nonlinear technologies.

MedicaidRx

MedicaidRx is a pharmacy-based risk assessment model developed by Todd Gilmer and other researchers at the University of California at San Diego. The model was originally designed and intended for a Medicaid population and is an update and expansion of the Chronic Disease Score model developed by researchers at Group Health Cooperative of Puget Sound.

The MedicaidRx model assigns each member to one or more of 45 medical condition categories based on the prescription drugs used by each member and to one of 11 age/gender categories. Based on the medical conditions and age/gender categories, the model predicts the overall medical costs for each member. The model includes separate sets of risk weights for adults and children.

Pharmacy Risk Groups (Vendor: Ingenix, Inc.)

Pharmacy Risk Groups (PRGs) is a pharmacy risk assessment model developed by Symmetry Health Data Systems, a subsidiary of Ingenix, Inc. Version 5.3 of PRGs was used for this study. The building blocks of PRGs are a patient's mix of pharmacy prescriptions and how a drug relates to other drugs prescribed for the patient. Each NDC is mapped to one of 107 PRGs. A PRG profile for each member is created using the age, gender and PRGs to which they are assigned. Using the PRG profile, a member's prospective or retrospective risk score is computed.

RxGroups (Vendor: DxCG, Inc.)

RxGroups is a component of the RiskSmart Models (a product of DxCG). For the purpose of this analysis, RiskSmart Version 2.1.1 was used. RxGroups is a pharmacy-based risk assessment model released in 2001 that was developed by researchers and clinicians from Kaiser Permanente, CareGroup of Boston and Harvard Medical School. This model classifies NDCs into 164 mutually exclusive categories (called RxGroups) based on each drug's therapeutic indication. Each patient is also assigned to one of 32 age/gender categories. The model predicts the

total medical cost for each patient based upon the RxGroups and the age/gender category.

Underwriting Model: RiskSmart (Vendor: DxCG, Inc.)

The RiskSmart underwriting model is a new addition to the RiskSmart Models, a product of DxCG, and was released in 2006. For the purpose of this analysis, RiskSmart Version 2.1.1 was used. The underwriting model is used to help underwriters assess employer groups with health care coverage for renewal and price-setting purposes before claims have fully matured. The model incorporates claim lag into its predictions by providing a six-month lag between the end of the baseline period and the prediction period. The underwriting model uses HCCs, disease interactions, age/gender categories and a prior cost variable to predict future medical costs. The underwriting model is different from most models in that it includes a prior cost variable to help with its predictions. It also has a variety of truncation options ($25,000, $100,000 or $250,000).

Study Methodology: 50/50 Split Design with Offered and Calibrated Weights

Each risk adjuster was analyzed using up to 10 scenarios (some scenarios were not practical, possible or appropriate for some models). Each scenario was run using no claim truncation and claim truncation at $100,000 and $250,000. Calibration refers to adjusting the model coefficients to the data and population used in the study. Adding prior costs as an independent prediction variable to the prospective models was a separate step. The following scenarios were analyzed:

- Prospective Model with Offered Risk Weights (without data and prediction lag)
- Prospective Model with Offered Risk Weights (with data and prediction lag)
- Prospective Model with Calibrated Risk Weights (without data and prediction lag)
- Prospective Model with Calibrated Risk Weights (with data and prediction lag)
- Prospective Model with Calibrated Risk Weights (without data and prediction lag)—including prior costs
- Prospective Model with Calibrated Risk Weights (with data and prediction lag)—including prior costs
- Concurrent Model with Offered Risk Weights (without data and prediction lag)
- Concurrent Model with Offered Risk Weights (with data and prediction lag)
- Concurrent Model with Calibrated Risk Weights (without data and prediction lag)
- Concurrent Model with Calibrated Risk Weights (with data and prediction lag)

These scenarios represent different approaches to implementing the risk adjuster model. The following section describes the major differences between the scenarios.

Claim Truncation

For each application the results were analyzed using three scenarios for truncating large claims: truncate large claims at $100,000, at $250,000 and no truncation. The truncation applies to total claim dollars for a given member for 2004 (or 2003 for concurrent predictions). Also, in cases where a model took prior cost information as input, the cost was appropriately truncated, and the model was rerun for the corresponding analysis.

Truncation of large claims is common when analyzing the predictive accuracy of risk adjusters for a variety of reasons, including the following:

- Truncation limits the impact of outliers. This should provide more stability in the results when calibrating the models and when analyzing predictive accuracy.
- Large claims for a given person are generally not predictable. Accordingly, some researchers argue that they should be removed or limited when doing the analysis.
- Truncation simulates the impact of reinsurance or stop loss at those levels.
- Some measures of predictive accuracy are overly sensitive to large claims.[4]

[4] Cumming et al., "A Comparative Analysis of Claims Based Methods." This subsection is substantially the same as the referenced report; the current report updates truncation levels and adds prior cost explanation.

Prospective vs. Concurrent

A prospective application of a risk adjuster involves using historical claims data to predict medical claim costs for a future period. A concurrent (*or retrospective*) application involves using claims data from a period of time to predict medical claim costs for that same period. Concurrent applications involve estimating the health status of individuals regardless of the underlying cost structure, since actual costs are available for concurrent time periods. In this study the prospective models use diagnosis and pharmacy data from 2003 to predict total medical claim costs for each member for 2004. The concurrent model uses diagnosis and pharmacy data from 2003 to predict total medical claim costs for each member for 2003 (the first year in the study data period). The concurrent application is slightly different from the prior SOA study. In that study, data for 1998 and 1999 were available, and the concurrent models were evaluated on 1999 data (the second year in the study data period).

Offered vs. Calibrated Risk Weights

For each risk adjuster there is a risk weight for a given medical condition category. The risk weight reflects an estimate of the marginal cost for a given medical condition relative to the base cost for individuals with no medical conditions. The offered risk weights are the standard risk weights that are provided with the risk adjuster software.[5] Adjustments to the offered risk weights were developed for the calibrated analysis.

With and Without Data and Prediction Lag ("Lagged" and "Nonlagged")

In this study *lagged* scenarios refer to scenarios where the combination of data lag and prediction lag are present. Claims take several months on average to be paid and, in some instances, can take much longer (up to several years). Data lag refers to the situation where a health plan is missing paid claims data, because it is not available when the risk-adjustment analysis is being performed. Additionally, in many applications there is a delay between the data paid-through date and the beginning of the prediction period (this is referred to as prediction lag). For the nonlagged scenarios, data incurred in 2003, paid through August 2005 was used to run the models. For the lagged scenarios, data incurred in January through August 2003, paid through August 2003 was used. Incomplete data cause predictions to be less accurate in general, but accurately reflect the environment in which the actuary and underwriter must work for many situations. Pharmacy data–based models are less adversely affected by data lag than medical (and medical plus pharmacy) models because pharmacy data are paid more quickly (this helps mitigate data lag, but not prediction lag).

Including Prior Costs as a Predictor

Using prior aggregate costs as an explicit, contributing predictor in models is not appropriate for provider or health plan payment purposes. However, for actuarial and underwriting purposes, including prior costs significantly improves the models' performance. Some models include prior costs in their products—namely, the DxCG underwriting model, the MEDai model used in the study and the ACG prior cost model. For other models it was added as an independent variable. Out of necessity, including prior costs was done as part of the calibration step under the "With Prior Costs" scenarios.

Steps in Study Methodology

The analysis can be described briefly by the following steps:

- Step 1 - Separating the data set into two equal-sized subsets: (1) a calibration subset and (2) a validation subset
- Step 2 - Assigning individual-level risk scores using each risk adjuster (the score for a particular member reflects an estimate of the relative cost for that member)
- Step 3 - Regression analysis: performing a linear regression using the calibration data subset to determine adjustments to the offered risk weights (for the recalibrated analyses only)
- Step 4 - Applying calibrated risk scores: applying the adjustments calculated during Step 3 to the validation data set in order to compute a calibrated score (for the recalibrated analyses only)

[5] Cumming et al., "A Comparative Analysis of Claims Based Methods."

- Step 5 - Analyzing results: analyzing the predictive accuracy using the validation data set to compare the score (i.e., predicted claims) of each member or group of members to actual claim dollars.

Each of these steps is described below.

Data Description

The study used data from MedStat Marketscan. The data set consisted of ICD9, CPT4 and NDC codes and associated amounts for a two year continuously enrolled, comprehensive major medical population, with approximately 620,000 members and about three billion dollars in annual claims.

For the concurrent nonlagged analyses, the classification period (which is the same as the prediction period) spanned claims incurred from Jan. 1, 2003 through Dec. 31, 2003, but paid through Aug. 2005.

For the concurrent with-data-lag analyses, the classification and prediction period spanned incurred claims from Jan. 1, 2003 through Aug. 31, 2003 but paid through Aug. 31, 2003.

For the prospective nonlagged analyses, the classification period spanned incurred and paid claims from Jan. 1, 2003 through Dec. 31, 2003 and the prediction period spanned incurred claims from Jan. 1, 2004 through Dec. 31, 2004, but paid though Aug. 31, 2005.

For the prospective with-data-lag analyses, the classification period spanned incurred claims from Jan. 1, 2003 through Aug. 31, 2003 but paid through Aug. 31, 2003 and the prediction period spanned incurred claims from Jan. 1, 2004 through Dec. 31, 2004, but paid though Aug. 31, 2005.

Table III.1 presents a comparison of the demographic distribution of the study population against that of a distribution typical insured population (referred to as the "Reference" population in the table). The Reference population was derived from the *Milliman Health Cost Guidelines*, 2006 edition. As illustrated in the table, the demographic distribution of the study population exhibits a greater proportion

The population underlying the study had the following characteristics:

TABLE III.1 Demographic Characteristics of Study Population Compared to Reference Population

Demographic Category	% of Total		% of Category	
	Study	Reference	Study	Reference
Male, To 25	0%	2%	1%	7%
Male, 25-29	1%	3%	4%	11%
Male, 30-34	2%	4%	5%	13%
Male, 35-39	2%	5%	6%	15%
Male, 40-44	3%	5%	10%	16%
Male, 45-49	5%	5%	15%	15%
Male, 50-54	7%	4%	20%	13%
Male, 55-59	8%	2%	24%	7%
Male, 60-64	5%	1%	15%	4%
Demographic Category	**% of Total**		**% of Category**	
	Study	**Reference**	**Study**	**Reference**
Female, To 25	0%	2%	1%	6%
Female, 25-29	1%	3%	4%	10%
Female, 30-34	2%	4%	5%	13%
Female, 35-39	2%	5%	6%	14%
Female, 40-44	4%	5%	10%	16%
Female, 45-49	6%	5%	15%	15%
Female, 50-54	8%	4%	20%	13%
Female, 55-59	10%	3%	24%	8%
Female, 60-64	7%	2%	16%	5%
Demographic Category	**% of Total**		**% of Category**	
	Study	**Reference**	**Study**	**Reference**
Child, 00-01	1%	3%	5%	7%
Child, 02-06	4%	7%	14%	20%
Child, 07-18	16%	21%	61%	59%
Child, 19-22	5%	5%	21%	13%

of individuals at older ages (50 years plus) than the Reference population. In addition, the demographic distribution of the study population exhibits relatively fewer children. The implication of the demographic differences is that the study

likely has placed more emphasis on the predictability of chronic illnesses than might be expected with other population distributions. This can also be seen in the error calculations presented later in this report. For the purposes of this study, this likely emphasizes differences in the predictive power of the various software packages.

For the cost groupings, the population size is readily apparent since individuals are placed in percentiles. For the disease groupings, the number of people in each cohort varies depending on when the individuals were identified with the condition. However, for the nonlagged, prospective analysis, Table III.3 shows the number of individuals by disease cohort during 2003.

TABLE III.2 Geographical Characteristics

Region	Members
Northeast	43,330
North Central	392,743
South	128,436
West	52,301
Unknown	873
Total	617,683

TABLE III.3 Members by Disease Category

Condition Category	Unique Members
Asthma	6,806
Breast Cancer	2,299
Diabetes	19,690
Heart Disease	19,270
HIV	170
Mental Illness	22,421
Total	70,656

Step 1. Separating the Data Set into Two Equal-Sized Subsets

A 50/50 split design was used for the study to allow for the development and testing of calibrated risk weights. Specifically, each member was randomly assigned to one of two subsets: (1) the calibration data subset and (2) the validation data subset, placing half of the population in each subset. This design was used to avoid over-fitting the data, which could exaggerate the goodness of the fit and various other measures of predictive accuracy (Cumming et al. 2002).

Step 2. Assigning Individual-Level Risk Scores Using Each Risk Adjuster

Each member is assigned a risk score (based on certain medical condition categories, including drug therapy categories and age/gender categories) by each risk adjuster model. Each risk adjuster model (except for CRGs and MEDai) produces a set of indicator variables (0 or 1) representing the condition and age/gender categories assigned. 3M's Clinical Risk Groups puts each member into one (or more) of about a thousand risk categories. MEDai produces a set of 1,000+ indicator variables, including medical condition, drugs, age/gender and prior cost categories. Some of these indicators are 0/1 and other are continuous variables (such as prior cost). For the prospective analysis, the indicator variables are based on either 2003 or 2004 diagnosis and pharmacy data as indicated. For the concurrent analysis, the indicator variables are based on 2003 diagnosis and pharmacy data.

Step 3. Regression Analysis (Recalibrated Scenarios)

For recalibrated scenarios, the prior study calculated new risk weights by regressing demographic and condition indicators on total actual claims for the calibration segment of the data. This study proceeded in a slightly different manner. Adjustments to the offered risk weights were calculated by regressing demographic and condition indicators on the difference between actual total claims and the offered risk-adjustment predictions. In general, to calculate the adjustments to risk weights for a particular risk adjuster, the following multivariate linear regression model was used ("Bin" indicates the age/gender or condition category(s) assigned to a particular individual):

$$Y_{\text{Actual}} - Y_{\text{Prediction}} = \sum_{i=1}^{A} \alpha_i \times \text{Age Bin}_i + \sum_{i=1}^{B} \beta_i \times \text{Condition Bin}_i$$

where

Y_{Actual} = Total actual allowed claims (including medical and pharmacy)
$Y_{\text{Prediction}}$ = Total predicted allowed claims (including medical and pharmacy)
α_i = The regression coefficient that specifies adjustments to the demographic-based risk prediction
β_i = The regression coefficient that specifies adjustments to the condition-based risk prediction.
y = The regression coefficient for prior cost (if the scenario includes prior cost)

For the "With Prior Cost" scenarios, prior costs were added at the same time the models were recalibrated (since most of the offered models did not use prior costs, it was not appropriate to add prior costs without recalibrating). Therefore, for the scenarios where prior cost was included as a predictive variable, the calibration equation included a prior cost term as shown in the equation below:

$$Y_{\text{Actual}} - Y_{\text{Prediction}} = \sum_{i=1}^{A} \alpha_i \times \text{Age Bin}_i + \sum_{i=1}^{B} \beta_i \times \text{Condition Bin}_i + \gamma \times \text{Prior Cost}$$

where (in addition to the variable definitions from prior equation)

γ = The regression coefficient for prior cost (if the scenario includes prior cost)

A linear regression is performed to determine a set of adjustments that best fits the calibration data set. These adjustments are specific to the condition and demographic variables, and are therefore applied to the individual-level risk score output by the software. Both the software output score and this adjusted or calibrated score are then multiplied by the average per member per year (PMPY) cost (from the calibration set) to obtain an offered and calibrated prediction, respectively.

A separate calibration analysis was performed for each level of claim truncation (none, $250,000 and $100,000) and for lagged versus nonlagged scenarios. Also, separate calibrations were performed for the prospective and concurrent scenarios. Yet another set of calibrations was performed by including prior cost as a prediction variable. Accordingly, there are up to 24 sets of calibrated predictions for each risk adjuster.

Calibrations for concurrent scenarios differed slightly in that they did not include demographic variables as predictors. It is undesirable to assign risk to a member who did not incur claims, and including demographic indicators in the recalibration method used in the study would result in a nonzero score being assigned to members without claims.

The adjustments recognize the credibility of the observations by dampening the adjustments according to the *p*-value. Lower *p*-values indicate that the statistical credibility of the result is higher. The study used a credibility factor equal to $(1.0–p\text{-value})^{5.95}$ for adjustments to the offered predictions. Therefore, a *p*-value of 0.01 would result in a credibility weight of 94.2 percent. Alternatively, a *p*-value of 0.50 would result in a credibility weight of 1.6 percent. The adjustments calculated from the regression were multiplied by the credibility weights to calculate the ultimate adjustments to the offered prediction (this convention assigns the complement of the credibility to no adjustment from the offered risk weight/score).

A number of other adjustments are commonly employed in developing a final set of risk weights for actual implementation. These other adjustments can include removing variables that are not statistically significant, smoothing the age/gender risk weights, blending developed risk weights with the "offered" risk weights, combining variables in the payment model, calibrating the risk weights after removing any variables, clinical review of the relationships, testing the stability of the risk weights with different claim truncation levels and testing the stability of the risk weights using subsets of the data (Cumming et al. 2002). This study does not include any of these further adjustments. It was concluded that further risk weight (without prior costs) recalibration would likely only provide marginal improvement because most of the vendors have already spent considerable time calibrating their models to a commercial population.

The methods used in the study to add prior costs as an independent variable were fairly straightforward and are consistent with the approach generally taken by health plans (although prior costs are usually added at the employer group level, and employer group level analysis was not a component of this study). More sophisticated approaches would likely result in improved accuracy, but were not practical for this study (or for most end users). Those approaches might include varying the weight of prior costs depending on the specific condition(s) present (chronic versus acute) and/or the age and gender of the individual, among others.

Calibrations were not carried out on the CRG adjuster because this software puts each individual into one risk category, rather than an array of condition and age/gender variables. Adding a prior cost variable was still possible and was carried out.

As stated previously, MEDai provided Milliman researchers with their set of calibrated predictions. MEDai also presented a version of the predictions that were not calibrated to the data set provided to them. However, those offered predictions are not presented in the study because of the special accommodations made to include MEDai.

DxCG uses the MedStat Marketscan data for all plan types, including all enrolled members to develop and calibrate their models (this study used continuously enrolled members from the Comprehensive Major Medical plan design subset of the same MedStat data).

Step 4. Applying Calibrated Risk Scores

Each member in the validation data subset is scored using the indicator variables described in Step 2 and the corresponding offered risk weights. These weights are then adjusted using the process described in Step 3. The adjusted risk weights and indicator variables are then used to create adjusted (calibrated) risk scores.

Step 5. Analyzing Results

As a final step, the predictive performance of the models is analyzed by comparing predicted cost (risk score multiplied by average allowed cost in calibration data set) to actual experience (as measured by the allowed cost). This comparison is done for both individuals and groups of individuals as described later.

Measures Used to Analyze Predictive Accuracy: Individual and Nonrandom Groups

Three measures were used to compare the predictive accuracy of the risk adjusters examined in this study. In general, these measures compare actual claim dollars with predictions from the risk adjuster models. This comparison is performed on two levels: (1) by individual and (2) by group.

Measures of Predictive Accuracy: Individual Level

The individual-level measures of predictive accuracy include individual R-squares and mean absolute prediction error (MAPE).

Individual R-squared in this context is described as the percentage of the variation in medical claim costs explained by a risk adjuster model. Variation refers to the difference in medical costs for a given individual compared to the average medical cost for all individuals (Cumming et al. 2002). The formula for R-squared is

$$\text{R-Square} = 1 - \frac{\sum (\text{Actual} - \text{Predicted})^2}{\sum (\text{Actual} - \text{Average of Actual})^2}$$

where the summation is over the entire sample.

It is important to note that this formula is a derived form of the basic R-square formula, and that the derivation holds if the prediction is based on the least-squares algorithm. In the case of this study, the derivation does not hold as predictions are based on grouping algorithms, clinical meaningfulness, etc. Therefore, what is presented here carries the statistical essence of the R-squares, but is not strictly an R-square calculation.

Mean absolute prediction error is calculated in a similar fashion. It is defined as the ratio of the absolute value of the prediction error to the sample size. Prediction error is defined as the difference between actual medical costs and predicted costs. The formula for MAPE is

$$\text{MAPE} = \frac{\sum |\text{Actual} - \text{Predicted}|}{\text{Sample Size}}.$$

Different arguments are made regarding the merits of alternative methods for measuring goodness of fit. Individual R-squared is a standard statistical measure for assessing model results and is commonly used for measuring predictive accuracy of risk adjusters. It is a single summary measure on a standardized scale of 0 to 1, where 0 indicates that the model explains 0 percent of the variation in cost for each individual and 1 indicates that the model explains 100 percent of the variation (i.e., 100 percent accuracy in the predictions). The standardized scale helps with comparability between studies. However, there still are many potential issues associated with comparing individual R-squared from one study to another that may make the comparisons inappropriate or invalid. These issues include differences in the data sets, study design and data quality.[6]

Individual R-squared has certain drawbacks. Because it squares each prediction error, it tends to be overly sensitive to the prediction error for individuals with large claims. According to the 1996 study, "because R^2 squares the errors of prediction, it can be greatly affected by a relatively small number of cases with very large prediction errors. Given the typical distribution of health expenditures across individuals, where a small number of individuals have relatively large expenditures, this is a concern for their analysis" (Dunn et al. 1996). This is one of the reasons for truncating large claims when individual R-squared is used as a measure of predictive accuracy.[7]

The mean absolute prediction error is also a single summary measure of predictive accuracy. On the positive side, it does not square the prediction errors and, so, is not overly sensitive to large claims. However, it is not expressed on a standardized scale, so comparisons across studies are difficult to make. Therefore, for purposes of this study, we have expressed MAPE as a percentage of the average PMPY cost.[8]

Measures of Predictive Accuracy: Group Level

A group-level measure of predictive accuracy involves adding up the total predicted claims for a group of individuals and comparing that value to the actual claims for the same group. This comparison provides a measure called the predictive ratio. A predictive ratio that is closer to 1.0 indicates a better fit. The predictive ratio is the reciprocal of the common actual-to-expected (A to E) actuarial ratio.

The methods for calculating a predictive ratio can differ primarily in how the groups are defined. There are two general approaches: (1) nonrandom groups and (2) random groups. Nonrandom refers to grouping individuals based on selected criteria. The common criteria used for analyzing risk adjusters include groups based on medical condition or amount of claim dollars. Nonrandom groups can also be defined based on other criteria, such as members of a particular employer group. This is sometimes referred to as using real groups. Random groups refer to groups created by selecting individuals at random from the study data set.[9] We used nonrandom groupings in this study as explained in the next section.

[6] Cumming et al., "A Comparative Analysis of Claims Based Methods." This subsection through the footnote reference is substantially the same as the referenced report; the current report includes minor wording changes.

[7] Cumming et al., "A Comparative Analysis of Claims Based Methods." This paragraph is substantially the same as the referenced report; the current report removes a reference to a previous study.

[8] Cumming et al., "A Comparative Analysis of Claims Based Methods." This paragraph is substantially the same as the referenced report; the current report adds a note about MAPE.

[9] Cumming et al., "A Comparative Analysis of Claims Based Methods." This subsection is substantially the same as the referenced report; the current report indicates grouping used for current study.

Nonrandom Groups Used for This Study

This study uses nonrandom groups based on three criteria: (1) medical condition in 2003, (2) medical condition in 2004 and (3) ranges of medical claim dollars for 2004.

The medical conditions used for this study include breast cancer, heart disease, asthma, depression, diabetes and HIV. The medical conditions were determined using medical diagnosis codes and an adjustment for false positives (a single instance of a relevant code was sufficient for inpatient claims, whereas two or more instances were required on outpatient claims). It should be noted that this approach might create a bias in favor of risk adjusters that are based on diagnosis data. A risk adjuster that distinguishes among individuals based on particular criteria (e.g., diagnosis codes) may tend to perform better when predicting expenditures for groups of individuals determined using the same type of criteria (Cumming et al. 2002).

For different medical conditions, the performance of the risk adjuster models may change significantly. For a given medical condition, a risk adjuster will naturally tend to perform better on this test if it has a medical condition category that matches more closely with the definition of the medical condition used in this study. The diagnosis definitions used in this study appear in Table III.4.

TABLE III.4 ICD-9 Definitions for Condition Category Cohorts

Condition	ICD-9
Breast Cancer	174-174.9
Heart Disease	390-398, 402, 404-429
Asthma	493-493.9
Mental Illness	290-298.9, 300-312.9
HIV	042
Diabetes	250.1, 250.10, 250.11, 250.12, 250.13, 648.0, 648.00, 648.01, 648.02, 648.03, 648.04, 648.8, 648.80, 648.81, 648.82, 648.83, 648.84, 250.0, 250.00, 250.01, 250.02, 250.03, 250.2, 250.20, 250.21, 250.22, 250.23, 250.3, 250.30, 250.31, 250.32, 250.33, 250.40, 250.41, 250.42, 250.43, 250.5, 250.50, 250.51, 250.52, 250.53, 250.60, 250.61, 250.62, 250.63, 250.70, 250.71, 250.72, 250.73, 250.8, 250.80, 250.81, 250.82, 250.83, 250.9, 250.90, 250.91, 250.92, 250.93, 362.0, 362.0, 362.01, 362.02, 362.1, 775.1, 790.2, 790.21, 790.22, 790.29, 253.5

Grouping Individuals Using Base Year vs. Prediction Year Information

There are two alternate approaches in determining the nonrandom groups. One approach uses claim information from the base year (i.e., 2003) to define the group. The other approach uses claim information from the prediction year (i.e., 2004) to define the group. Different years were used to define the groups based on the scenario.

Measures that use groups based on claim information from the prediction year may be more useful when analyzing risk adjusters for applications such as underwriting or rating, identification of patients for case or disease management, provider profiling and provider payment. These types of measures help answer questions such as: How well can the risk adjuster predict claims for the next year? How well can the models predict who will have a large claim next year?

Measures that use groups based on claim information from the base year may be more useful when analyzing risk adjusters for applications such as health plan payment. These types of measures help us answer questions such as the following: If a health plan (directly or indirectly) selected members based on their claim history (i.e., past medical conditions or expenditures), then would the health plan receive a fair payment for the upcoming year?

Throughout this report, the risk-adjustment models are grouped together based on the similarities of their input data sources. This categorization allows for appropriate comparisons since the input data a risk adjuster uses is a defining characteristic and often the first consideration a purchaser makes in narrowing down the choices for a particular risk-adjustment application. The abbreviations shown in the Inputs column in the tables are defined as follows:

Code	Description
Diag	ICD-9 Diagnosis Codes
Med	ICD-9 Diagnosis Codes and Procedure Information
Rx	Pharmacy NDC Codes
$Rx	Prior Pharmacy Cost
$Total	Prior Total Cost
Use	Measure of Prior Utilization, but not Prior Cost
All	All of the above

The MEDai process produced the best R-squared (and MAPE) fit. During the period of this study, MEDai did not have a product that could be tested in the researchers' offices. Therefore, MEDai was provided the calibration data and the input information for the testing phase. The other models may (or may not) have performed much better if the representatives from those companies had been given the opportunity to tailor and calibrate their models to the population and data used in the study. In this report MEDai is characterized as a service vendor as opposed to a software vendor and is illustrated separately, in fairness to the other vendors. MEDai provides models other than the one included in this study. Additional MEDai models (offered, concurrent, without prior costs, etc.) were not included in the study because of the logistics necessary to ensure a level playing field.

Table IV.1 shows R-squared results for the offered models (not customized for the population and data used in the study) and optimized models (optimized indicates that the predictions were calibrated for the population and data, and prior costs were included as a prediction variable). Higher R-squared values indicate a model with a better fit. The tables that follow this one help to further explain the results of the study in more depth. A primary objective of Table IV.1 is to present a high level overview of the results for the benefit of the reader. Some of the offered models include prior costs (denoted by "$" in the Inputs column). A prior cost independent variable was added to all of the optimized models.

TABLE IV.1 R-Squared for Prospective Nonlagged (Offered vs. Optimized) by Truncation Level (Offered Compared to Recalibrated, with Prior Costs)

		Offered Models			Optimized Models (Include Prior Costs)		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	20.8%	19.2%	16.2%	24.2%	23.0%	20.2%
CDPS	Diag	17.6%	14.9%	12.4%	27.4%	24.6%	21.2%
Clinical Risk Groups	Diag	19.3%	17.5%	14.9%	21.5%	20.5%	18.4%
DxCG DCG	Diag	22.3%	20.6%	17.4%	29.7%	26.5%	22.9%
DxCG RxGroups	Rx	23.8%	20.4%	16.8%	30.6%	27.1%	23.4%
Ingenix PRG	Rx	25.0%	20.5%	17.2%	30.9%	27.4%	23.7%
MedicaidRx	Rx	19.3%	15.8%	12.9%	29.7%	26.3%	22.7%
Impact Pro	Med+Rx+Use	26.3%	24.4%	21.3%	29.3%	27.2%	24.0%
Ingenix ERG	Med+Rx	23.7%	19.7%	16.2%	30.0%	26.5%	22.8%
ACG w/ Prior Cost	Diag+$Rx	25.6%	22.4%	18.7%	27.7%	25.4%	22.1%
DxCG UW Model	Diag+$Total	31.3%	27.4%	23.6%	33.1%	29.1%	25.2%
Service Vendor	**Inputs**	**100K**	**100K**	**250K**	**None**	**100K**	**250K**
MEDai*	All	N/A	N/A	N/A	35.7%	32.1%	27.6%

* The offered MEDai model was not tested in the study.

Including prior costs in the prediction is appropriate only in some circumstances such as renewal underwriting. Prior costs are obviously not appropriate for recognizing risk differences in capitation payment.

The pharmacy-only models generally performed well in both the offered and optimized models. The MedicaidRx model has a relatively low R-squared for the offered model, which would be expected given that it is intended for a Medicaid population, and the study used a commercial population. The optimized models show significant improvement over the offered models, which is primarily due to the addition of prior costs as an independent variable. (The optimized Impact Pro error measures improved less than other models that do not include prior costs.) This cause of improvement is evidenced by the smaller improvement from offered to optimized predictions for models that include prior costs in the offered model.

TABLE IV.2 MAPE for Prospective Nonlagged (Offered vs. Optimized) by Truncation Level (Offered Compared to Recalibrated, with Prior Costs)

		Offered Models			Optimized Models (Include Prior Costs)		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	87.7%	89.9%	90.4%	84.6%	86.2%	86.6%
CDPS	Diag	93.4%	95.3%	95.8%	83.7%	85.6%	86.3%
Clinical Risk Groups	Diag	88.7%	90.9%	91.4%	85.2%	86.6%	87.0%
DxCG DCG	Diag	85.3%	87.5%	88.0%	80.5%	82.5%	83.2%
DxCG RxGroups	Rx	82.9%	85.3%	85.9%	78.7%	80.7%	81.4%
Ingenix PRG	Rx	83.4%	85.8%	86.4%	78.9%	80.9%	81.5%
MedicaidRx	Rx	87.3%	89.6%	90.2%	79.9%	81.9%	82.6%
Impact Pro	Med+Rx+Use	79.3%	81.8%	82.4%	78.7%	80.6%	81.2%
Ingenix ERG	Med+Rx	84.1%	86.4%	87.0%	79.1%	81.2%	81.9%
ACG w/ Prior Cost	Diag+$Rx	85.1%	85.6%	85.6%	80.3%	82.1%	82.6%
DxCG UW Model	Diag+$Total	80.1%	80.4%	80.4%	76.1%	78.3%	78.9%
Service Vendor	**Inputs**	**100K**	**100K**	**250K**	**None**	**100K**	**250K**
MEDai*	All	N/A	N/A	N/A	73.0%	75.2%	75.6%

* The offered MEDai model was not tested in the study.

R-squared improves substantially when actual costs are truncated (as expected), although some models show more improvement than others.

Table IV.2 is similar to Table IV.1, except that MAPE results (as a percentage of total average actual costs) are shown instead of R-squared results. Unlike R-squared, a lower MAPE is more desirable.

MAPE calculations reduce the impact of misestimates on outliers as compared to R-squared calculations. MAPE results may be more appropriate to review for purposes such as small group renewal underwriting; where state regulations limit allowable rating action, outliers are less important. Predicting outliers within small groups with more precision may not be helpful depending on state regulations because some states substantially limit how much a company can vary rates from the average due to health status.

The results for MAPE are relatively similar in terms of the order of performance of the different models. For the optimized models, the MEDai and DxCG underwriting models had the lowest MAPE (indicating better performance), while the offered CRGs and CDPS models had the highest MAPE.

Comparison of Results to Prior (2002) SOA Study

Table IV.3 shows a comparison of the R-squared results of this study to the R-squared results of the 2002 study.

The truncation levels, while different between the two studies, are relatively comparable because differences in cost levels between the two studies can be explained in terms of overall medical care cost trend (i.e., $50,000 is comparable to $100,000) and data sampling. The sample was restricted to individuals having comprehensive benefit–type coverage, to allow for the homogeneity of the sample and ease of comparability. While a $200,000 truncation level would have been more comparable to the $100,000 level used in the prior study, $250,000 is used because several of the models included that truncation level in their offered models, and not a $200,000 level.

Two of the notable differences highlighted in Table IV.3 are as follows:

- The models are generally performing better than they did in the prior study. This is likely due to improvements in the models themselves and improvements in data coding.
- RxRisk is not included in this study. Limited resources dictated focusing on the more recently updated and widely used adjusters. The copy of RxRisk that was received indicated that it had not been updated since March 2002.

Prospective, Offered, Without Prior Cost

Table IV.4 shows the R-squared and MAPE results of the models that do not use prior costs.

As shown in Table IV.4, the Impact Pro model performed the best under both MAPE and R-squared. Ingenix PRG also performed well, especially for R-squared at 100k truncation. From Table IV.2, it can be seen that the Impact Pro model results under MAPE did not change much from the offered model to the optimized

TABLE IV.3 Comparison to 2002 Study of Offered Weight R-Squared Prospective Nonlagged by Claims Truncation Level

	2002 Study			Current Study		
Risk Adjuster Tool	**50K**	**100K**	**None**	**100K**	**250K**	**None**
ACG	N/A	N/A	N/A	20.8%	19.2%	16.2%
CDPS	13.4%	12.5%	10.3%	17.6%	14.9%	12.4%
DCG	19.5%	18.0%	14.3%	22.3%	20.6%	17.4%
MedicaidRx	11.6%	9.8%	7.1%	19.3%	15.8%	12.9%
RxGroups	20.6%	18.1%	13.4%	23.8%	20.4%	16.8%
RxRisk	17.5%	14.8%	11.1%	N/A	N/A	N/A
ERG	21.8%	19.3%	14.6%	23.7%	19.7%	16.2%

TABLE IV.4 R-Squared and MAPE Prospective Nonlagged Offered (Without Prior Cost) by Claims Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	20.8%	19.2%	16.2%	87.7%	89.9%	90.4%
CDPS	Diag	17.6%	14.9%	12.4%	93.4%	95.3%	95.8%
Clinical Risk Groups	Diag	19.3%	17.5%	14.9%	88.7%	90.9%	91.4%
DxCG DCG	Diag	22.3%	20.6%	17.4%	85.3%	87.5%	88.0%
DxCG RxGroups	Rx	23.8%	20.4%	16.8%	82.9%	85.3%	85.9%
Ingenix PRG	Rx	25.0%	20.5%	17.2%	83.4%	85.8%	86.4%
MedicaidRx	Rx	19.3%	15.8%	12.9%	87.3%	89.6%	90.2%
Impact Pro	Med+Rx+Use	26.3%	24.4%	21.3%	79.3%	81.8%	82.4%
Ingenix ERG	Med+Rx	23.7%	19.7%	16.2%	84.1%	86.4%	87.0%
ACG w/ Prior Cost*	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model*	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai*	All	N/A	N/A	N/A	N/A	N/A	N/A

* These models include prior cost as input.

TABLE IV.5 R-Squared and MAPE Prospective Nonlagged Offered vs. Recalibrated (Without Prior Cost, 250K Truncation)

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**Offered**	**Recalibrated**	**Change**	**Offered**	**Recalibrated**	**Change**
ACG	Diag	19.2%	19.6%	0.4%	89.9%	88.8%	-1.1%
CDPS	Diag	14.9%	17.7%	2.8%	95.3%	91.9%	-3.4%
Clinical Risk Groups*	Diag	17.5%	N/A	N/A	90.9%	N/A	N/A
DxCG DCG	Diag	20.6%	21.3%	0.7%	87.5%	87.0%	-0.5%
DxCG RxGroups	Rx	20.4%	20.5%	0.1%	85.3%	85.3%	0.0%
Ingenix PRG	Rx	20.5%	21.2%	0.7%	85.8%	85.6%	-0.2%
MedicaidRx	Rx	15.8%	17.7%	1.9%	89.6%	88.4%	-1.2%
Impact Pro	Med+Rx+Use	24.4%	25.6%	1.2%	81.8%	81.6%	-0.2%
Ingenix ERG	Med+Rx	19.7%	20.0%	0.3%	86.4%	86.1%	-0.3%
ACG w/ Prior Cost**	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model**	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Offered**	**Recalibrated**	**Change**	**Offered**	**Recalibrated**	**Change**
MEDai**	All	N/A	N/A	N/A	N/A	N/A	N/A

* Model could not be recalibrated consistently with other models.

** These models include prior cost as input.

model, which was recalibrated and prior costs added. This is somewhat surprising, although the Impact Pro model is intended for an underwriting system. Therefore, the Impact Pro model appears to capture measures of prior use, even if not directly. MedicaidRx and CDPS were not intended for a commercial population, and the offered predictive measures reflect this.

Comparison of Offered and Recalibrated Models

Table IV.5 shows how the predictive measures changed with recalibration for the prospective, nonlagged models that do not use prior costs.

The greatest improvements after recalibration are for CDPS and MedicaidRx. In addition, the improvement in several models is relatively small. The models with modest changes either have been designed to be very robust or were calibrated on a data set similar to the one used in the study (and vice versa for the others).

The recalibration is fairly straightforward. The approach differed slightly from the approach used in the prior study. Adjustments to the originally offered demographic and condition weights were calculated rather than completely new replacements for the offered weights. This approach was more straightforward mechanically than the prior study's approach since some tools do not provide offered weights easily (the calculated adjustment was credibility adjusted using the *p*-value of the statistical tests). The "Study Design" section includes a more detailed description of the recalibration process.

Comparison of Results Using Lagged and Nonlagged Data

Table IV.6 shows how results changed with lagged models.

As shown in Table IV.6, the increase in performance with complete nonlagged data is significant. A few of the vendors offer models within their product suite that include consideration of lag—for example, DxCG underwriting models and Impact Pro.

The commercial pharmacy risk adjusters perform better than the diagnosis only models with lagged data. The DxCG DCG and ACG models are most affected by lag and complete data.

Appendix A includes values for the optimized models.

Concurrent and Comparison to Prospective

Table IV.7 shows the results for the offered concurrent models. It would not be appropriate for concurrent models to consider costs for the period (that would be a fairly easy model to build!).

The DCG model performs best under both R-squared and MAPE. Models that use prior cost as an input variable have "N/As" in the table as well as other models that do not output a concurrent risk score by design.

Table IV.6
* Model includes prior cost as input.

Table IV.7
* These models do not include a concurrent option.
** These models include prior cost as input.

TABLE IV.6 R-Squared and MAPE Offered Prospective Lagged vs. Nonlagged (Without Prior Cost) 250K Truncation

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**Lagged**	**Nonlagged**	**Change**	**Lagged**	**Nonlagged**	**Change**
ACG	Diag	14.5%	19.2%	4.7%	93.7%	89.9%	-3.8%
CDPS	Diag	11.9%	14.9%	3.0%	98.8%	95.3%	-3.5%
Clinical Risk Groups	Diag	14.1%	17.5%	3.4%	93.9%	90.9%	-3.0%
DxCG DCG	Diag	15.1%	20.6%	5.5%	91.6%	87.5%	-4.1%
DxCG RxGroups	Rx	18.0%	20.4%	2.4%	87.4%	85.3%	-2.1%
Ingenix PRG	Rx	18.0%	20.5%	2.5%	87.8%	85.8%	-2.0%
MedicaidRx	Rx	13.6%	15.8%	2.2%	91.7%	89.6%	-2.1%
Impact Pro	Med+Rx+Use	21.4%	24.4%	3.0%	85.5%	81.8%	-3.7%
Ingenix ERG	Med+Rx	16.9%	19.7%	2.8%	88.7%	86.4%	-2.3%
ACG w/ Prior Cost*	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model*	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Lagged**	**Nonlagged**	**Change**	**Lagged**	**Nonlagged**	**Change**
MEDai*	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE IV.7 R-Squared and MAPE Offered Concurrent Nonlagged by Claims Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	29.4%	29.7%	27.4%	73.0%	75.0%	75.4%
CDPS	Diag	35.5%	32.9%	31.0%	79.0%	80.6%	81.0%
Clinical Risk Groups	Diag	47.1%	43.3%	39.9%	68.6%	70.5%	70.9%
DxCG DCG	Diag	57.2%	51.8%	49.8%	61.6%	65.0%	65.4%
DxCG RxGroups*	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG*	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	32.1%	28.1%	24.6%	77.2%	79.1%	79.6%
Impact Pro*	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	46.5%	42.4%	38.6%	65.8%	67.7%	68.2%
ACG w/ Prior Cost**	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model**	Diag+$Total	N/A	N/A	N/A	N/A	N/A	**N/A**
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai**	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE IV.8 R-Squared Offered Nonlagged (Without Prior Cost & 250K truncation) – Prospective vs. Concurrent

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**Prospective**	**Concurrent**	**Change**	**Prospective**	**Concurrent**	**Change**
ACG	Diag	19.2%	29.7%	10.5%	89.9%	75.0%	-14.9%
CDPS	Diag	14.9%	32.9%	18.0%	95.3%	80.6%	-14.7%
Clinical Risk Groups	Diag	17.5%	43.3%	25.8%	90.9%	70.5%	-20.4%
DxCG DCG	Diag	20.6%	51.8%	31.2%	87.5%	65.0%	-22.5%
DxCG RxGroups*	Rx	20.4%	N/A	N/A	85.3%	N/A	N/A
Ingenix PRG*	Rx	20.5%	N/A	N/A	85.8%	N/A	N/A
MedicaidRx	Rx	15.8%	28.1%	12.3%	89.6%	79.1%	-10.5%
Impact Pro*	Med+Rx+Use	24.4%	N/A	N/A	81.8%	N/A	N/A
Ingenix ERG	Med+Rx	19.7%	42.4%	22.7%	86.4%	67.7%	-18.7%
ACG w/ Prior Cost**	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model**	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Prospective**	**Concurrent**	**Change**	**Prospective**	**Concurrent**	**Change**
MEDai**	All	N/A	N/A	N/A	N/A	N/A	N/A

Table IV.8
* These models do not include a concurrent option.
** These models include prior cost as input.

Table IV.9
* Model could not be recalibrated consistently with other models.
** These models include prior cost as input.

TABLE IV.9 R-Squared and MAPE Prospective Recalibrated Nonlagged (Without Prior Cost vs. With Prior Cost) 250K trucation

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**w/out Prior**	**with Prior**	**Change**	**w/out Prior**	**with Prior**	**Change**
ACG	Diag	19.6%	23.0%	3.4%	88.8%	86.2%	-2.6%
CDPS	Diag	17.7%	24.6%	6.9%	91.9%	85.6%	-6.3%
Clinical Risk Groups*	Diag	N/A	20.5%	N/A	N/A	86.6%	N/A
DxCG DCG	Diag	21.3%	26.5%	5.2%	87.0%	82.5%	-4.5%
DxCG RxGroups	Rx	20.5%	27.1%	6.6%	85.3%	80.7%	-4.6%
Ingenix PRG	Rx	21.2%	27.4%	6.2%	85.6%	80.9%	-4.7%
MedicaidRx	Rx	17.7%	26.3%	8.6%	88.4%	81.9%	-6.5%
Impact Pro	Med+Rx+Use	25.6%	27.2%	1.6%	81.6%	80.6%	-1.0%
Ingenix ERG	Med+Rx	20.0%	26.5%	6.5%	86.1%	81.2%	-4.9%
ACG w/ Prior Cost**	Diag+$Rx	N/A	25.4%	N/A	N/A	82.1%	N/A
DxCG UW Model**	Diag+$Total	N/A	29.1%	N/A	N/A	78.3%	N/A
Service Vendor	**Inputs**	**w/out Prior**	**with Prior**	**Change**	**w/out Prior**	**with Prior**	**Change**
MEDai**	All	N/A	32.1%	N/A	N/A	75.2%	N/A

Table IV.8, on the opposite page, compares the R-squared and MAPE values for the prospective and concurrent models.

The concurrent model performance appears to be correlated with the level of data included in the models. The prospective models are also obviously affected, but the impact is greater for the concurrent models. This outcome is intuitive because it is easier to predict total current expenditures (medical plus drug) with information on both the medical diagnoses a person has and the drugs they are taking than to try to predict both aspects of costs with only one of the types of data. Prospective predictions are less precise and, therefore, having all of the data is less helpful.

Impact of Adding Prior Cost to Recalibrated

Adding prior costs as an independent prediction variable increases accuracy for most models significantly (especially those that do not already reflect prior costs). Where health plans use risk adjusters in renewal underwriting, they generally use prior costs at the employer group level in combination with the aggregated individual risk-adjustment predictions to develop the renewal rate for the group. Evidence suggests that the credibility or weight assigned to prior costs should increase as group size increases. Therefore, if the risk-adjustment software includes a measure of prior cost in the individual predictions, it is important to consider how this affects the weight that should be applied to aggregate prior costs. Modeling the accuracy of the different models on employer groups was outside the scope of this study (but is listed as an area of recommended future study). In general, we would expect the relative differences in accuracy between the models to decrease as group size increases.

Table IV.9, on the opposite page, shows the impact of adding prior costs to the recalibrated models that do not include prior costs.

As shown above, the MEDai process outperforms the other models by a significant margin. In addition, the pharmacy models benefit a great deal by the addition of prior costs. In fact, the MedicaidRx model outperforms three of the commercial models on R-squared, and four of the commercial models (commercial meaning only available with licensing fee, meaning that CDPS is not a commercial model) on MAPE once prior cost is added.

SECTION V. Grouped Results by Medical Condition

Grouped results are presented using predictive ratios, which are simply the ratio of the average predicted cost to the average actual cost for a particular group of individuals. Predictive ratios closer to 100 percent are desirable.[10] As shown in the table below, predictive ratios are generally less than 100 percent, which is somewhat expected since risk adjusters generally underpredict costs for higher cost individuals. This is an important tendency since it affects applications like Special Needs Plans for chronically ill individuals in Medicare Advantage.

Individuals are assigned to the condition categories based on the presence of those conditions in either 2003 or 2004, depending on the scenario. For example, Table V.1 below groups individuals according to the presence of the respective medical condition in 2003 (and is labeled as such: "by Medical Condition in 2003"). For all of the prospective models, the predictive ratios are for 2004 predictions and 2004 actual costs (however, they vary in what year the condition categories are defined). For all of the concurrent models, the predictive ratios are for 2003 values (not technically predictions since they are concurrent) and 2003 actual costs.

Prospective—2003 Medical Condition

The first section of the grouped results shows predictive ratios for six selected medical conditions in 2003 (see Table V.1).

TABLE V.1 Predictive Ratios by Medical Condition in 2003 (Recalibrated Nonlagged Prospective without Prior Costs, 250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	98.3%	90.9%	96.2%	100.8%	99.1%	98.0%
CDPS	Diag	97.1%	81.3%	97.7%	93.5%	94.9%	91.1%
Clinical Risk Groups*	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	93.5%	91.1%	97.5%	96.0%	92.5%	98.5%
DxCG RxGroups	Rx	95.2%	72.4%	95.7%	86.7%	84.0%	89.2%
Ingenix PRG	Rx	93.0%	73.2%	96.0%	86.3%	85.6%	87.4%
MedicaidRx	Rx	91.9%	74.0%	95.2%	78.8%	84.7%	88.1%
Impact Pro	Med+Rx+Use	99.3%	97.5%	98.3%	97.0%	101.6%	97.8%
Ingenix ERG	Med+Rx	97.3%	92.6%	99.4%	94.5%	81.5%	92.3%
ACG w/ Prior Cost**	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model**	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai**	All	N/A	N/A	N/A	N/A	N/A	N/A

* Model could not be recalibrated consistently with other models.

** These models include prior cost as input.

[10] An interesting question was posed by William Gilmore, ASA, MAAA, of Blue Cross Blue Shield of Mississippi. Mr. Gilmore noted that the average member prediction was very close to the average member cost, based on his use of a risk adjuster in practice. However, the average male and female predictions were not equal to the average male and female member cost (respectively). The differences were relatively small, but still material. This issue was investigated and its findings confirmed. The result is logical because condition category weights are usually not specific to a demographic category (gender or age), but are instead optimized across the entire population. This is done for reasons of credibility and parsimony. A chance to test the change in predictive measures resulting from overall demographic adjustments was not available. A very small improvement in predictive measures with this change would be expected. Maybe more importantly, the results would be sound across age/gender categories, which would help when explaining them to others within an organization.

TABLE V.2	Predictive Ratios by Medical Condition in 2004 (Recalibrated Nonlagged Prospective without Prior Costs, 250K Truncation)						
Risk Adjuster Tool	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
ACG	Diag	71.6%	63.8%	83.7%	60.1%	71.9%	70.8%
CDPS	Diag	69.2%	57.5%	84.1%	55.1%	63.3%	65.7%
Clinical Risk Groups*	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	68.2%	64.6%	84.4%	57.7%	66.0%	70.5%
DxCG RxGroups	Rx	68.2%	64.6%	84.4%	57.7%	66.0%	70.5%
Ingenix PRG	Rx	74.1%	52.9%	86.8%	58.3%	60.8%	69.5%
MedicaidRx	Rx	72.6%	53.6%	87.1%	57.9%	63.0%	68.2%
Impact Pro	Med+Rx+Use	73.9%	65.2%	88.6%	58.8%	57.7%	69.2%
Ingenix ERG	Med+Rx	73.9%	65.2%	88.6%	58.8%	57.7%	69.2%
ACG w/ Prior Cost**	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model**	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai**	All	N/A	N/A	N/A	N/A	N/A	N/A

* Model could not be recalibrated consistently with other models.

** These models included prior cost as input.

Prospective—2004 Medical Condition

Table V.2 shows predictive ratios for the same medical conditions based on the presence of that condition in 2004. As shown in this table, the predictive ratios worsen when 2004 costs are used to group individuals. This is due to individuals with these medical conditions in 2004 having higher average costs and a larger variance in costs than those with these medical conditions in 2003. Higher average costs and a larger variance in costs cause the predictive ratios to worsen.

Impact Pro, Ingenix ERG and ACG performed well relative to the other models under the predictive ratio measure. An interesting observation is that predictive ratios for pharmacy-only adjusters vary noticeably with diseases and are generally not as close to 100 percent as the diagnosis models (this is more prominent in the analysis using 2003 claims to define condition groupings). This outcome is not surprising since a diagnosis-based criterion was employed for creating the disease groups rather than one based on NDC codes. This example further highlights the importance of appropriate tool usage. When considering the choice of adjuster for purposes of stratifying the population into cohorts, that choice should be based on whether the desired definitions of the cohorts are reflected in the adjuster grouping mechanism.

The performance generally improves considerably for the concurrent models compared to prospective results with medical conditions in 2004.

Concurrent—2003 Medical Condition

TABLE V.3 Predictive Ratios by Medical Condition in 2003 (Recalibrated Nonlagged Concurrent without Prior Costs, 250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	103.2%	102.5%	88.8%	91.3%	41.0%	100.6%
CDPS	Diag	104.7%	76.5%	87.1%	83.8%	80.1%	80.2%
Clinical Risk Groups*	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	92.9%	98.4%	93.0%	95.8%	83.3%	94.7%
DxCG RxGroups	Rx	85.8%	79.7%	89.4%	75.2%	67.6%	79.6%
Ingenix PRG**	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	85.8%	75.9%	90.1%	65.0%	73.2%	79.9%
Impact Pro**	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	92.5%	96.6%	93.7%	89.8%	74.8%	85.2%
ACG w/ Prior Cost***	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model***	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai***	All	N/A	N/A	N/A	N/A	N/A	N/A

* Model could not be recalibrated consistently with other models.

** These models do not include a concurrent option.

*** These models include prior cost as input.

Prospective with Prior Costs—2003 & 2004 Medical Condition

Tables V.4 and V.5 show predictive ratios for disease-based groups in 2003 and 2004, respectively, using a prospective application of the risk adjuster models (optimized by recalibrating and including prior cost).

As expected, the predictive ratios for the concurrent models generally improved compared to the prospective models without prior costs. In addition, the predictive ratios exceed 100 percent more often. This is expected given the variation in actual costs for these conditions.

TABLE V.4 Predictive Ratios by Medical Condition in 2003 (Recalibrated Nonlagged Prospective with Prior Costs, 250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	99.0%	91.0%	100.1%	105.6%	115.5%	99.2%
CDPS	Diag	93.2%	86.6%	99.7%	96.8%	96.4%	94.6%
Clinical Risk Groups	Diag	96.5%	110.2%	110.0%	115.8%	109.3%	101.8%
DxCG DCG	Diag	95.8%	90.2%	99.2%	96.2%	99.3%	100.3%
DxCG RxGroups	Rx	101.2%	79.6%	99.0%	97.0%	94.6%	96.8%
Ingenix PRG	Rx	97.9%	80.0%	98.4%	96.4%	93.5%	94.9%
MedicaidRx	Rx	97.9%	84.2%	98.7%	95.2%	96.3%	96.8%
Impact Pro	Med+Rx+Use	100.8%	99.9%	99.5%	98.6%	106.5%	100.0%
Ingenix ERG	Med+Rx	99.8%	92.6%	101.0%	97.8%	92.7%	97.2%
ACG w/ Prior Cost	Diag+$Rx	100.7%	101.0%	100.5%	102.5%	119.1%	100.1%
DxCG UW Model	Diag+$Total	99.1%	93.1%	100.7%	97.6%	107.3%	101.0%
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	104.4%	93.3%	102.6%	97.9%	96.1%	99.7%

TABLE V.5 Predictive Ratios by Medical Condition in 2004 (Recalibrated Nonlagged Prospective with Prior Costs, 250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	72.1%	64.2%	86.9%	62.6%	83.4%	71.7%
CDPS	Diag	68.7%	61.4%	85.7%	57.7%	66.5%	68.5%
Clinical Risk Groups	Diag	75.2%	65.4%	89.6%	59.9%	66.0%	73.1%
DxCG DCG	Diag	76.7%	57.3%	88.4%	60.9%	68.1%	72.5%
DxCG RxGroups	Rx	76.7%	57.3%	88.4%	60.9%	68.1%	72.5%
Ingenix PRG	Rx	74.6%	57.6%	88.0%	60.5%	67.8%	72.6%
MedicaidRx	Rx	74.4%	60.7%	88.1%	59.4%	69.1%	71.3%
Impact Pro	Med+Rx+Use	76.7%	71.9%	89.0%	62.6%	77.6%	71.9%
Ingenix ERG	Med+Rx	76.7%	71.9%	89.0%	62.6%	77.6%	71.9%
ACG w/ Prior Cost	Diag+$Rx	75.3%	70.3%	88.2%	62.3%	85.6%	73.9%
DxCG UW Model	Diag+$Total	75.3%	70.3%	88.2%	62.3%	85.6%	73.9%
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	79.8%	66.8%	91.1%	62.0%	70.7%	75.4%

SECTION VI. Predictive Ratios by Cost Groupings

Individuals are assigned to the cost categories based on their actual costs in either 2003 or 2004, depending on the scenario. For all of the prospective models, the predictive ratios are for 2004 predictions and 2004 actual costs. For all of the concurrent models, the predictive ratios are for 2003 outputs and 2003 actual costs.

Cost Groupings—Prospective & Concurrent

The following analysis shows how well the models predict average 2004 costs for members who had high, medium and low costs in 2004. For example, the 99–100 grouping represents the top 1 percent of the population in terms of future year PMPYs, while the 0–20 grouping contains the least expensive 20 percent of the population.

Table VI.1 highlights the fact that all risk-adjustment models underpredict high-cost individuals and overpredict low-cost individuals. Table VI.1 also shows that the predictive ratios increase as the cost percentiles decrease. The different models perform remarkably similarly, Clinical Risk Groups and Impact Pro performed relatively well at the 96th percentile and above (Ingenix PRG performed relatively well in the 96th–99th percentiles, but not as well at the 99th–100th percentiles). Impact Pro performed relatively well in all of the percentile ranges.

TABLE VI.1 Prospective without Prior Cost (Recalibrated, Nonlagged)
Predictive Ratios by Cost Percentile Groupings (Cost Groupings Defined for 2004)

	Percentile Ranges							
Risk Adjuster Tool	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
ACG	21.8%	42.5%	67.5%	100.0%	152.2%	265.0%	570.7%	8308.1%
CDPS	18.2%	38.4%	63.6%	96.8%	154.5%	275.1%	595.3%	9335.9%
Clinical Risk Groups*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	20.5%	41.7%	67.3%	100.1%	153.3%	263.6%	558.3%	7869.0%
DxCG RxGroups	18.2%	43.8%	72.8%	105.8%	155.0%	248.8%	516.9%	7914.0%
Ingenix PRG	19.2%	44.3%	72.6%	104.2%	152.9%	247.4%	523.9%	8301.4%
MedicaidRx	15.9%	40.1%	69.9%	107.0%	163.4%	261.9%	516.9%	7374.3%
Impact Pro	26.9%	48.3%	73.3%	103.9%	152.1%	241.4%	480.9%	6605.6%
Ingenix ERG	18.0%	41.5%	71.1%	108.7%	163.6%	261.4%	509.2%	6171.7%
ACG w/ Prior Cost**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Percentile Ranges							
Service Vendor	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* Model could not be recalibrated consistently with other models.
** These models include prior cost as input.

Table VI.2, on the opposite page, shows predictive ratios for the concurrent models. When compared against Table VI.1, it is clear how much better the concurrent models stratify members by cost level, although the models still underpredict high-cost individuals and overpredict low-cost individuals.

Individuals with Low Costs in 2003 and High Costs in 2004

The following analysis measures how well the models predicted 2004 costs for "movers" (defined as individuals with low costs in 2003 and high costs in 2004). This is an important cohort to follow since part of the value of a risk adjuster, when compared against prior cost, is in its ability to predict changes in cost (i.e., low to high cost and high to low cost). The data used for the table is individuals with less than the median cost in 2003, and then with the percentile ranges in 2004 as indicated in the table.

As shown in Table VI.3, all of the models generally overpredict costs on average in 2004 for those with low costs in 2003 (see 0–100th percentile column). This is consistent with the prior tables, as risk adjusters generally overpredict costs for healthy people (and those who are relatively healthy in 2003 are more likely to be healthy in 2004). It is important not to interpret this finding as a deficiency in the models or methods. These results are due to the nature and variability of health care costs and the difficulty estimating costs for people who, by definition, have significant changes in their cost levels.

In addition, Table VI.3 shows how the different risk adjusters stratify their predictions for the highest-cost individuals who were low cost in the prior year. ERG has the best predictive ratios in each of the categories (excluding 0–100th percentile category, where Impact Pro had the best predictive ratio).

TABLE VI.2 Concurrent without Prior Cost (Offered, Nonlagged) Predictive Ratios by Cost Percentile Groupings (Cost Groupings Defined for 2003)

	Percentile Ranges							
Risk Adjuster Tool	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
ACG	57.0%	82.8%	94.8%	100.2%	107.6%	124.3%	137.9%	133.4%
CDPS	44.9%	60.9%	73.3%	86.4%	106.0%	142.9%	195.1%	283.1%
Clinical Risk Groups	62.8%	76.7%	83.8%	92.6%	105.8%	129.0%	158.9%	208.4%
DxCG DCG	75.2%	84.6%	89.0%	94.3%	102.9%	120.3%	133.4%	151.2%
DxCG RxGroups*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	43.2%	70.9%	88.1%	102.3%	116.6%	129.8%	136.3%	154.6%
Impact Pro*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	54.4%	75.2%	88.4%	101.2%	114.0%	127.6%	134.9%	131.5%
ACG w/ Prior Cost**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Percentile Ranges							
Service Vendor	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TABLE VI.3 Predictive Ratios by 2004 Cost Percentile where <50th Percentile in 2003 (Prospective, Recalibrated, Nonlagged, without Prior Cost)

	2004 Cost Percentile Range						
Risk Adjuster Tool	**0-100th**	**70th-100th**	**75th-100th**	**80th-100th**	**85th-100th**	**90th-100th**	**95th-100th**
ACG	132.0%	16.9%	14.5%	12.3%	10.4%	8.3%	6.2%
CDPS	144.8%	14.8%	12.6%	10.7%	9.0%	7.3%	5.5%
Clinical Risk Groups*	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	126.8%	17.8%	15.2%	12.9%	10.8%	8.7%	6.6%
DxCG RxGroups	130.1%	16.2%	13.8%	11.6%	9.8%	7.9%	6.1%
Ingenix PRG	133.5%	15.7%	13.3%	11.2%	9.4%	7.6%	5.9%
MedicaidRx	126.5%	17.6%	15.0%	12.6%	10.5%	8.5%	6.7%
Impact Pro	110.6%	20.1%	17.2%	14.5%	12.2%	9.9%	7.6%
Ingenix ERG	112.1%	21.0%	18.0%	15.3%	12.8%	10.3%	7.7%
ACG w/ Prior Cost**	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model**	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2004 Cost Percentile Range						
Service Vendor	**0-100th**	**70th-100th**	**75th-100th**	**80th-100th**	**85th-100th**	**90th-100th**	**95th-100th**
MEDai**	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table VI.2

* These models do not include a concurrent option.

** These models include prior cost as input.

Table VI.3

* Model could not be recalibrated consistently with other models.

** These models include prior cost as input.

Note: The 0–100th percentile values were not adjusted, but all other values were normalized by 0–100th percentile values. Unadjusted predictive ratios can be calculated by multiplying shown values by 0–100th percentile values.

TABLE VI.4 Predictive Ratios by 2004 Cost Percentile where <50th Percentile in 2003 (Prospective, Recalibrated, Nonlagged, with Prior Cost)

	2004 Cost Percentile Range						
Risk Adjuster Tool	**0-100th**	**70th-100th**	**75th-100th**	**80th-100th**	**85th-100th**	**90th-100th**	**95th-100th**
ACG	127.4%	21.4%	18.3%	15.6%	13.1%	10.5%	7.9%
CDPS	126.8%	21.3%	18.2%	15.4%	13.0%	10.5%	8.0%
Clinical Risk Groups	102.1%	21.6%	18.5%	15.7%	13.1%	10.6%	7.9%
DxCG DCG	119.1%	21.6%	18.5%	15.7%	13.2%	10.6%	8.0%
DxCG RxGroups	110.8%	20.9%	17.7%	14.9%	12.4%	10.1%	7.8%
Ingenix PRG	113.9%	20.6%	17.5%	14.6%	12.2%	9.9%	7.7%
MedicaidRx	106.4%	21.6%	18.3%	15.3%	12.8%	10.3%	8.0%
Impact Pro	106.3%	21.6%	18.4%	15.5%	13.0%	10.6%	8.2%
Ingenix ERG	103.8%	22.6%	19.3%	16.3%	13.7%	11.0%	8.3%
ACG w/ Prior Cost	120.4%	20.7%	17.7%	15.1%	12.6%	10.2%	7.7%
DxCG UW Model	99.8%	21.8%	18.7%	15.8%	13.3%	10.7%	8.0%
	2004 Cost Percentile Range						
Service Vendor	**0-100th**	**70th-100th**	**75th-100th**	**80th-100th**	**85th-100th**	**90th-100th**	**95th-100th**
MEDai	93.5%	22.0%	18.8%	15.9%	13.4%	10.7%	8.1%

Note: The 0–100th percentile values were not adjusted, but all other values were normalized by 0–100th percentile values. Unadjusted predictive ratios can be calculated by multiplying shown values by 0–100th percentile values.

Table VI.4 shows results similar to Table VI.3, except that results for risk adjusters that include prior costs are shown, and the prior cost independent variable was added to all of the models that do not already include prior costs. The DxCG UW Model is a very good predictive ratio for the total cohort of low-cost individuals as shown in the 0–100th column. ERG has the best predictive ratios for all but the 0–100th percentile columns.

Like any predictive modeling tool, the performance of risk adjusters is affected by a host of factors including data and usage limitations. These and other factors are detailed below.

Population Specificity and Applicability

Models can be calibrated so that they perform reasonably well for populations for which they were not originally intended. For example, CDPS and MedicaidRx were originally created for Chronic Disabled and Medicaid populations, respectively, but performed well when calibrated and applied to a commercial data set.[11] However, the condition category groupings and information presented may not be specific enough for the analysis being performed. For example, risk adjusters intended for an over-age-65 population may not include adequate breakdowns of pregnancy-related and infant diseases.

It is important to consider all of the objectives for which the risk adjuster will be used and what information will be gathered. The age/gender and condition categories need to be meaningful for the population being measured and for the purpose for which the tool is being used. Customization of the tools by risk adjuster vendors, outside consultants or in-house staff can provide meaningful improvements. However, modifications and calibrations should be made carefully.

Turnover

The population to which a risk adjuster is applied may include persons who will not be enrolled during the prediction period, because of lapse (voluntary or involuntary) or death. Likewise, new participants may enter the risk pool, and there will be only limited or no claims data available for them during the experience period.

Milliman's "Optimal Renewal Guidelines" study measured the predictive performance of pure age/gender predictions, in addition to optimized risk adjuster predictions. The prospective R-squared value for the age/gender prediction was about 6 percent. The prospective R-squared value for the optimized risk adjuster prediction was about 25 percent. Therefore, a rough estimate of the R-squared once turnover within a population is considered would be as follows:

> [(0.06 x turnover rate + 0.25 x (1 - turnover rate)) / 0.25]
> x Pre-turnover R-squared.

For example, assume that there is turnover of 15 percent (that is, you do not or will not have diagnosis or drug use data for 15 percent of the participants in the prediction period) and the R-squared without considering turnover is 27 percent (prospective) for a particular analysis. The adjusted R-squared calculated using the formula above would be about 24 percent [(0.06 x 0.15 + 0.25 x 0.85) / 0.25 x 0.27]. This approach does not consider partial enrollment. Some vendors have added logic to develop risk scores for participants who enter during the experience period.

This equation simply assumes that new entrants will receive an age/gender prediction. Further, it assumes that the change in predictive power is equal to the continuous enrollment (pre-turnover) R-squared, multiplied by a portion of the proportional change in predictive power from optimized to age/gender as observed in the "Optimal Renewal Guidelines" study. In the above equation, the turnover rate is defined as the portion of the population that will be active during the rating period that was not available during the experience period. This is a simplified, illustrative formula as it assumes changes in R-squared are linear, and does not consider partial enrollment during either or both of the experience and prediction periods.

[11] Cumming et al., "A Comparative Analysis of Claims Based Methods."

It may be more appropriate to use the pre-turnover R-squared in place of the 0.25 value in the formula above, as the age/gender performance may not change materially with changes in the risk-adjustment methods (although modeling conditions are important and affect both values, which is why the equation above is presented). The equation for the post-turnover R-squared (assuming the age/gender R-squared does not vary for different analyses) would be simplified as follows:

(0.06 x turnover rate + Pre-turnover R-squared x (1 - turnover rate)

The formula would also work for MAPE, and might even be more appropriate since MAPE does not square error terms.

Lag Issues

When using a risk adjuster, the prediction period often begins several months in the future. For example, when developing small group renewal rates, the rate development typically takes place three to six months in advance of the rating period. This delay is referred to as prediction lag, and it affects model performance above and beyond turnover, which was previously discussed (prediction lag creates uncertainty because of the additional time for potential changes in the health status of members). For any prospective analysis, the fact that future costs are being predicted creates uncertainty because an individual's health status may change. However, for purposes of this study, prediction lag is defined as the period between the end of the data collection period and the beginning of the prediction period.

Many of the risk-adjustment models are calibrated on continuously enrolled populations for a time period that immediately follows the experience period. Any time the conditions differ between the calibration of offered weights and the application of the risk adjuster, it is important to consider adjusting the model. Several of the risk-adjustment vendors include models with prediction lag options in their suite of tools. A modest prediction lag should not have a strong influence on model performance, especially if the model is recalibrated for the specific situation. However, prediction lag will increase the effects of turnover since it expands the period for potential turnover.

Data lag is related to, but not the same as, prediction lag. Data ready for risk adjuster input must be actual paid claims. Incurred medical claims usually take two to four months to be paid (on average), with some claims potentially taking several years to be completely paid. Prescription drug claims are paid much more quickly, but still take a month or two to be considered completely paid. Therefore, potentially meaningful and timely claims data may not be available for use in a risk adjuster in many situations. While vendors have added models to minimize lag issues, data lag affects the performance of all models, especially those that rely primarily on medical data.

In this study the impact of data and prediction lag was analyzed. Table VII.1 shows the combined impact of data and prediction lag collectively on model performance:

This table shows that predictive performance is substantially impacted by data and prediction lag. The risk adjusters based on only pharmacy data are less affected. In this study claims that were incurred and paid during January to August 2003 were used to predict claim costs for calendar year 2004. Thus, a four-month data and prediction lag for the "lagged" analyses was modeled.

Data delays are an implementation problem for any risk-adjustment model. A continuous enrollment requirement can remove up to 40 percent to 50 percent of any currently enrolled Medicaid population from the clinical condition risk assessment (e.g., all new enrollees), thus dramatically reducing the predictive performance of the total capitation system. Therefore, it is important to understand the extent to which the delay has affected the performance of the model.[12]

TABLE VII.1 R-Squared Prospective Recalibrated (Without Prior Cost, 250K Truncation)

		R-squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**Lagged**	**Nonlagged**	**Change**	**Lagged**	**Nonlagged**	**Change**
ACG	Diag	15.2%	19.6%	4.4%	92.8%	88.8%	-4.0%
CDPS	Diag	14.5%	17.7%	3.2%	95.1%	91.9%	-3.2%
Clinical Risk Groups*	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	16.9%	21.3%	4.4%	91.2%	87.0%	-4.2%
DxCG RxGroups	Rx	18.2%	20.5%	2.3%	87.2%	85.3%	-1.9%
Ingenix PRG	Rx	18.9%	21.2%	2.3%	87.6%	85.6%	-2.0%
MedicaidRx	Rx	15.8%	17.7%	1.9%	90.1%	88.4%	-1.7%
Impact Pro	Med+Rx+Use	21.5%	25.6%	4.1%	84.9%	81.6%	-3.3%
Ingenix ERG	Med+Rx	17.4%	20.0%	2.6%	88.4%	86.1%	-2.3%
ACG - w/ Prior Cost**	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model**	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Lagged**	**Nonlagged**	**Change**	**Lagged**	**Nonlagged**	**Change**
MEDai**	All	N/A	N/A	N/A	N/A	N/A	N/A

* Model could not be recalibrated consistently with other models.

** These models include prior cost as input.

Data Issues

From the perspective of data used to assess risk, methods can be categorized by their reliance on demographic, prior expenditure and/or health data, including self-reported health status and lab results. This study examines methods that use claims-based health data. The risk-adjustment methods based on claims data can be further divided into methods that rely on diagnosis codes from claims or encounter data, methods that rely on prescription data as a proxy for diagnoses and methods that use prior costs (and various combinations of the three data sources).

Models using other health data, such as lab results or survey data on self-reported chronic disease or functional status are not included in this study. Use of this information represents the next exciting frontier for predictive modeling. The increasing adoption of standardized formats for electronic medical records (EMRs) will likely accelerate the development and utility of predictive models that use this information.

Methods that rely solely on demographic risk factors, such as age, gender and program eligibility status, are easy to administer. These methods are not measures of the care process and therefore do not produce the incentive to change treatment or coding to maximize risk scores. Unfortunately, these methods have relatively poor predictive value at an individual level or for risk-skewed groups.

[12] Cumming et al., "A Comparative Analysis of Claims Based Methods."

In contrast, an individual's total prior medical expenditure is a reasonably good predictor of future expenditure. These data are easier to manage than detailed encounter data. However, the incentives related to providing care in an efficient manner are very poor.

Health status measures, such as diagnoses and prescriptions, are good predictors and provide useful medical management information. Diagnostic data must be obtained by plans from providers. Often these data are difficult for some types of plans to obtain either because the plan has a capitation contract with providers that do not require data for payment or the plans are staff or group provider models that have little or no fee-for-service experience. Ambulatory diagnoses are also somewhat unreliably coded, but the diagnostic risk assessment software available generally has built-in safeguards to reduce the problems caused by incomplete data.

Changes in coding patterns over time are expected. For diagnosis-based methods, a major concern with coding changes is for ambulatory diagnoses. These codes have not been widely used as the basis for payment or rate setting, although this use is becoming more common. For example, it is an important component of the HCC model used for Medicare Advantage payment. Changes in coding practices may result in the identification of new cases with a primary condition, the improved refinement of coding for severity or the increase in the coding of all related conditions affecting treatment. These changes can create the appearance of a higher-risk population when compared with the population used to calibrate the prediction model. The results can, therefore, inflate the estimate of the total cost for a population.

Another significant data issue is accessibility. Some plans or purchasers may have better access than others to prescription drug data. Prescription drug data are timely and relatively clean and complete for major ambulatory drugs. In addition, these data do not need to be obtained from providers, eliminating a potentially burdensome administrative step. The incentives for efficiency may be poor if prescribing is increased in order to raise a plan or provider's risk score. Prescription-based risk assessment models generally rely on drugs believed to be nondiscretionary. However, with off-label prescribing, and to the extent that discretion remains in prescribing drugs for additional diseases or for less severe or marginal forms of the disease, caution should be exercised when prescription-based models are considered for provider payment applications. Also, it is generally more important to periodically update and calibrate pharmacy-based models because of the rapid introduction of new drugs and off-label uses.

TABLE VII.2 Comparison of Risk Measures

	Risk Measures			
Criteria	**Demographics**	**Prior Expenditures**	**Prescriptions**	**Health Diagnoses**
Data Quality	High	Medium	High	Medium
Prediction Accuracy	Low	High	High	High
Administrative Burden	Low	Medium	Medium	High
Utilization Incentive	Low/None	High	High*	Low
Diagnosis Coding Incentive	Low/None	Low	Low	High

* High for prescription drugs, low for all other services.

Table VII.2 qualitatively compares types of risk assessment methods based on risk measures/data sources.

The methods evaluated in this study differ to some extent in the number of conditions they incorporate. Some use almost all known diseases to assign risk scores. Others exclude minor, acute conditions under the assumption that these conditions are not relevant to risk selection. The models assume that they do not represent significant per capita costs and including them may produce a clinically needless proliferation of these codes. However, if the intent is to evaluate how primary care providers are managing these frequent acute minor problems, then a model that includes these conditions would be preferred.

Another difference is the assignment of disease measures to risk categories. The process may produce categories that are much too heterogeneous for a specific disease of interest. Some conditions are lumped with related, yet clinically quite distinct, diseases due to similar costs. In addition, more detailed coding to describe severity will not change the assignment to a risk category beyond the simple

identification of the disease. On the other hand, a disease such as diabetes has its own category in most products, and payment is affected by coding diabetes more specifically.

The approach to assigning individual risk scores also varies. Some methods are additive, with additional payment made for each additional identified disease category, and others are multiplicative (nearly all are hierarchal at some level). For payment applications, some of these categories may be arranged in hierarchies of related conditions—for example, pulmonary conditions, with payment made for only the highest cost category in the hierarchy, the assumption being that the categories with lower costs in the hierarchy indicate complications related to the more significant condition. This approach avoids "double" counting. Other methods address this relatedness of conditions by assigning individuals to mutually exclusive risk categories derived by interacting all of the individual's conditions or by identifying the individual's dominant condition.

The methods evaluated in this study have been designed to be as robust to data problems as possible while preserving predictive performance. The models typically require only one occurrence of the diagnosis or prescription in the assessment period to assign risk. The number of times the same code appears is typically irrelevant. Discretionary or ill-defined indicators are often excluded or assigned so as to minimize gaming incentives. This means that data need not be perfectly complete and detailed to be adequate for risk-adjustment. [13]

Group Size and State Regulation in Employer Group Renewal Rating

State regulation often greatly limits the rating action that small group carriers can take based on the risk adjuster predictions by limiting allowable rate changes due to medical risk factors (ranging from +/-10 percent to unlimited depending on the state). Group size also affects the predictive performance of risk adjuster models, because as groups become larger, variations in individuals' costs are less important, therefore prediction accuracy increases. Large groups also tend to have future costs that are more predictable based on their historic costs than smaller groups.

To understand the impact of rating regulations on predictive performance, suppose two methods for predicting a small group's health care costs are used. One method estimates the group's costs as 30 percent higher than average, while the other method estimates the group's costs as 35 percent higher. With the benefit of hindsight and actual claim data, the group's costs turn out to be 30 percent higher than average. Depending on which state the carrier was operating in, either method may have provided the carrier with all of the useful information they could use for purposes of setting the group's renewal rate. For example, Iowa allows only +/- 25 percent variation from the average rate due to the health status of the group. Therefore, if this was an Iowa renewal, both methods would have directed the carrier to rate the group up as high as possible and would have provided "perfect information" (depending on your perspective). However, in states with 35 percent or more allowable rating variation, the first method provides better information.

The "Optimal Renewal Guidelines" study concluded that state regulatory limits on small group rating significantly impacted the actionable predictive power of renewal methods, including those that used risk adjusters. In addition, meaningful differences between methods decreased as group size increased.

Table VII.3, on the next page, shows how group size and regulatory rating limits affect MAPE (excerpt from "Optimal Renewal Guidelines" study). The Risk Adjuster results represent optimized risk adjuster results, including prior costs.

As shown in this table, the MAPE results for both a manual rate and risk adjuster approach improve as group size increases and when rating limits are introduced and tighten (for the MAPE calculations with rating limits, actual costs were limited by allowable rate variation, decreasing the potential error). Historic loss ratio methods performed better than the manual rate approach, and showed less difference compared to the risk adjuster approach.

Uses of Health-Based Risk-Adjustment

There are many uses for health-based risk-adjustment by purchasers and plans. When selecting a health-based risk-adjustment method, two primary features differentiate the applications:

[13] Cumming et al., "A Comparative Analysis of Claims Based Methods." This subsection is substantially the same as the referenced report; the current report updates changes in current data issues.

TABLE VII.3	Impact of Group Size and Regulatory Rating Limits (MAPE with and without Cap)			
Group	Risk Adjuster +/- 25%		Manual Rate +/- 25%	
Size	Uncapped	With Cap	Uncapped	With Cap
1 Mbr	82.7%	16.4%	101.0%	19.7%
1 EE	70.2%	16.7%	85.8%	21.0%
3 EEs	50.8%	16.9%	59.9%	21.3%
10 EEs	32.0%	16.1%	36.8%	20.0%
25 EEs	21.3%	14.8%	24.1%	17.6%
50 EEs	15.1%	12.6%	17.2%	14.7%
150 EEs	9.1%	8.9%	10.3%	10.2%

- Does the application involve payment to providers or plans?
- Does the application's perspective focus on targeted subpopulations, or is it global?

Using the two distinguishing characteristics, specific applications can be categorized for the following four uses.

Provider or Plan Payment—Global Perspective

These uses include health plan premium rate setting and provider capitation. Under these conditions any of the diagnosis-based methods may be preferred because they are good predictors and may introduce less of a gaming incentive than the prescription-based models. Prior cost models should not be used. Risk selection at the provider level is usually more extreme than risk selection across health plans. When capitation or volume target incentives are used to pay providers, the concerns with diagnosis gaming and overtreatment become important. The use of actual utilization data, such as prescriptions, to indicate a disease and increase payment should be avoided or approached with caution. Diagnosis data are not immune from gaming, but criteria exist for diagnosing many, if not most, major conditions, and this helps provide a basis for validation. An additional benefit of using health-based risk-adjustment for capitation is that providers have a strong incentive to provide the data.

Provider or Plan Payment—Targeted Perspective

These uses include setting disease management payment levels, for example, carve-outs, high-cost case management or disease-specific payments. The selection should be limited to diagnosis-based models to avoid perverse incentives. One would need to explore which of the methods best captures the severity and complications associated with managing a specific disease on the one hand and high-cost complex cases with many co-morbidities on the other. It may also be true that, for the diseases of interest, one could become satisfied that the prescription indicating the presence of the condition or its severity is nondiscretionary, and then prescription-based systems or a combination of systems may be considered. Prior cost models should not be used, although some cost threshold (similar to a stop loss provision in some hospital diagnosis-related group (DRG) contracts) might be appropriate to include as an adjustment to payment.

No Provider or Plan Payment—Global Perspective

These uses include setting defined premium and contribution levels for employers and employees (i.e., small group underwriting), provider efficiency profiling, total medical cost forecasting and budgeting. Any of the methods could be applied for these uses because secondary incentives are weak when payment is not involved. Other factors, such as the cost of data and other uses for the risk assessment information, would dominate the selection. A prior cost variable should be included in the prediction for small group underwriting, as it increases the predictive power of the methods considerably.

A relatively new use of health-based risk-adjustment in rate setting is to adjust employee premiums in defined contribution products. The use of risk-adjustment within consumer-directed health plans will likely become important as these plans are more widely adopted.

No Provider or Plan Payment—Targeted Perspective

These uses include high-cost case identification, individual underwriting and disease management program planning and budgeting. In addition to the standard selection criteria, the selection would be based on which method provides the most meaningful clinical categorization of individuals. [14]

[14] Cumming et al., "A Comparative Analysis of Claims Based Methods." This subsection is substantially the same as the referenced report; the current report provides updated information.

Medical and Pharmacy Data Issues

Implementation will be more challenging if there is not some early testing and data handling in the planning phase. A simulation may be the first time the purchaser will be handling massive amounts of data, especially the encounter data.

Data should be examined for reasonableness. Examining the frequency distributions of various data elements will help identify incomplete encounter data. Although there are no norms, there is some information about what portion of members should be expected not to have any claims. Data may be missing because of subcapitation or because of carve-outs. A common problem is missing mental health provider data for a program that covers mental health services. Each person should have similar benefit plans or normalizing adjustments, and additional modeling will be necessary. Any differences between the populations and benefits and methods for addressing those differences should be noted in results.

Different types of plans have a variety of data problems. Staff model HMOs that have limited experience with fee-for-service billing could have problems providing data for encounters and the bundling of services. Plans whose systems truncate the number of diagnosis codes per record may potentially result in understated risk measures.

Data quality can be an issue at the plan level and at the provider level. Data concerns at the plan level revolve around completeness, while data issues at the provider level include both completeness and accuracy.

For diagnosis data, the concern at the plan level is to capture all diagnoses already recorded by the provider. Plans may be missing diagnoses for two reasons:

- Incomplete or unavailable encounter data from some providers
- Truncation of the number of diagnoses per encounter supplied by the provider.

Prescription data are almost always complete and accurate at the plan level for most significant conditions and do not involve data transfer from providers.

For diagnosis coding at the provider level, there are three possible activities that can change the number and distribution of diagnoses and can increase the measured risk for a population when, in fact, the underlying morbidity of the population may be stable:

- Diagnostic discovery: Increased number and severity of diagnoses are reported, all of which are appropriate. The correction of previous underreporting will reduce the problem of lack of persistence of diagnoses and will more fairly represent the illness burden of the population.
- Diagnostic creep: Increased number and severity of diagnoses for cases where the diagnosis is uncertain. This represents an upward bias in response to payment incentives. Many of the groupers underlying many risk-adjustment methods try to minimize this problem by bundling related diagnoses and by excluding ill-defined codes.

- Tentative diagnoses: Represents a potential source of error when a diagnosis is appropriately used to justify a diagnostic procedure (rule-out) or to signal the need to treat a person without confirmatory diagnostic tests as if the patient has the disease (presumptive), because delay in treatment is harmful. Here, too, the groupers underlying many risk-adjustment methods have rules for excluding codes that are highly likely to be tentative.

Purchasers have so far not detected significant changes in provider-level coding patterns, but it is important to be vigilant and to set up monitoring and auditing systems that examine coding practices.[15]

Eligibility Data Issues

It may require two months or more to receive updates of changes in eligibility status of plan members from the purchaser. For some large employers, the retroactive adjustment for new enrollment, enrollment status changes or terminations may take even longer.

To the extent eligibility information is out of date, the risk scoring will also be affected and can be materially biased. For example, if it takes several months for eligibility data to reflect the death of members, then those members will appear healthy for some period of time after their death. This may affect concurrent risk-adjustment applications most significantly.

The Time to Execute the Risk Scoring and the Frequency of Risk Scoring

Purchasers can control how often and how fast they compute and assign risk scores. Combined with the usual claims run-out lag, the range can be from a minimum of six months up to 24 months.

Data delays are an implementation problem for any risk-adjustment model. For individual-level prospective models, the enrollee often must be continuously eligible for 6–12 months in the assessment period, 6–18 months in the claims delay period, and 1–12 months in the payment period for a health plan to be paid for the risk of that enrollee. A continuous enrollment requirement can remove up to 40 percent to 50 percent of any currently enrolled Medicaid population from the clinical condition risk assessment (e.g., all new enrollees), thus dramatically reducing the predictive performance of the total capitation system. Therefore, it is important to know the extent to which the delay has reduced the performance of the model compared to its "laboratory" tested results that often included no delay. Section VII of this report includes a discussion of the impact of lag on model performance.

[15] Cumming et al., "A Comparative Analysis of Claims Based Methods." This subsection is substantially the same as the referenced report.

Follow-up Studies | SECTION IX.

The following list identifies beneficial studies recommended for follow-up analysis. These studies would build on the results presented in this report and the two preceding SOA risk adjuster research studies.

- Explicitly analyze the impact of turnover (i.e., a non-continuously enrolled population)
- Analyze Medicare's risk assessment tool, HCC
- Analyze predictive measures for different, homogeneous populations (Medicare, Medicaid, individual, small group, large group, HMO, PPO, etc.)
- Analyze impact of adding prior costs to risk adjuster predictions by group size (and how credibility of risk adjuster and prior cost components changes with group size)
- Analyze consistency of performance (robustness) across different data sets and over time.
- Explicitly analyze the impact of small group regulation for all of the models; the general impact of state regulation is expected to be similar for the different models
- Analyze the predictive improvement (or expected improvement) when more than 12 months of data are used
- Analyze potential predictive performance improvements with the inclusion of lab, HRA and other available data
- Analyze additional models more appropriate for disease management uses of risk adjusters, and use measures more meaningful for these uses (i.e., specificity).

References | SECTION X.

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APPENDIX A-1. Offered, Prospective, Nonlagged, without Prior Costs

TABLE A-1.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	20.8%	19.2%	16.2%	87.7%	89.9%	90.4%
CDPS	Diag	17.6%	14.9%	12.4%	93.4%	95.3%	95.8%
Clinical Risk Groups	Diag	19.3%	17.5%	14.9%	88.7%	90.9%	91.4%
DxCG DCG	Diag	22.3%	20.6%	17.4%	85.3%	87.5%	88.0%
DxCG RxGroups	Rx	23.8%	20.4%	16.8%	82.9%	85.3%	85.9%
Ingenix PRG	Rx	25.0%	20.5%	17.2%	83.4%	85.8%	86.4%
MedicaidRx	Rx	19.3%	15.8%	12.9%	87.3%	89.6%	90.2%
Impact Pro	Med+Rx+Use	26.3%	24.4%	21.3%	79.3%	81.8%	82.4%
Ingenix ERG	Med+Rx	23.7%	19.7%	16.2%	84.1%	86.4%	87.0%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-1.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	88.4%	100.0%	96.7%	103.1%	99.6%	92.3%
CDPS	Diag	95.0%	73.4%	84.8%	76.4%	67.3%	92.5%
Clinical Risk Groups	Diag	85.1%	94.7%	99.7%	99.5%	91.5%	89.0%
DxCG DCG	Diag	93.3%	98.3%	98.6%	103.2%	86.4%	95.9%
DxCG RxGroups	Rx	95.5%	76.9%	97.9%	89.4%	89.2%	88.6%
Ingenix PRG	Rx	94.9%	93.9%	98.2%	89.7%	79.6%	87.1%
MedicaidRx	Rx	90.1%	94.9%	92.7%	79.1%	90.8%	94.0%
Impact Pro	Med+Rx+Use	97.6%	115.4%	96.4%	99.8%	95.1%	98.0%
Ingenix ERG	Med+Rx	90.0%	99.2%	94.8%	92.9%	80.0%	91.9%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-1.3 Predictive Ratios by 2004 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	22.1%	42.0%	66.0%	97.4%	147.7%	261.1%	597.2%	9690.4%
CDPS	Diag	14.6%	32.0%	55.4%	87.1%	144.7%	285.5%	763.0%	12765.0%
Clinical Risk Groups	Diag	22.0%	41.1%	64.0%	96.0%	149.5%	261.3%	606.0%	9781.5%
DxCG DCG	Diag	23.4%	43.0%	67.0%	98.3%	148.8%	257.3%	562.8%	8454.6%
DxCG RxGroups	Rx	19.9%	45.2%	73.3%	105.1%	152.3%	243.8%	516.0%	8096.4%
Ingenix PRG	Rx	21.1%	46.6%	74.6%	104.7%	149.5%	239.5%	512.9%	8226.8%
MedicaidRx	Rx	16.0%	41.2%	72.2%	109.7%	166.1%	260.9%	496.3%	6130.0%
Impact Pro	Med+Rx+Use	30.0%	49.4%	72.4%	100.7%	146.8%	237.0%	493.6%	7396.0%
Ingenix ERG	Med+Rx	17.7%	40.2%	68.9%	106.3%	161.6%	263.3%	533.5%	7162.8%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A-2. Offered, Prospective, Nonlagged, with Prior Costs

TABLE A-2.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	N/A	N/A	N/A	N/A	N/A	N/A
CDPS	Diag	N/A	N/A	N/A	N/A	N/A	N/A
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	N/A	N/A	N/A	N/A	N/A	N/A
ACG w/ Prior Cost	Diag+$Rx	25.6%	22.4%	18.7%	82.8%	85.1%	85.6%
DxCG UW Model	Diag+$Total	31.3%	27.4%	23.6%	79.0%	80.1%	80.4%
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-2.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	N/A	N/A	N/A	N/A	N/A	N/A
CDPS	Diag	N/A	N/A	N/A	N/A	N/A	N/A
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	N/A	N/A	N/A	N/A	N/A	N/A
ACG w/ Prior Cost	Diag+$Rx	92.5%	109.0%	95.8%	97.5%	103.6%	91.0%
DxCG UW Model	Diag+$Total	93.2%	84.9%	91.1%	90.7%	103.6%	94.6%
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-2.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CDPS	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ACG w/ Prior Cost	Diag+$Rx	22.3%	46.6%	71.9%	98.8%	142.1%	241.6%	570.6%	10010.0%
DxCG UW Model	Diag+$Total	22.2%	45.6%	71.4%	102.2%	150.4%	246.0%	524.8%	8377.8%
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A-3. Offered, Prospective, Lagged, without Prior Costs

TABLE A-3.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	15.6%	14.5%	12.3%	91.6%	93.7%	94.1%
CDPS	Diag	13.9%	11.9%	9.8%	96.9%	98.8%	99.2%
Clinical Risk Groups	Diag	16.0%	14.1%	12.1%	91.8%	93.9%	94.4%
DxCG DCG	Diag	16.8%	15.1%	12.6%	89.4%	91.6%	92.1%
DxCG RxGroups	Rx	21.1%	18.0%	14.8%	85.1%	87.4%	88.0%
Ingenix PRG	Rx	22.5%	18.0%	15.2%	85.3%	87.8%	88.3%
MedicaidRx	Rx	16.5%	13.6%	11.1%	89.4%	91.7%	92.3%
Impact Pro	Med+Rx+Use	24.2%	21.4%	18.2%	83.1%	85.5%	86.1%
Ingenix ERG	Med+Rx	20.4%	16.9%	13.9%	86.5%	88.7%	89.3%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-3.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	81.7%	96.2%	91.1%	92.8%	105.5%	86.3%
CDPS	Diag	89.1%	70.5%	80.8%	70.4%	64.2%	87.2%
Clinical Risk Groups	Diag	79.2%	83.2%	94.7%	89.7%	98.2%	84.9%
DxCG DCG	Diag	88.9%	94.8%	94.9%	95.2%	88.5%	92.3%
DxCG RxGroups	Rx	90.3%	74.3%	98.0%	86.6%	93.0%	85.3%
Ingenix PRG	Rx	90.8%	89.4%	97.9%	86.9%	83.6%	84.6%
MedicaidRx	Rx	89.3%	96.6%	95.8%	79.7%	97.4%	93.3%
Impact Pro	Med+Rx+Use	90.7%	92.1%	95.2%	89.9%	96.3%	91.4%
Ingenix ERG	Med+Rx	86.8%	99.4%	96.1%	89.1%	83.4%	90.4%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-3.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	18.9%	38.0%	61.6%	93.2%	149.3%	272.7%	641.0%	11015.6%
CDPS	Diag	13.0%	29.9%	52.4%	83.5%	142.9%	290.5%	810.3%	14295.3%
Clinical Risk Groups	Diag	18.9%	37.7%	60.1%	92.4%	148.3%	269.8%	660.6%	11255.2%
DxCG DCG	Diag	20.3%	40.2%	64.4%	96.3%	150.7%	266.5%	597.7%	9589.7%
DxCG RxGroups	Rx	18.4%	43.7%	71.8%	104.5%	153.0%	246.5%	528.9%	8702.9%
Ingenix PRG	Rx	19.9%	45.2%	72.9%	103.6%	150.2%	243.2%	528.3%	8849.3%
MedicaidRx	Rx	15.7%	41.3%	72.8%	111.0%	167.2%	258.2%	481.2%	6226.6%
Impact Pro	Med+Rx+Use	22.2%	43.8%	68.9%	100.4%	152.7%	253.3%	540.0%	8691.8%
Ingenix ERG	Med+Rx	16.4%	39.1%	68.1%	106.1%	163.4%	265.1%	536.8%	7570.0%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A-4. Offered, Prospective, Lagged, with Prior Costs

TABLE A-4.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	N/A	N/A	N/A	N/A	N/A	N/A
CDPS	Diag	N/A	N/A	N/A	N/A	N/A	N/A
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	N/A	N/A	N/A	N/A	N/A	N/A
ACG w/ Prior Cost	Diag+$Rx	21.7%	18.7%	15.6%	85.8%	88.1%	88.6%
DxCG UW Model	Diag+$Total	25.2%	21.3%	17.8%	84.3%	85.3%	85.6%
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-4.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	N/A	N/A	N/A	N/A	N/A	N/A
CDPS	Diag	N/A	N/A	N/A	N/A	N/A	N/A
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	N/A	N/A	N/A	N/A	N/A	N/A
ACG w/ Prior Cost	Diag+$Rx	86.5%	102.5%	90.5%	87.5%	108.1%	85.9%
DxCG UW Model	Diag+$Total	86.3%	78.0%	86.0%	82.6%	96.0%	88.1%
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-4.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CDPS	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ACG w/ Prior Cost	Diag+$Rx	19.1%	43.3%	68.7%	96.2%	143.9%	249.9%	604.0%	11078.8%
DxCG UW Model	Diag+$Total	18.0%	40.7%	66.4%	98.6%	151.7%	260.7%	584.9%	10058.2%
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A-5. Offered, Concurrent, Nonlagged, without Prior Costs

TABLE A-5.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	29.4%	29.7%	27.4%	73.0%	75.0%	75.4%
CDPS	Diag	35.5%	32.9%	31.0%	79.0%	80.6%	81.0%
Clinical Risk Groups	Diag	47.1%	43.3%	39.9%	68.6%	70.5%	70.9%
DxCG DCG	Diag	57.2%	51.8%	49.8%	61.6%	65.0%	65.4%
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	32.1%	28.1%	24.6%	77.2%	79.1%	79.6%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	46.5%	42.4%	38.6%	65.8%	67.7%	68.2%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-5.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	109.0%	97.3%	90.6%	94.0%	44.4%	107.5%
CDPS	Diag	102.3%	73.4%	87.6%	74.4%	65.2%	89.9%
Clinical Risk Groups	Diag	92.0%	103.8%	92.8%	87.5%	80.9%	89.9%
DxCG DCG	Diag	93.8%	109.9%	96.3%	103.4%	80.9%	92.3%
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	83.2%	82.6%	93.3%	65.3%	68.8%	79.6%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	88.6%	108.7%	92.9%	89.9%	70.7%	86.4%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-5.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	57.0%	82.8%	94.8%	100.2%	107.6%	124.3%	137.9%	133.4%
CDPS	Diag	44.9%	60.9%	73.3%	86.4%	106.0%	142.9%	195.1%	283.1%
Clinical Risk Groups	Diag	62.8%	76.7%	83.8%	92.6%	105.8%	129.0%	158.9%	208.4%
DxCG DCG	Diag	75.2%	84.6%	89.0%	94.3%	102.9%	120.3%	133.4%	151.2%
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	43.2%	70.9%	88.1%	102.3%	116.6%	129.8%	136.3%	154.6%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	54.4%	75.2%	88.4%	101.2%	114.0%	127.6%	134.9%	131.5%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A-6. Offered, Concurrent, Lagged, without Prior Costs

TABLE A-6.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	25.0%	24.4%	23.3%	77.9%	78.6%	78.7%
CDPS	Diag	29.5%	27.1%	26.2%	85.8%	86.4%	86.5%
Clinical Risk Groups	Diag	40.8%	37.3%	35.7%	76.5%	77.2%	77.3%
DxCG DCG	Diag	50.5%	43.0%	41.5%	68.3%	71.2%	71.3%
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	25.4%	22.5%	21.3%	83.0%	83.7%	83.8%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	39.1%	35.6%	33.9%	72.0%	72.7%	72.8%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-6.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	111.6%	101.1%	91.5%	94.5%	47.7%	111.7%
CDPS	Diag	98.6%	73.8%	88.3%	73.7%	63.5%	89.9%
Clinical Risk Groups	Diag	87.9%	100.8%	90.0%	85.1%	93.5%	88.2%
DxCG DCG	Diag	94.0%	116.2%	99.5%	105.7%	87.8%	96.2%
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	83.0%	84.0%	99.5%	69.2%	71.2%	81.9%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	86.9%	114.3%	96.9%	91.2%	73.6%	89.9%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-6.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	62.2%	83.8%	93.4%	98.4%	104.5%	120.4%	133.9%	126.6%
CDPS	Diag	49.1%	62.5%	71.2%	82.0%	100.9%	136.6%	194.9%	299.6%
Clinical Risk Groups	Diag	65.9%	75.2%	79.5%	87.4%	101.0%	126.2%	166.9%	235.5%
DxCG DCG	Diag	82.1%	88.4%	89.6%	93.3%	100.3%	114.8%	126.3%	145.1%
DxCG RxGroups	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	51.1%	76.3%	89.7%	101.6%	112.4%	120.1%	121.7%	136.8%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	60.6%	79.4%	89.7%	100.8%	111.4%	119.6%	121.8%	116.1%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A-7. Recalibrated, Prospective, Nonlagged, without Prior Costs

TABLE A-7.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	21.8%	19.6%	16.6%	86.9%	88.8%	89.3%
CDPS	Diag	20.8%	17.7%	14.7%	89.9%	91.9%	92.4%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	24.9%	21.3%	17.8%	85.0%	87.0%	87.6%
DxCG RxGroups	Rx	25.1%	20.5%	16.8%	82.8%	85.3%	85.9%
Ingenix PRG	Rx	25.6%	21.2%	17.6%	83.3%	85.6%	86.2%
MedicaidRx	Rx	22.2%	17.7%	14.6%	86.1%	88.4%	89.0%
Impact Pro	Med+Rx+Use	28.3%	25.6%	22.0%	79.5%	81.6%	82.2%
Ingenix ERG	Med+Rx	24.4%	20.0%	16.4%	83.8%	86.1%	86.8%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-7.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	98.3%	90.9%	96.2%	100.8%	99.1%	98.0%
CDPS	Diag	97.1%	81.3%	97.7%	93.5%	94.9%	91.1%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	93.5%	91.1%	97.5%	96.0%	92.5%	98.5%
DxCG RxGroups	Rx	95.2%	72.4%	95.7%	86.7%	84.0%	89.2%
Ingenix PRG	Rx	93.0%	73.2%	96.0%	86.3%	85.6%	87.4%
MedicaidRx	Rx	91.9%	74.0%	95.2%	78.8%	84.7%	88.1%
Impact Pro	Med+Rx+Use	99.3%	97.5%	98.3%	97.0%	101.6%	97.8%
Ingenix ERG	Med+Rx	97.3%	92.6%	99.4%	94.5%	81.5%	92.3%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-7.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	21.8%	42.5%	67.5%	100.0%	152.2%	265.0%	570.7%	8308.1%
CDPS	Diag	18.2%	38.4%	63.6%	96.8%	154.5%	275.1%	595.3%	9335.9%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	20.5%	41.7%	67.3%	100.1%	153.3%	263.6%	558.3%	7869.0%
DxCG RxGroups	Rx	18.2%	43.8%	72.8%	105.8%	155.0%	248.8%	516.9%	7914.0%
Ingenix PRG	Rx	19.2%	44.3%	72.6%	104.2%	152.9%	247.4%	523.9%	8301.4%
MedicaidRx	Rx	15.9%	40.1%	69.9%	107.0%	163.4%	261.9%	516.9%	7374.3%
Impact Pro	Med+Rx+Use	26.9%	48.3%	73.3%	103.9%	152.1%	241.4%	480.9%	6605.6%
Ingenix ERG	Med+Rx	18.0%	41.5%	71.1%	108.7%	163.6%	261.4%	509.2%	6171.7%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A-8. Recalibrated, Prospective, Nonlagged, with Prior Costs

TABLE A-8.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	24.2%	23.0%	20.2%	84.6%	86.2%	86.6%
CDPS	Diag	27.4%	24.6%	21.2%	83.7%	85.6%	86.3%
Clinical Risk Groups	Diag	21.5%	20.5%	18.4%	85.2%	86.6%	87.0%
DxCG DCG	Diag	29.7%	26.5%	22.9%	80.5%	82.5%	83.2%
DxCG RxGroups	Rx	30.6%	27.1%	23.4%	78.7%	80.7%	81.4%
Ingenix PRG	Rx	30.9%	27.4%	23.7%	78.9%	80.9%	81.5%
MedicaidRx	Rx	29.7%	26.3%	22.7%	79.9%	81.9%	82.6%
Impact Pro	Med+Rx+Use	29.3%	27.2%	24.0%	78.7%	80.6%	81.2%
Ingenix ERG	Med+Rx	30.0%	26.5%	22.8%	79.1%	81.2%	81.9%
ACG w/ Prior Cost	Diag+$Rx	27.7%	25.4%	22.1%	80.3%	82.1%	82.6%
DxCG UW Model	Diag+$Total	33.1%	29.1%	25.2%	76.1%	78.3%	78.9%
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	35.7%	32.1%	27.6%	73.0%	75.2%	75.6%

TABLE A-8.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	99.0%	91.0%	100.1%	105.6%	115.5%	99.2%
CDPS	Diag	93.2%	86.6%	99.7%	96.8%	96.4%	94.6%
Clinical Risk Groups	Diag	96.5%	110.2%	110.0%	115.8%	109.3%	101.8%
DxCG DCG	Diag	95.8%	90.2%	99.2%	96.2%	99.3%	100.3%
DxCG RxGroups	Rx	101.2%	79.6%	99.0%	97.0%	94.6%	96.8%
Ingenix PRG	Rx	97.9%	80.0%	98.4%	96.4%	93.5%	94.9%
MedicaidRx	Rx	97.9%	84.2%	98.7%	95.2%	96.3%	96.8%
Impact Pro	Med+Rx+Use	100.8%	99.9%	99.5%	98.6%	106.5%	100.0%
Ingenix ERG	Med+Rx	99.8%	92.6%	101.0%	97.8%	92.7%	97.2%
ACG w/ Prior Cost	Diag+$Rx	100.7%	101.0%	100.5%	102.5%	119.1%	100.1%
DxCG UW Model	Diag+$Total	99.1%	93.1%	100.7%	97.6%	107.3%	101.0%
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	104.4%	93.3%	102.6%	97.9%	96.1%	99.7%

TABLE A-8.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	27.1%	46.7%	69.6%	99.1%	146.5%	249.9%	544.2%	8433.1%
CDPS	Diag	24.2%	43.8%	67.8%	98.6%	150.4%	256.7%	546.1%	8537.4%
Clinical Risk Groups	Diag	28.4%	49.2%	73.0%	103.5%	150.4%	238.8%	488.7%	6808.8%
DxCG DCG	Diag	25.2%	45.6%	70.4%	101.1%	149.7%	248.5%	528.7%	7780.7%
DxCG RxGroups	Rx	24.9%	48.0%	75.0%	105.4%	151.3%	237.3%	482.6%	7177.5%
Ingenix PRG	Rx	25.0%	48.0%	74.5%	104.4%	150.6%	238.0%	489.1%	7426.9%
MedicaidRx	Rx	24.2%	46.4%	73.4%	106.2%	155.8%	243.8%	478.5%	6773.7%
Impact Pro	Med+Rx+Use	29.7%	50.6%	74.9%	103.6%	149.5%	235.0%	470.1%	6587.2%
Ingenix ERG	Med+Rx	24.3%	46.1%	73.6%	107.4%	156.4%	245.1%	482.0%	6226.3%
ACG w/ Prior Cost	Diag+$Rx	27.2%	51.7%	76.5%	102.1%	141.7%	230.3%	510.3%	8146.4%
DxCG UW Model	Diag+$Total	26.8%	50.9%	77.4%	107.6%	150.4%	229.0%	452.4%	6427.8%
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	29.5%	52.5%	78.0%	106.5%	145.4%	216.2%	411.9%	5592.5%

APPENDIX A-9. Recalibrated, Prospective, Lagged, without Prior Costs

TABLE A-9.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	16.8%	15.2%	12.8%	90.9%	92.8%	93.3%
CDPS	Diag	17.3%	14.5%	12.0%	93.1%	95.1%	95.7%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	20.3%	16.9%	13.9%	89.1%	91.2%	91.7%
DxCG RxGroups	Rx	22.7%	18.2%	14.9%	84.8%	87.2%	87.9%
Ingenix PRG	Rx	23.3%	18.9%	15.6%	85.3%	87.6%	88.2%
MedicaidRx	Rx	20.1%	15.8%	12.8%	87.8%	90.1%	90.7%
Impact Pro	Med+Rx+Use	24.9%	21.5%	18.2%	82.7%	84.9%	85.6%
Ingenix ERG	Med+Rx	21.6%	17.4%	14.3%	86.1%	88.4%	89.0%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-9.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	90.9%	82.3%	89.8%	89.7%	104.1%	89.5%
CDPS	Diag	88.9%	73.4%	94.7%	83.9%	95.1%	84.3%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	87.2%	81.0%	92.2%	84.7%	91.7%	90.8%
DxCG RxGroups	Rx	91.1%	68.1%	94.5%	81.5%	79.9%	85.2%
Ingenix PRG	Rx	89.6%	70.2%	94.5%	81.8%	81.6%	84.4%
MedicaidRx	Rx	89.0%	69.4%	93.2%	74.4%	79.3%	84.3%
Impact Pro	Med+Rx+Use	96.3%	85.0%	98.2%	90.3%	97.1%	92.6%
Ingenix ERG	Med+Rx	94.7%	82.4%	98.0%	87.6%	81.8%	88.6%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-9.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	18.4%	38.0%	62.2%	94.7%	152.7%	277.0%	625.3%	10186.8%
CDPS	Diag	15.8%	35.4%	59.9%	93.0%	154.5%	283.8%	639.3%	10974.9%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	16.9%	37.4%	62.6%	95.7%	153.5%	274.9%	619.0%	10000.0%
DxCG RxGroups	Rx	16.3%	41.6%	70.5%	104.5%	155.7%	253.7%	539.2%	8725.9%
Ingenix PRG	Rx	17.3%	42.1%	70.2%	102.9%	153.8%	253.1%	548.1%	9089.1%
MedicaidRx	Rx	14.3%	38.1%	67.3%	104.8%	162.7%	266.2%	546.3%	8485.7%
Impact Pro	Med+Rx+Use	22.0%	44.8%	71.1%	103.6%	155.3%	250.4%	515.6%	7683.3%
Ingenix ERG	Med+Rx	16.0%	39.1%	68.4%	106.3%	163.9%	266.3%	536.7%	7392.6%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A-10. Recalibrated, Prospective, Lagged, with Prior Costs

TABLE A-10.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	18.0%	16.6%	14.3%	89.6%	91.2%	91.6%
CDPS	Diag	21.0%	17.9%	15.1%	89.3%	91.2%	91.7%
Clinical Risk Groups	Diag	17.3%	15.6%	13.6%	89.0%	90.6%	91.0%
DxCG DCG	Diag	23.0%	19.5%	16.4%	86.4%	88.3%	88.9%
DxCG RxGroups	Rx	25.3%	21.1%	17.7%	82.7%	84.9%	85.5%
Ingenix PRG	Rx	25.9%	21.7%	18.2%	82.9%	85.1%	85.6%
MedicaidRx	Rx	24.1%	19.9%	16.7%	84.5%	86.6%	87.1%
Impact Pro	Med+Rx+Use	25.4%	22.1%	18.9%	82.2%	84.2%	84.8%
Ingenix ERG	Med+Rx	24.5%	20.4%	17.1%	83.6%	85.8%	86.4%
ACG w/ Prior Cost	Diag+$Rx	23.0%	20.1%	17.0%	84.3%	86.2%	86.7%
DxCG UW Model	Diag+$Total	26.5%	22.0%	18.4%	82.0%	84.0%	84.6%
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	28.3%	24.1%	20.1%	79.7%	81.6%	81.5%

TABLE A-10.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	91.1%	81.8%	91.9%	92.2%	114.8%	90.2%
CDPS	Diag	86.7%	76.0%	95.8%	86.1%	100.3%	86.8%
Clinical Risk Groups	Diag	86.8%	95.5%	102.6%	100.9%	110.7%	93.2%
DxCG DCG	Diag	89.7%	80.2%	93.4%	85.4%	99.0%	92.8%
DxCG RxGroups	Rx	95.2%	72.8%	96.4%	87.7%	89.8%	89.8%
Ingenix PRG	Rx	93.2%	74.5%	96.3%	88.0%	86.6%	88.5%
MedicaidRx	Rx	92.5%	76.6%	95.6%	84.6%	89.9%	89.8%
Impact Pro	Med+Rx+Use	96.3%	85.2%	98.5%	91.3%	104.9%	94.4%
Ingenix ERG	Med+Rx	95.3%	81.5%	98.9%	89.7%	89.8%	91.5%
ACG w/ Prior Cost	Diag+$Rx	94.0%	91.4%	93.6%	90.7%	117.8%	92.1%
DxCG UW Model	Diag+$Total	92.7%	81.3%	95.6%	86.8%	104.4%	93.0%
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	95.6%	80.6%	97.9%	88.2%	96.0%	89.4%

TABLE A-10.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	20.9%	40.3%	63.6%	94.6%	149.5%	268.4%	611.4%	10234.1%
CDPS	Diag	18.9%	38.6%	62.9%	94.8%	152.6%	272.8%	607.6%	10339.0%
Clinical Risk Groups	Diag	22.5%	43.1%	66.9%	99.1%	152.0%	256.2%	560.1%	8816.9%
DxCG DCG	Diag	19.4%	40.0%	65.1%	97.2%	152.2%	265.6%	593.1%	9708.7%
DxCG RxGroups	Rx	19.5%	43.8%	72.0%	104.7%	154.2%	248.1%	522.0%	8314.8%
Ingenix PRG	Rx	20.0%	44.1%	71.7%	103.6%	153.0%	247.8%	526.5%	8542.2%
MedicaidRx	Rx	18.5%	41.6%	69.9%	105.1%	159.2%	256.3%	520.7%	8035.0%
Impact Pro	Med+Rx+Use	23.3%	46.1%	72.1%	103.4%	153.7%	246.8%	508.8%	7657.8%
Ingenix ERG	Med+Rx	19.0%	41.5%	70.0%	105.8%	160.0%	257.6%	523.0%	7385.3%
ACG w/ Prior Cost	Diag+$Rx	21.3%	46.3%	72.1%	99.4%	145.3%	244.3%	559.0%	9615.7%
DxCG UW Model	Diag+$Total	20.5%	44.3%	70.9%	102.9%	153.0%	249.8%	530.6%	8445.6%
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	21.5%	46.9%	73.6%	104.5%	148.7%	225.6%	443.2%	6853.3%

APPENDIX A-11. Recalibrated, Concurrent, Nonlagged, without Prior Costs

TABLE A-11.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	32.3%	31.5%	28.7%	75.2%	76.6%	77.0%
CDPS	Diag	38.3%	36.8%	35.2%	78.0%	79.6%	80.1%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	58.0%	54.5%	51.0%	61.3%	63.4%	64.1%
DxCG RxGroups	Rx	41.8%	36.9%	32.8%	70.0%	72.4%	73.0%
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	36.1%	31.0%	27.3%	75.7%	78.0%	78.5%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	48.1%	43.3%	39.5%	65.3%	68.0%	68.9%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-11.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	103.2%	102.5%	88.8%	91.3%	41.0%	100.6%
CDPS	Diag	104.7%	76.5%	87.1%	83.8%	80.1%	80.2%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	92.9%	98.4%	93.0%	95.8%	83.3%	94.7%
DxCG RxGroups	Rx	85.8%	79.7%	89.4%	75.2%	67.6%	79.6%
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	85.8%	75.9%	90.1%	65.0%	73.2%	79.9%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	92.5%	96.6%	93.7%	89.8%	74.8%	85.2%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-11.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	55.9%	80.6%	92.7%	99.3%	109.7%	128.3%	139.5%	129.2%
CDPS	Diag	51.6%	66.5%	76.4%	86.9%	104.6%	137.8%	185.1%	267.2%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	65.3%	79.4%	87.0%	94.6%	105.7%	125.4%	141.9%	157.6%
DxCG RxGroups	Rx	51.9%	77.8%	90.6%	98.9%	106.9%	120.3%	140.2%	197.6%
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	44.1%	71.7%	88.6%	102.1%	115.4%	128.3%	136.4%	161.3%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	54.7%	76.0%	88.6%	100.6%	113.1%	127.3%	136.1%	135.9%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A-12. Recalibrated, Concurrent, Lagged, without Prior Costs

TABLE A-12.1 R-Squared and MAPE % by Truncation Level

		R-Squared			MAPE%		
Risk Adjuster Tool	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
ACG	Diag	24.6%	24.2%	23.1%	81.3%	81.7%	81.8%
CDPS	Diag	32.3%	30.2%	29.3%	84.8%	85.5%	85.6%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	51.5%	47.4%	45.5%	67.7%	68.8%	68.9%
DxCG RxGroups	Rx	35.0%	31.1%	29.5%	76.1%	77.1%	77.2%
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	29.5%	25.9%	24.5%	81.2%	82.0%	82.1%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	40.6%	36.5%	34.8%	70.9%	72.0%	72.2%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**100K**	**250K**	**None**	**100K**	**250K**	**None**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-12.2 Predictive Ratios by Medical Condition in 2003 (250K Truncation)

Risk Adjuster Tool	Inputs	Asthma	Breast Cancer	Diabetes	Heart Disease	HIV	Mental Illness
ACG	Diag	109.8%	111.8%	91.2%	93.8%	45.6%	104.3%
CDPS	Diag	105.1%	78.7%	87.1%	83.2%	70.8%	78.3%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	93.3%	103.2%	94.3%	96.8%	75.2%	96.1%
DxCG RxGroups	Rx	83.6%	76.7%	88.4%	73.8%	61.8%	78.3%
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	86.5%	74.3%	90.5%	65.8%	64.6%	80.3%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	92.9%	99.3%	94.6%	89.8%	67.6%	85.3%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**Asthma**	**Breast Cancer**	**Diabetes**	**Heart Disease**	**HIV**	**Mental Illness**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A

TABLE A-12.3 Predictive Ratios by 2003 Cost Quintile (250K Truncation)

Risk Adjuster Tool	Inputs	99-100	96-99	90-96	80-90	60-80	40-60	20-40	0-20
ACG	Diag	62.9%	83.3%	92.8%	98.3%	105.9%	121.7%	131.9%	119.5%
CDPS	Diag	53.8%	66.9%	74.2%	83.2%	100.7%	132.9%	185.5%	281.6%
Clinical Risk Groups	Diag	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG DCG	Diag	67.7%	80.6%	86.4%	93.2%	103.4%	121.6%	138.5%	155.1%
DxCG RxGroups	Rx	55.2%	78.8%	88.4%	95.7%	103.2%	116.8%	139.3%	198.5%
Ingenix PRG	Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MedicaidRx	Rx	48.8%	74.5%	87.9%	99.9%	111.0%	122.2%	130.3%	154.7%
Impact Pro	Med+Rx+Use	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ingenix ERG	Med+Rx	58.4%	77.8%	88.0%	99.2%	110.8%	122.4%	129.0%	125.0%
ACG w/ Prior Cost	Diag+$Rx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DxCG UW Model	Diag+$Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service Vendor	**Inputs**	**99-100**	**96-99**	**90-96**	**80-90**	**60-80**	**40-60**	**20-40**	**0-20**
MEDai	All	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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