**National Quality Forum—Evidence (subcriterion 1a)**

**Measure Number** (*if previously endorsed*)**:** NQF #2634

**Measure Title**: Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Change in Mobility Score for Medical Rehabilitation Patients

**IF the measure is a component in a composite performance measure, provide the title of the Composite Measure here:** Not applicable

**Date of Submission**: 4/9/2019

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| **Instructions**  *Complete 1a.1 and 1a.2 for all measures. If instrument-based measure, complete 1a.3.*  *Complete* ***EITHER 1a.2, 1a.3 or 1a.4*** *as applicable for the type of measure and evidence.*  *For composite performance measures:*  *A separate evidence form is required for each component measure unless several components were studied together.*  *If a component measure is submitted as an individual performance measure, attach the evidence form to the individual measure submission.*   * All information needed to demonstrate meeting the evidence subcriterion (1a) must be in this form. An appendix of *supplemental* materials may be submitted, but there is no guarantee it will be reviewed. * If you are unable to check a box, please highlight or shade the box for your response. * Contact NQF staff regarding questions. Check for resources at [Submitting Standards webpage](http://www.qualityforum.org/Measuring_Performance/Submitting_Standards.aspx). |

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| **Note: The information provided in this form is intended to aid the Standing Committee and other stakeholders in understanding to what degree the evidence for this measure meets NQF’s evaluation criteria.**   1a. Evidence to Support the Measure Focus The measure focus is evidence-based, demonstrated as follows:   * Outcome: [**3**](#Note3) Empirical data demonstrate a relationship between the outcome and at least one healthcare structure, process, intervention, or service. If not available, wide variation in performance can be used as evidence, assuming the data are from a robust number of providers and results are not subject to systematic bias. * Intermediate clinical outcome: a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence [**4**](#Note4)that the measured intermediate clinical outcome leads to a desired health outcome. * Process: [**5**](#Note5) a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence [**4**](#Note4) that the measured process leads to a desired health outcome. * Structure: a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence [**4**](#Note4) that the measured structure leads to a desired health outcome. * Efficiency: [**6**](#Note6) evidence not required for the resource use component. * For measures derived from patient reports, evidence should demonstrate that the target population values the measured outcome, process, or structure and finds it meaningful. * Process measures incorporating Appropriate Use Criteria: See NQF’s guidance for evidence for measures, in general; guidance for measures specifically based on clinical practice guidelines apply as well.   **Notes**  **3.** Generally, rare event outcomes do not provide adequate information for improvement or discrimination; however, serious reportable events that are compared to zero are appropriate outcomes for public reporting and quality improvement.  **4.** The preferred systems for grading the evidence are the Grading of Recommendations, Assessment, Development and Evaluation [(GRADE) guidelines](http://www.gradeworkinggroup.org) and/or modified GRADE.  **5.** Clinical care processes typically include multiple steps: assess → identify problem/potential problem → choose/plan intervention (with patient input) → provide intervention → evaluate impact on health status. If the measure focus is one step in such a multistep process, the step with the strongest evidence for the link to the desired outcome should be selected as the focus of measurement. Note: A measure focused only on collecting PROM data is not a PRO-PM.  **6.** Measures of efficiency combine the concepts of resource use and quality (see NQF’s [Measurement Framework: Evaluating Efficiency Across Episodes of Care](http://www.qualityforum.org/Publications/2010/01/Measurement_Framework__Evaluating_Efficiency_Across_Patient-Focused_Episodes_of_Care.aspx); [AQA Principles of Efficiency Measures](http://www.aqaalliance.org/files/PrinciplesofEfficiencyMeasurementApril2006.doc)). |

**1a.1.This is a measure of**: (*should be consistent with type of measure entered in De.1*)

Outcome

Outcome: Change in Function: Mobility

Patient-reported outcome (PRO): Click here to name the PRO

*PROs include HRQoL/functional status, symptom/symptom burden, experience with care, health-related behaviors.* (*A PRO-based performance measure is not a survey instrument. Data may be collected using a survey instrument to construct a PRO measure.)*

Intermediate clinical outcome (*e.g., lab value*): Click here to name the intermediate outcome

Process: Click here to name what is being measured

Appropriate use measure: Click here to name what is being measured

Structure: Click here to name the structure

Composite: Click here to name what is being measured

**1a.2** **LOGIC MODEL** Diagram or briefly describe the steps between the healthcare structures and processes (e.g., interventions, or services) and the patient’s health outcome(s). The relationships in the diagram should be easily understood by general, non-technical audiences. Indicate the structure, process or outcome being measured.

Inpatient Rehabilitation Facilities (IRFs) are designed to provide intensive rehabilitation services to patients. Patients seeking care in IRFs are those whose illness, injury, or condition has resulted in a loss of function, and for whom rehabilitative care is expected to help regain that function. Examples of conditions treated in IRFs include stroke, spinal cord injury, hip fracture, brain injury, neurological disorders, and other diagnoses characterized by loss of function. During an IRF stay, goals of treatment include fostering the patient’s ability to manage his or her daily activities so that the patient can complete self-care and mobility activities as independently as possible and, if feasible, return to a safe, active, and productive life in a community-based setting.

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Key rehabilitation services provided to patients in an IRF include physiatry care, (i.e., physical medicine and rehabilitation physician), physical therapy, occupational therapy, rehabilitation nursing, speech-language pathology, and prosthetic and orthotic services (Medicare Payment Advisory Commission, 2019). Figure 1a lists the structures, processes and the outcomes that relate to this measure. This model shows that an IRF’s structures and processes (treatments or interventions) can result in improved patient functioning.

Figure 1a Structures and Processes Associated with Patients’ Functional Outcomes.



**From previous NQF Submission (2014)**

Given that the primary goal of rehabilitation is improvement in function, IRF clinicians have traditionally assessed and documented patients’ functional status at admission and discharge to evaluate the effectiveness of the rehabilitation care provided to individual patients, as well as the effectiveness of the IRF overall (see Figure 1).

**Figure 1. Role of Patient Assessment, Interventions and Functional Outcomes**

The diagram presents the role of assessing patients’ functional status, the processes that following including interventions and services and the resulting outcome in function. This figure shows the sequential steps in the relationship between assessing and documenting patients’ function status at admission and discharge to evaluate the effectiveness of the rehabilitation care provided. After the patient is assessed on admission, a care plan and treatment goals are established by the IRF and the treatment, including rehabilitation care and therapy is implemented. The patient is again assessed on discharge and the admission and discharge function status assessments are used to determine functional outcomes. This model shows that an IRF’s processes (treatments or interventions) can result in improved patient functioning.

**1a.3** **Value and Meaningfulness:**  **IF** this measure is derived from patient report, provide evidence that the target population values the measured ***outcome, process, or structure*** and finds it meaningful. (Describe how and from whom their input was obtained.)

**\*\*RESPOND TO ONLY ONE SECTION BELOW -EITHER 1a.2, 1a.3 or 1a.4) \*\***

**1a.2** **FOR OUTCOME MEASURES including PATIENT REPORTED OUTCOMES - Provide empirical data demonstrating the relationship between the outcome (or PRO) to at least one healthcare structure, process, intervention, or service.**

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To demonstrate that IRFs have the ability to improve patient functioning, including mobility abilities, NQF requires evidence that at least one structure, process, intervention or service can affect patient functioning. Because intensive, interdisciplinary therapy services are a core feature of an IRF stay and these services are targeted to improve functional outcomes, we provide a summary of evidence from the literature that is focused on therapy services and functional outcomes.

For this evidence update, we conducted a scoping review to identify relevant literature examining the relation between therapy interventions and improved patient functioning. We describe the details about the scoping review methodology below, after the literature summary and abstracts. However, we would like to note upfront that the summary below only includes articles published after January 1, 2013 since we sought to identify relevant literature since our 2014 NQF submission.

**Therapy Interventions and Functional Outcomes**

Most IRF research examining functional outcomes has focused on motor function, which encompasses self-care and mobility and sometimes bladder function. Several observational studies have reported positive associations between the amount of therapy provided and motor function for patients with various diagnoses, including spinal cord injury (Backus et al., 2013), stroke (Wang et al., 2013; Goedert, Zhang & Barrett, 2015), traumatic brain injury (Rosenbaum Gordon, Joannou, & Berman, 2018), hip fracture (Siebens et al., 2013); and after West Nile Virus (Hoffman & Paschal, 2013). One additional study, that was not diagnosis specific, also found improved functional outcomes related to rehabilitation therapy intensity (Morghen et al., 2017). Backus found that more time in inpatient physical therapy (PT) was associated with higher motor function 1-year post-discharge, while Wang reported a significant relationship between daily therapeutic duration and functional gain during an IRF stay and offered treatment time thresholds for optimal functional outcomes for patients with stroke.

Two additional observational studies examined the influence of age as a mediator on the amount of therapy provided and patients’ functional outcomes. One study found that older adults (65 and older) with a traumatic brain injury received fewer hours of treatment per day and fewer total hours of therapy due to a shorter length of stay, and these patients overall regained less function, compared to younger IRF patients (Djikers et al., 2013). Hsieh et. al, (2013) found that older adults (60 and older) with a spinal cord injury received less rehabilitation therapy during longer rehabilitation stays, and had lower functional abilities compared to younger patients.

Several observational studies reported that IRF care improved patients’ motor functional outcomes but did not specify the type and amount of therapy provided. Improvement in motor functional outcomes were reported for patients recovering from trauma (Hamidi et al., 2018), patients 85 and older post-stroke (O’Brien & Xue, 2016), post-knee surgery patients (Chu et al., 2016), and post-hip fracture patients (Cary, Baernholdt, Anderson, & Merwin, 2015). Hamidi et al. (2018) also explored the relationship between frailty level and functional improvement among IRF patients, finding that frailer patients were less likely to regain their baseline functional ability.

Studies examining specific rehabilitation therapy interventions and patients’ functional outcomes has generally been challenging to examine (Kroll & Fisher, 2018), because rehabilitation interventions tend to be multidisciplinary, tailored to each patient’s specific needs and there are no standardized definitions and no standardized measurement of interventions. Efforts are underway to classify interventions using standardized terminology in order to better understand the relation between interventions and outcomes; that is, the active ingredients of a rehabilitation program. Winstein (2016) noted that measuring the effect of rehabilitation interventions in post-acute rehabilitation settings is important for understanding “the amount of adequate resources, dose and duration,” that are needed to affect functional improvement.

We identified two IRF studies that examined the effect of novel therapy interventions that were added to “usual” therapy. Herron (2016) found that occupational therapists conducting initial visual assessments of stroke patients resulted in better patient functional outcomes. Another study found that adding attention-control training for stroke patients improved motor outcomes compared to control participants over a 6-month period (Skidmore et al., 2015).

Four studies were identified that investigated therapy interventions and mobility outcomes among IRF patients. Hornby et al. (2015) examined the feasibility of increased focused stepping to improve poststroke patient mobility outcomes, including a 6-minute walking test and a measure of balance; findings showed patient functional gains on walking and balance tests. Taylor et al. (2018) explored how complementary therapies using during rehabilitation may improve outcomes. Complementary interventions included occupational therapists (OTs) and physician therapist (PTs) for yoga, Pilates, thai chi, aromatherapy, relaxation techniques and other. Only three percent of rehabilitation patients received alternate therapies; the amount of time patients received the therapies was associated with reduced pain but changes in mobility outcomes were reported. Rice (2016) found that an evidenced-based, structured education program led to improvement to the quality of transfers for participants who perform assisted or dependent transfers.

Rehabilitation therapy services are provided in all types of post-acute care services: IRFs, skilled nursing facilities, home health and long-term care hospitals. IRFs have historically provided the most intensive therapy services, and several studies have compared patients’ functional outcomes by type of post-acute care setting to better understand the role of therapy intensity and other IRF-specific care. Three studies reported improved motor functional outcomes for IRF patients compared to other post-acute care settings. Sauter (2013) found that patients who underwent major dysvascular lower limb amputations receipt of interdisciplinary rehabilitation services in an IRF yielded improved functional outcomes 6 months after amputation compared to care received in SNFs or at home. Nehra et al. (2016) reported improved motor function for post-trauma patients discharged to an IRF compared to those who were not treated in an IRF. A systematic review exploring poststroke outcomes in IRFs compared to SNFs, found that of four included studies that compared functional outcomes, one study reported higher functional ratings for SNFs compared to IRFs, three studies found functional gains were larger for IRF patients compared to patients treated in skilled nursing facilities (Alcusky, Ulbricht, & Lapane, 2018). One of the studies included in the systematic review. Chan et al. (2013) found that stroke patients who received therapy in an IRF had higher functional motor gains compared to patient treated in skilled nursing facilities and home health.

In addition to the studies that compare functional outcomes across post-acute care settings, we provide a summary of studies examining therapy services and functional outcomes in the SNF setting. These studies are pertinent, because there is overlap in the types of patients treated in IRFs and SNFs, and the amount of therapy provided in SNFs tends to vary more than in the IRF setting.

Positive associations of functional motor outcomes for patients receiving therapy in SNFs have been reported on several observation studies. One SNF study found that more than 60 percent of patients improved their functional status as a result of their SNF stay, and noted that patients with conditions such as cognitive impairment, delirium, dementia, heart failure, and stroke showed less improvement in daily activity performance during their stay. Likewise, among TBI patients, SNF patients admitted with cognitive or communication impairments gained function, but tended to have less improvement in motor function (Wysocki, Thomas, & Mor, 2015). Jung (2016) examined temporal trends in therapy provision in SNFs and found therapy hours increased 52% between 2000 and 2009, and that more therapy hours in SNFs appeared to improve outcomes, except for patients who were already receiving a level of therapy.

**Conclusion**

In summary, as required by NQF’s endorsement maintenance process, we sought to identify evidence linking a healthcare structure or process (interventions or services) to patient outcomes. For this review, we summarized various studies pertaining to the relation between therapy interventions and services and IRF patients’ functional outcomes. We also included peer-reviewed evidence from other post-acute care (PAC) settings. Most studies included motor function which encompasses self-care, mobility, and sometimes bladder functioning; three additional articles focused on mobility outcomes. Most articles were observational studies while two presented novel therapies being tested in addition to “usual” therapy. One article focused on rehabilitation guidelines for PAC settings. This review provides supportive evidence that functional improvement in IRF patients is related to the therapy interventions they received while in the IRF.

**References and Abstracts**

Alcusky, M., Ulbricht, C. M., & Lapane, K. L. (2018). Postacute Care Setting, Facility Characteristics, and Poststroke Outcomes: A Systematic Review. *Arch Phys Med Rehabil, 99*(6), 1124-1140.e1129. doi:10.1016/j.apmr.2017.09.005

OBJECTIVES: To synthesize research comparing poststroke health outcomes between patients rehabilitated in skilled nursing facilities (SNFs) and those in inpatient rehabilitation facilities (IRFs) as well as to evaluate relations between facility characteristics and outcomes. DATA SOURCES: PubMed and CINAHL searches spanned January 1, 1998, to October 6, 2016, and encompassed MeSH and free-text keywords for stroke, IRF/SNF, and study outcomes. Searches were restricted to peer-reviewed research in humans published in English. STUDY SELECTION: Observational and experimental studies examining outcomes of adult patients with stroke rehabilitated in an IRF or SNF were eligible. Studies had to provide site of care comparisons and/or analyses incorporating facility-level characteristics and had to report >/=1 primary outcome (discharge setting, functional status, readmission, quality of life, all-cause mortality). Unpublished, single-center, descriptive, and non-US studies were excluded. Articles were reviewed by 1 author, and when uncertain, discussion with study coauthors achieved consensus. Fourteen titles (0.3%) were included. DATA EXTRACTION: The types of data, time period, size, design, and primary outcomes were extracted. We also extracted 2 secondary outcomes (length of IRF/SNF stay, cost) when reported by included studies. Effect measures, modeling approaches, methods for confounding adjustment, and potential confounders were extracted. Data were abstracted by 1 author, and the accuracy was verified by a second reviewer. DATA SYNTHESIS: Two studies evaluating community discharge, 1 study evaluating the predicted probability of readmission, and 3 studies evaluating all-cause mortality favored IRFs over SNFs. Functional status comparisons were inconsistent. No studies evaluated quality of life. Two studies confirmed increased costs in the IRF versus SNF setting. Although substantial facility variation was described, few studies characterized sources of variation. CONCLUSIONS: The few studies comparing poststroke outcomes indicated better outcomes (with higher costs) for patients in IRFs versus those in SNFs. Contemporary research on the role of the postacute care setting and its attributes in determining health outcomes should be prioritized to inform reimbursement system reform.

Backus, D., Gassaway, J., Smout, R. J., Hsieh, C. H., Heinemann, A. W., DeJong, G., & Horn, S. D. (2013). Relation between inpatient and postdischarge services and outcomes 1 year postinjury in people with traumatic spinal cord injury. *Arch Phys Med Rehabil, 94*(4 Suppl), S165-174. doi:10.1016/j.apmr.2013.01.012

OBJECTIVE: To examine the association between inpatient and postdischarge rehabilitation services and function, life satisfaction, and community participation 1 year after spinal cord injury (SCI). DESIGN: Prospective, observational. SETTING: Six rehabilitation facilities. PARTICIPANTS: Patients with SCI (N=1376). INTERVENTIONS: None. MAIN OUTCOME MEASURES: Satisfaction with Life Scale (SWLS), Craig Handicap Assessment and Reporting Technique (CHART), motor FIM (mFIM), and return to work/school at 1 year post-SCI. RESULTS: Demographic and injury characteristics explained 49% of the variance in mFIM and 9% to 25% of the variance in SWLS and CHART social integration, mobility, and occupation scores. Inpatient rehabilitation services explained an additional 2% of the variance for mFIM and 1% to 3% of the variance for SWLS and CHART scores. More time in inpatient physical therapy (PT) was associated with higher mFIM scores; more time in inpatient therapeutic recreation (TR) and social work and more postdischarge nursing (NSG) were associated with lower mFIM scores. More inpatient PT and TR and more postdischarge PT were associated with higher mobility scores; more inpatient psychology (PSY) was associated with lower mobility scores. More postdischarge TR was associated with higher SWLS; more postdischarge PSY services was associated with lower SWLS. Inpatient TR was positively associated with social integration scores; postdischarge PSY was negatively associated with social integration scores. More postdischarge vocational counseling was associated with higher occupation scores. Differences between centers did not explain additional variability in the outcomes studied. CONCLUSIONS: Inpatient and postdischarge rehabilitation services are weakly associated with life satisfaction and societal participation 1 year after SCI. Further study of the type and intensity of postdischarge services, and the association with outcomes, is needed to ascertain the most effective use of therapy services after SCI.

Cary, M. P., Baernholdt, M., Anderson, R. A., & Merwin, E. I. (2015). Performance-based outcomes of inpatient rehabilitation facilities treating hip fracture patients in the United States. *Arch Phys Med Rehabil, 96*(5), 790-798. doi:10.1016/j.apmr.2015.01.003

OBJECTIVE: To examine the influence of facility and aggregate patient characteristics of inpatient rehabilitation facilities (IRFs) on performance-based rehabilitation outcomes in a national sample of IRFs treating Medicare beneficiaries with hip fracture. DESIGN: Secondary data analysis. SETTING: U.S. Medicare-certified IRFs (N=983). PARTICIPANTS: Data included patient records of Medicare beneficiaries (N=34,364) admitted in 2009 for rehabilitation after hip fracture. INTERVENTION: Not applicable. MAIN OUTCOME MEASURES: Performance-based outcomes included mean motor function on discharge, mean motor change (mean motor score on discharge minus mean motor score on admission), and percentage discharged to the community. RESULTS: Higher mean motor function on discharge was explained by aggregate characteristics of patients with hip fracture (lower age [P=.009], lower percentage of blacks [P<.001] and Hispanics [P<.001], higher percentage of women [P=.030], higher motor function on admission [P<.001], longer length of stay [P<.001]) and facility characteristics (freestanding [P<.001], rural [P<.001], for profit [P=.048], smaller IRFs [P=.014]). The findings were similar for motor change, but motor change was also associated with lower mean cognitive function on admission (P=.008). Higher percentage discharged to the community was associated with aggregate patient characteristics (lower age [P<.001], lower percentage of Hispanics [P=.009], higher percentage of patients living with others [P<.001], higher motor function on admission [P<.001]). No facility characteristics were associated with the percentage discharged to the community. CONCLUSIONS: Performance-based measurement offers health policymakers, administrators, clinicians, and consumers a major opportunity for securing health system improvement by benchmarking or comparing their outcomes with those of other similar facilities. These results might serve as the basis for benchmarking and quality-based reimbursement to IRFs for 1 impairment group: hip fracture.

Chan, L., Sandel, M. E., Jette, A. M., Appelman, J., Brandt, D. E., Cheng, P., . . . Rasch, E. K. (2013). Does postacute care site matter? A longitudinal study assessing functional recovery after a stroke. *Arch Phys Med Rehabil, 94*(4), 622-629. doi:10.1016/j.apmr.2012.09.033

OBJECTIVE: To determine the impact of postacute care site on stroke outcomes. DESIGN: Prospective cohort study. SETTING: Four northern California hospitals that are part of a single health maintenance organization. PARTICIPANTS: Patients with stroke (N=222) enrolled between February 2008 and July 2010. INTERVENTION: Not applicable. MAIN OUTCOME MEASURE: Baseline and 6-month assessments were performed using the Activity Measure for Post Acute Care (AM-PAC), a test of self-reported function in 3 domains: Basic Mobility, Daily Activities, and Applied Cognition. RESULTS: Of the 222 patients analyzed, 36% went home with no treatment, 22% received home health/outpatient care, 30% included an inpatient rehabilitation facility (IRF) in their care trajectory, and 13% included a skilled nursing facility (but not IRF) in their care trajectory. At 6 months, after controlling for important variables such as age, functional status at acute care discharge, and total hours of rehabilitation, patients who went to an IRF had functional scores that were at least 8 points higher (twice the minimally detectable change for the AM-PAC) than those who went to a skilled nursing facility in all 3 domains and in 2 of 3 functional domains compared with those who received home health/outpatient care. CONCLUSIONS: Patients with stroke may make more functional gains if their postacute care includes an IRF. This finding may have important implications as postacute care delivery is reshaped through health care reform.

Chu, S. K., Babu, A. N., McCormick, Z., Mathews, A., Toledo, S., & Oswald, M. (2016). Outcomes of Inpatient Rehabilitation in Patients With Simultaneous Bilateral Total Knee Arthroplasty. *Pm r, 8*(8), 761-766. doi:10.1016/j.pmrj.2015.11.005

BACKGROUND: The number of total knee arthroplasty (TKA) procedures performed in the United States is increasing each year, and the number of bilateral TKA procedures has also increased during the past 2 decades. However, few studies in the literature have investigated the rehabilitation outcomes of patients who undergo bilateral TKA. This study was performed to provide information on the benefits and role of inpatient rehabilitation for patients after bilateral TKA. OBJECTIVE: To investigate the functional outcomes, complications, and transfer rates of patients in the inpatient rehabilitation setting who undergo simultaneous bilateral TKA. DESIGN: Retrospective cohort study. SETTING: Freestanding inpatient rehabilitation hospital. PATIENTS: Ninety-four patients admitted to an inpatient rehabilitation hospital after simultaneous bilateral TKA from 2008-2013. METHODS: Retrospective chart review of demographic, clinical, and functional data for patients admitted to inpatient rehabilitation after simultaneous bilateral TKA. MAIN OUTCOME MEASURES: Length of stay, admission and discharge Functional Independence Measure (FIM), and FIM efficiency. RESULTS: The study included 27 male (28.7%) and 67 female (71.3%) patients aged 42.0-86.9 years, with a mean of 65.6 +/- 10.2 years. Mean length of time between surgery and admission to inpatient rehabilitation was 4.5 +/- 3.3 days. Mean length of stay in rehabilitation was 11.7 +/- 4.2 days. Mean admission and discharge FIM scores were 87.3 +/- 11.7 and 113.4 +/- 4.8, respectively, with a mean FIM gain of 26.1 +/- 10.5. The mean FIM efficiency was 2.33 +/- 0.84. Eight patients required transfer to an acute care hospital. Complications leading to transfer to acute care facilities included sepsis, cardiac arrhythmias, knee dislocation, and suspected small bowel obstruction. Eighty-eight patients were discharged home, 4 patients were discharged to skilled nursing facilities, and 2 patients were transferred to an acute care hospital and did not return to the inpatient rehabilitation hospital. CONCLUSIONS: After undergoing simultaneous bilateral TKA, patients demonstrate functional gains when admitted to inpatient rehabilitation facilities based on FIM gains and FIM efficiency scores; 8.5% of patients in this cohort required transfer to an acute care facility as a result of complications during inpatient rehabilitation, and 93.6% of patients were discharged home.

Dijkers, M., Brandstater, M., Horn, S., Ryser, D., & Barrett, R. (2013). Inpatient rehabilitation for traumatic brain injury: the influence of age on treatments and outcomes. *NeuroRehabilitation, 32*(2), 233-252. doi:10.3233/nre-130841

BACKGROUND: Elderly persons with traumatic brain injury (TBI) are increasingly admitted to inpatient rehabilitation, but we have limited knowledge of their characteristics, the treatments they receive, and their short-term and medium-term outcomes. This study explored these issues by means of comparisons between age groups. METHODS: Data on 1419 patients admitted to 9 inpatient rehabilitation facilities for initial rehabilitation after TBI were collected by means of (1) abstraction from medical records; (2) point-of care forms completed by therapists after each treatment session; and (3) interviews at 3 months and 9 months after discharge, conducted with the patient or a proxy. RESULTS: Elderly persons (65 or older) had a lower brain injury severity, and a shorter length of stay (LOS) in acute care. During rehabilitation, they received fewer hours of therapy, due to a shorter LOS and fewer hours of treatment per day, especially from psychology and therapeutic recreation. They regained less functional ability during and after inpatient rehabilitation, and had a very high mortality rate. CONCLUSIONS: Elderly people can be rehabilitated successfully, and discharged back to the community. The treatment therapists deliver, and issues surrounding high mortality need further research.

Goedert, K. M., Zhang, J. Y., & Barrett, A. M. (2015). Prism adaptation and spatial neglect: the need for dose-finding studies. *Front Hum Neurosci, 9*, 243. doi:10.3389/fnhum.2015.00243

Spatial neglect is a devastating disorder in 50-70% of right-brain stroke survivors, who have problems attending to, or making movements towards, left-sided stimuli, and experience a high risk of chronic dependence. Prism adaptation is a promising treatment for neglect that involves brief, daily visuo-motor training sessions while wearing optical prisms. Its benefits extend to functional behaviors such as dressing, with effects lasting 6 months or longer. Because one to two sessions of prism adaptation induce adaptive changes in both spatial-motor behavior (Fortis et al., 2011) and brain function (Saj et al., 2013), it is possible stroke patients may benefit from treatment periods shorter than the standard, intensive protocol of ten sessions over two weeks-a protocol that is impractical for either US inpatient or outpatient rehabilitation. Demonstrating the effectiveness of a lower dose will maximize the availability of neglect treatment. We present preliminary data suggesting that four to six sessions of prism treatment may induce a large treatment effect, maintained three to four weeks post-treatment. We call for a systematic, randomized clinical trial to establish the minimal effective dose suitable for stroke intervention.

Hamidi, M., Zeeshan, M., O'Keeffe, T., Nisbet, B., Northcutt, A., Nikolich-Zugich, J., . . . Joseph, B. (2018). Prospective evaluation of frailty and functional independence in older adult trauma patients. *Am J Surg, 216*(6), 1070-1075. doi:10.1016/j.amjsurg.2018.10.023

BACKGROUND: The aim of our study was to assess the association between frailty and functional status in geriatric trauma patients. METHODS: 3-year(2013-2015) prospective analysis and included all geriatric trauma patients(>/=65y) discharged to a single rehabilitation center from our level-I trauma center. Frailty was measured using Trauma-Specific-Frailty-Index(TSFI) while Functional status was assessed using functional-independence-measure(FIM) at admission and discharge from rehabilitation center. Multivariate linear regression analysis was performed. RESULTS: 267 patients were enrolled. Mean age was 76.9+/-7.1y, 63.6% were males. Overall, 22.8% were frail, and 37.4% were pre-frail. On linear regression, higher motor-FIM, higher cognitive-FIM scores at admission, and longer length-of-stay at rehab were independently associated with increased discharge FIM score. While, ISS(injury-severity-score), pre-frail and frail status were negatively correlated with FIM gain. CONCLUSION: Frail patients were less likely to recover to their baseline functional status compared with non-frail patients. Early focused intervention in frail elderly patients is warranted to improve functional status in this population.

Herron, S. (2016). Review of experience with a collaborative eye care clinic in inpatient stroke rehabilitation. *Top Stroke Rehabil, 23*(1), 67-75. doi:10.1179/1074935715z.00000000065

BACKGROUND: Visual deficits following stroke are frequently subtle and are often overlooked. Even though these visual deficits may be less overt in nature, they are still debilitating to survivors. Visual deficits have been shown to negatively impact cognition, mobility, and activities of daily living (ADL). There is little consistency across healthcare facilities regarding protocol for assessing vision following stroke. OBJECTIVE: This research was designed to describe a profile for patients exhibiting visual deficits following stroke, examine the role of occupational therapists in vision assessment, and discuss a potential model to provide a protocol for collaboration with an eye care professional as part of the rehabilitation team. METHODS: The sample consisted of 131 patients in an inpatient rehabilitation (IPR) unit who were identified as having potential visual deficits. Occupational therapists on an IPR unit administered initial vision screenings and these patients were subsequently evaluated by the consulting optometrist. Frequencies were calculated for the appearance of functional symptoms, diagnoses, and recommendations. Correlations were also computed relating diagnoses and recommendations made. RESULTS: All patients referred by the occupational therapist for optometrist evaluation had at least one visual diagnosis. The most frequent visual diagnoses included: saccades (77.7%), pursuits (61.8%), and convergence (63.4%). There was also a positive correlation between number of functional symptoms seen by occupational therapists and visual diagnoses made by the optometrist (r = 0.209, P = 0.016). CONCLUSION: Results of this study support the need for vision assessment following stroke in IPR, confirm the role of occupational therapists in vision assessment, and support the need for an optometrist as a member of the rehabilitation team.

Hoffman, J. E., & Paschal, K. A. (2013). Functional outcomes of adult patients with West Nile virus admitted to a rehabilitation hospital. *J Geriatr Phys Ther, 36*(2), 55-62. doi:10.1519/JPT.0b013e318258bcba

BACKGROUND AND PURPOSE: The clinical manifestation of West Nile Virus (WNV) varies in individuals from mild flu-like symptoms to acute flaccid paralysis. Advanced age is the most significant risk factor for developing severe neurological disease and for death. The broad range of neurologic symptoms associated with WNV infection leads to varied body structure and function limitations and participation restrictions that may require rehabilitation. The purpose of this study is to describe the functional impairments upon admission and the functional outcomes at discharge of 48 adult patients admitted with WNV to a rehabilitation facility in the Midwest from 2002 to 2009. METHODS: A retrospective chart review was completed on 48 patients (29 male, 19 female) with mean age 67.8 (SD = 16.6, range = 24-91) years and median age 72.5 years, admitted to inpatient rehabilitation with a diagnosis of WNV after January 1, 2002, and discharged prior to December 31, 2009. General information (sex, age, social history, employment, and living environment), past medical history, and information specific to the current hospitalization (medical conditions, functional status and activity level on admission and discharge as measured by the Functional Independence Measure [FIM], lengths of stay [LOSs] in the acute care and rehabilitation hospital, physical therapy care, discharge destination, and follow-up care provisions) were gathered. The standardized response mean (SRM) was calculated for total, motor, and cognitive FIM scores to provide insight into the effect size and the responsiveness of the FIM for the patients with WNV in this study. RESULTS: All patients were admitted to the rehabilitation hospital from acute care hospitals following LOSs ranging from 1 to 62 days. The rehabilitation hospital LOS ranged from 2 to 304 days. These patients had significant comorbidities including hypertension (43.75%), diabetes mellitus (41.67%), acute respiratory failure (37.5%), ventilator dependency/tracheostomy (33.33%), and pneumonia (29.17%). Their admission FIM scores ranged from 13 to 116 (mean = 45.8 +/- 28.2) and discharge FIM scores ranged from 18 to 121 (mean = 75.1 +/- 34.2). The change in FIM during inpatient rehabilitation was statistically significant (P < .001). The calculated SRM for the total (1.06) and motor (1.12) FIM indicate a large effect size, whereas the SRM for the cognitive FIM (0.79) indicates a moderate effect. The majority of patients were discharged home or to a nursing facility (46%), skilled or extended care (38%) with a need for continued rehabilitation services. DISCUSSION AND CONCLUSIONS: The manifestation of the WNV and functional outcomes after comprehensive rehabilitation vary from patient to patient. Higher numbers of comorbid conditions lead to more complex presentation and challenge rehabilitation professionals to design individualized plans of care to enable these patients to achieve the highest functional outcomes. Most patients require follow-up physical therapy care after discharge from rehabilitation

Hornby, T. G., Holleran, C. L., Leddy, A. L., Hennessy, P., Leech, K. A., Connolly, M., . . . Roth, E. (2015). Feasibility of Focused Stepping Practice During Inpatient Rehabilitation Poststroke and Potential Contributions to Mobility Outcomes. *Neurorehabil Neural Repair, 29*(10), 923-932. doi:10.1177/1545968315572390

BACKGROUND: Optimal physical therapy strategies to maximize locomotor function in patients early poststroke are not well established. Emerging data indicate that substantial amounts of task-specific stepping practice may improve locomotor function, although stepping practice provided during inpatient rehabilitation is limited (<300 steps/session). OBJECTIVE: The purpose of this investigation was to determine the feasibility of providing focused stepping training to patients early poststroke and its potential association with walking and other mobility outcomes. METHODS: Daily stepping was recorded on 201 patients <6 months poststroke (80% < 1 month) during inpatient rehabilitation following implementation of a focused training program to maximize stepping practice during clinical physical therapy sessions. Primary outcomes included distance and physical assistance required during a 6-minute walk test (6MWT) and balance using the Berg Balance Scale (BBS). Retrospective data analysis included multiple regression techniques to evaluate the contributions of demographics, training activities, and baseline motor function to primary outcomes at discharge. RESULTS: Median stepping activity recorded from patients was 1516 steps/d, which is 5 to 6 times greater than that typically observed. The number of steps per day was positively correlated with both discharge 6MWT and BBS and improvements from baseline (changes; r = 0.40-0.87), independently contributing 10% to 31% of the total variance. Stepping activity also predicted level of assistance at discharge and discharge location (home vs other facility). CONCLUSION: Providing focused, repeated stepping training was feasible early poststroke during inpatient rehabilitation and was related to mobility outcomes. Further research is required to evaluate the effectiveness of these training strategies on short- or long-term mobility outcomes as compared with conventional interventions.

Hsieh, C. H., DeJong, G., Groah, S., Ballard, P. H., Horn, S. D., & Tian, W. (2013). Comparing rehabilitation services and outcomes between older and younger people with spinal cord injury. *Arch Phys Med Rehabil, 94*(4 Suppl), S175-186. doi:10.1016/j.apmr.2012.10.038

OBJECTIVE: To compare patient and injury characteristics, rehabilitation services, and outcomes between people incurring traumatic spinal cord injury (SCI) at younger and older ages. DESIGN: Multisite prospective observational cohort study. SETTING: Six acute rehabilitation facilities. PARTICIPANTS: Patients (N=866) aged >/= 16 years admitted to participating centers for their initial rehabilitation after SCI. INTERVENTIONS: Not applicable. MAIN OUTCOME MEASURES: Motor FIM scores at discharge and 1-year postinjury, discharge location, and postacute clinical pathways. RESULTS: Patients were divided into 4 age-at-injury groups: 16 to 29, 30 to 44, 45 to 60, and >60 years of age. Older adults (>60 y) incurring SCI were more likely to be married, retired/unemployed, on Medicare, and to have attained more education. Their injuries mostly resulted from falls and were incomplete in nature. The oldest group had the highest severity of illness, lowest admission and discharge motor FIM scores, and longer rehabilitation stay. They received relatively less rehabilitation than younger groups. They spent proportionately more time in occupational therapy working on preparatory activities and less time on self-care activities during inpatient rehabilitation. In the aged >60 years group, 80% went home at discharge; 17.2% were discharged to a nursing home. Younger groups were less likely to go to a nursing home. Admission motor FIM was the most significant predictor of motor FIM at discharge and 1-year anniversary across age groups. But the age groups differed significantly in patient and treatment factors that explained their respective outcomes. CONCLUSIONS: Older injured individuals experienced a different clinical pathway from younger patients. The present study suggests the need for development of a rehabilitation program tailored specifically to older adults.

Kroll, C., & Fisher, T. (2018). Justifying Rehabilitation Intensity Through Functional Performance Measures in Postacute Care. *Am J Occup Ther, 72*(1), 7201090010p7201090011-7201090010p7201090016. doi:10.5014/ajot.2018.721002

The Centers for Medicare and Medicaid Services (CMS) has scrutinized the provision of rehabilitation services in skilled nursing facilities (SNFs) for some time. Little research guidance exists on appropriate dosage or rehabilitation intensity (RI) among SNF patients or patients in other postacute care (PAC) settings. CMS developed a PAC assessment, the Continuity Assessment Record and Evaluation (CARE) Tool, in response to questions about what issues drive placement in various PAC settings under Medicare. The ability to adequately assess functional outcomes and correlate them to the RI provided by using the CARE Tool is promising. However, further research, policy advocacy, and practice analysis must be undertaken to promote and protect adequate access to occupational therapy and physical therapy in SNFs and other PAC settings. Individual practitioners must participate in data gathering to ensure that the data for analysis are fully informed by the occupational therapy perspective.

Morghen, S., Morandi, A., Guccione, A. A., Bozzini, M., Guerini, F., Gatti, R., . . . Bellelli, G. (2017). The association between patient participation and functional gain following inpatient rehabilitation. *Aging Clin Exp Res, 29*(4), 729-736. doi:10.1007/s40520-016-0625-3

OBJECTIVES: To evaluate patients' participation during physical therapy sessions as assessed with the Pittsburgh rehabilitation participation scale (PRPS) as a possible predictor of functional gain after rehabilitation training. METHODS: All patients aged 65 years or older consecutively admitted to a Department of Rehabilitation and Aged Care (DRAC) were evaluated on admission regarding their health, nutritional, functional and cognitive status. Functional status was assessed with the functional independence measure (FIM) on admission and at discharge. Participation during rehabilitation sessions was measured with the PRPS. Functional gain was evaluated using the Montebello rehabilitation factor score (MRFS efficacy), and patients stratified in two groups according to their level of functional gain and their sociodemographic, clinical and functional characteristics were compared. Predictors of poor functional gain were evaluated using a multivariable logistic regression model adjusted for confounding factors. RESULT: A total of 556 subjects were included in this study. Patients with poor functional gain at discharge demonstrated lower participation during physical therapy sessions were significantly older, more cognitively and functionally impaired on admission, more depressed, more comorbid, and more frequently admitted for cardiac disease or immobility syndrome than their counterparts. There was a significant linear association between PRPS scores and MRFS efficacy. In a multivariable logistic regression model, participation was independently associated with functional gain at discharge (odds ratio 1.51, 95 % confidence interval 1.19-1.91). CONCLUSION: This study showed that participation during physical therapy affects the extent of functional gain at discharge in a large population of older patients with multiple diseases receiving in-hospital rehabilitation.

Nehra, D., Nixon, Z. A., Lengenfelder, C., Bulger, E. M., Cuschieri, J., Maier, R. V., & Arbabi, S. (2016). Acute Rehabilitation after Trauma: Does it Really Matter? *J Am Coll Surg, 223*(6), 755-763. doi:10.1016/j.jamcollsurg.2016.09.001

BACKGROUND: The impact of post-discharge rehabilitation care for the trauma patient remains poorly investigated. Here we describe the functional outcomes of trauma patients discharged to an inpatient rehabilitation facility (IRF), and compare the likelihood of discharge home, 1-year rehospitalization, and 1-year mortality between patients discharged to an IRF and a propensity score-matched cohort of patients not discharged to an IRF. STUDY DESIGN: The Washington State Rehabilitation Registry was used to collect data for all trauma patients discharged to an IRF between 2011 and 2012. These charts were linked to the Washington State Trauma Registry and the Comprehensive Hospital Abstract Reporting System database to obtain detailed patient, injury, and mortality data. Propensity score matching was used to identify a control group of patients who were not discharged to an IRF. Primary outcomes measures were improvement in Functional Independence Measure score with inpatient rehabilitation and the likelihood of discharge home, 1-year rehospitalization, and 1-year mortality. RESULTS: Nine hundred and thirty-three trauma patients were discharged to an IRF between 2011 and 2012. Total functional independence measure scores improved from 63.7 (SD 20.3) to 92.2 (SD 20.9) (p < 0.001) with care at an IRF. When patients discharged to an IRF were compared with the propensity score-matched control patients, rehabilitation was found to significantly increase the likelihood of discharge to home (odds ratio = 9.41; 95% CI, 6.80-13.01) and to decrease 1-year mortality (odds ratio = 0.60; 95% CI, 0.39-0.92). CONCLUSIONS: Acute trauma patients should be recognized as an underserved population that would benefit considerably from inpatient rehabilitation services after discharge from the hospital.

O'Brien, S. R., & Xue, Y. (2016). Inpatient Rehabilitation Outcomes in Patients With Stroke Aged 85 Years or Older. *Phys Ther, 96*(9), 1381-1388. doi:10.2522/ptj.20150364

BACKGROUND: In the United States, people 85 years of age or older have a growing number of strokes each year, and this age group is most at risk for disability. Inpatient rehabilitation facilities (IRFs) adhere closest to post-acute stroke rehabilitation guidelines and have the most desirable outcomes compared with skilled nursing facilities. As stroke is one of the leading causes of disability, knowledge of postrehabilitation outcomes is needed for this age group, although at present such information is limited. OBJECTIVE: The purpose of this study was to describe functional and discharge outcomes after IRF rehabilitation in people with stroke aged 85 years or older. DESIGN: A serial, cross-sectional design was used. METHODS: Inpatient Rehabilitation Facility-Patient Assessment Instrument data were analyzed beginning in 2002 for the first 5.5 years after implementation of the prospective payment system and included 71,652 cases. Discharge function, measured using the Functional Independence Measure (FIM), and community discharge were the discharge outcome measures. Sample description used frequencies and means. Generalized estimating equations (GEEs) with post hoc testing were used to analyze the annual trends for discharge FIM and community discharge by age group (85-89, 90-94, 95-99, and >/=100 years). Risk-adjusted linear and logistic GEE models, with control for cluster, were used to analyze the association between both outcome measures and age group. RESULTS: Over 5.5 years, mean discharge FIM scores decreased by 3.6 points, and mean achievement of community discharge decreased 5.5%. Approximately 54% of the sample achieved community discharge. Continuous and logistic GEEs revealed factors associated with discharge outcomes. LIMITATIONS: Results obtained using an observational design should not be viewed as indicating causation. The lack of control for a caregiver may have altered results. CONCLUSIONS: The very elderly people admitted to IRF stroke rehabilitation made functional gains, and most were able to return to the community.

O'Brien, S. R., & Zhang, N. (2018). Association Between Therapy Intensity and Discharge Outcomes in Aged Medicare Skilled Nursing Facilities Admissions. *Arch Phys Med Rehabil, 99*(1), 107-115. doi:10.1016/j.apmr.2017.07.012

OBJECTIVES: To determine the association between therapy intensity and discharge outcomes for aged Medicare skilled nursing facilities (SNFs) fee-for-service beneficiaries and to determine the association between therapy intensity and time to community discharge. DESIGN: Retrospective observational design. SETTING: SNFs. PARTICIPANTS: Aged Medicare fee-for-service beneficiaries (N=311,338) in 3605 SNFs. INTERVENTIONS: The total minutes of physical therapy, occupational therapy, and speech therapy per day were divided into intensity groups: high (>/=60min); medium-high (45-<60min); medium-low (30-<45min); and low (<30min). MAIN OUTCOME MEASURES: Four discharge outcomes-community, hospitalization, permanent placement, and death-were examined using a multivariate competing hazards model. For those associated with community discharge, a Poisson multivariate model was used to determine whether length of stay differed by intensity. RESULTS: High intensity therapy was associated with more community discharges in comparison to the remaining intensity groups (hazard ratio, .84, .68, and .433 for medium-high, medium-low, and low intensity groups, respectively). More hospitalizations and deaths were found as therapy intensity decreased. Only high intensity therapy was associated with a 2-day shorter length of stay (incident rate ratio, .95). CONCLUSIONS: High intensity therapy was associated with desirable discharge outcomes and may shorten SNF length of stay. Despite growing reimbursements to SNFs for rehabilitation services, there may be desirable benefits to beneficiaries who receive high intensity therapy.

### Rice et al (2013) Impact of the clinical practice guideline for preservation of upper limb function on transfer skills of persons with acute spinal cord injury. [Arch Phys Med Rehabil.](https://www.ncbi.nlm.nih.gov/pubmed/?term=Impact+of+the+clinical+practice+guideline+for+preservation+of+upper+limb+function+on+transfer+skills+of+persons+with+acute+spinal+cord+injury) Jul;94(7):1230-46.

OBJECTIVES: To describe the development of a strict education protocol to implement the clinical practice guideline "Preservation of Upper Limb Function Following Spinal Cord Injury" into a clinical setting, and evaluate the effect of the protocol on transfer quality. DESIGN: Randomized controlled trial**.** SETTING: Acute Model Spinal Cord Injury Systems rehabilitation facility and community. PARTICIPANTS: Volunteer sample of full-time wheelchair users (N=70) with new spinal cord injuries randomized (1:1) to an intervention and standard-of-care group. INTERVENTION: The intervention group was educated on transfer skills with a structured protocol implemented by a physical and occupational therapist who were extensively educated on the clinical practice guidelines and current transfer research. The standard-of-care group received standard therapy services. MAIN OUTCOME MEASURES: Comparison of transfer quality evaluated by the Transfer Assessment Instrument at 4 time points during first year after injury. RESULTS: No significant differences were found between study groups. Secondary analysis based on type of transfer performed found that participants in the intervention group who performed assisted sitting pivot transfers performed higher-quality transfers (mean +/- SE: 9.43+/-.55) compared with the standard-of-care group (mean +/- SE: 7.81+/-.46) (P=.026) at 1 year after discharge. Also, participants who performed a dependent transfer had a higher average score across all 4 time points (mean +/- SE: 9.14+/-.34) compared with the standard-of-care group (mean +/- SE: 8.09+/-.29) (P=.019). CONCLUSIONS: For participants who perform assisted or dependent transfers, use of an evidenced-based, structured education program during acute inpatient rehabilitation has the potential to significantly improve the quality of transfers. Further follow-up testing is necessary with a larger sample size to determine the long-term effects.

Rosenbaum, A. M., Gordon, W. A., Joannou, A., & Berman, B. A. (2018). Functional outcomes following post-acute rehabilitation for moderate-to-severe traumatic brain injury. *Brain Inj, 32*(7), 907-914. doi:10.1080/02699052.2018.1469040

OBJECTIVE: The objective of this study was to examine the benefits of long-term inpatient rehabilitation for individuals with moderate-to-severe traumatic brain injuries (TBIs). METHODS: Retrospective database review of 67 individuals with moderate-to-severe TBI admitted to a specialised inpatient TBI program. Outcome measures are as follows: (1) functional independence measure + functional assessment measure (FIM+FAM; admission, discharge, change scores); (2) discharge designation (community vs. long-term care (LTC)). RESULTS: There was a mean improvement on FIM+FAM of 54.19 points (SD = 35.63) or 67% between admission and discharge (t(66) = -12.45, p < 0.001). Mean time post-injury upon completion of therapy was 409.59 days (SD = 343.93). Upon completion of rehabilitation, 50 (75%) participants were discharged to community and 17 to LTC. Among those returning to community, those with longer length of stays were more severely disabled on admission (t(35.9) = -4.86, p < 0.001). Controlling for admission functional status, individuals returning to community following >90 days of therapy required a mean of 378.94 days (SD = 298.86) to achieve comparable gains to those less impaired who received shorter periods of rehabilitation (F(1) = 0.530, p = 0.47). CONCLUSION: Continued specialised inpatient services following acute inpatient rehabilitation for individuals with moderate-to-severe TBI can reduce the level of dependency and enhance the likelihood of return to community living.

Sauter et al (2013). Functional outcomes of persons who underwent dysvascular lower extremity amputations: effect of postacute rehabilitation setting. [Am J Phys Med Rehabil.](https://www.ncbi.nlm.nih.gov/pubmed/?term=Functional+outcomes+of+persons+who+underwent+dysvascular+lower+extremity+amputations%3A+effect+of+postacute+rehabilitation+setting) Apr;92(4):287-96.

OBJECTIVE: The aim of this study was to examine the effect of postacute rehabilitation setting on functional outcomes among patients who underwent major dysvascular lower extremity amputations. DESIGN: This is a population-based prospective cohort study conducted in Maryland and Wisconsin. Data collected from medical records and patient interviews conducted during acute hospitalization after amputation and at 6 mos after the acute care discharge were analyzed using multivariate models and instrumental variable techniques. RESULTS: A total of 297 patients were analyzed on the basis of postacute care rehabilitation setting: acute inpatient rehabilitation facility (IRF), skilled nursing facility (SNF), or home. The majority (43.4%) received care in an IRF; 32%, in an SNF; and 24.6%, at home. On the Short Form-36 subscales, significantly improved outcomes were observed for the patients receiving postacute care at an IRF relative to those cared for at an SNF in physical function, role physical, and physical component summary score. Patients receiving postacute care in IRFs also experienced better role physical and physical component summary score outcomes compared with those discharged directly home. In addition, patients receiving postacute care in an IRF were significantly more likely to score in the top quartile for general health in IRF compared with SNF or home and less likely to score in the lowest quartile for physical function, role physical, and physical component summary score in IRF compared with SNF. Lower activity of daily living impairment was observed in IRF compared with SNF. CONCLUSIONS: Among this large and diverse cohort of patients who underwent major dysvascular lower limb amputations, receipt of interdisciplinary rehabilitation services in an IRF yielded improved functional outcomes 6 mos after amputation relative to care received in SNFs or at home.

Siebens, H. C., Sharkey, P., Aronow, H. U., Deutscher, D., Roberts, P., Munin, M. C., . . . Horn, S. D. (2016). Variation in Rehabilitation Treatment Patterns for Hip Fracture Treated With Arthroplasty. *Pm r, 8*(3), 191-207. doi:10.1016/j.pmrj.2015.07.005

BACKGROUND: Recommendations for health care redesign often advocate for comparative effectiveness research that is patient-centered. For patients who require rehabilitation services, a first step in this research process is to understand current practices for specific patient groups. OBJECTIVE: To document in detail the physical and occupational therapy treatment activities for inpatient hip fracture rehabilitation among 3 patient subgroups distinguished by their early rate of functional recovery between time of surgery to rehabilitation admission. DESIGN: Multicenter prospective observational cohort, practice-based evidence, study. SETTING: Seven skilled nursing facilities and 11 inpatient rehabilitation facilities across the United States. PARTICIPANTS: A total of 226 patients with hip fractures treated with hip arthroplasty. METHODS: Comparisons of physical and occupational therapy treatment activities among 3 groups with different initial recovery trajectory (IRT) rates (slower, moderate, faster). MAIN OUTCOME MEASURE(S): Percent of patients in each IRT group exposed to each physical and occupational therapy activity (exposure), and mean minutes per week for each activity (intensity). RESULTS: The number of patients exposed to different physical or occupational therapy activities varied within the entire sample. More specifically, among the 3 IRT groups, significant differences in exposure occurred for 44% of physical therapy activities and 39% of occupational therapy activities. More patients in the slower recovery group, IRT 1, received basic activities of daily living treatments and more patients in the faster recovery group, IRT 3, received advanced activities. The moderate recovery group, IRT 2, had some treatments similar to IRT 1 group and others similar to IRT 3 group. CONCLUSIONS: Analyses of practice-based evidence on inpatient rehabilitation of hip fracture patients treated with arthroplasty identified differences in therapy activities among three patient groups classified by IRT rates. These results may enhance physiatrists', other physicians', and rehabilitation teams' understanding of inpatient rehabilitation for these patients and help design future comparative effectiveness research.

Skidmore, E. R., Dawson, D. R., Butters, M. A., Grattan, E. S., Juengst, S. B., Whyte, E. M., . . . Becker, J. T. (2015). Strategy Training Shows Promise for Addressing Disability in the First 6 Months After Stroke. *Neurorehabil Neural Repair, 29*(7), 668-676. doi:10.1177/1545968314562113

OBJECTIVE: To examine the feasibility of a strategy training clinical trial in a small group of adults with **stroke-related cognitive impairments** in inpatient rehabilitation, and to explore the impact of strategy training on disability. DESIGN: Non-randomized two-group intervention pilot study. SETTING: Two inpatient rehabilitation units within an academic health centre. PARTICIPANTS: Individuals with a primary diagnosis of acute stroke, who were admitted to inpatient rehabilitation and demonstrated cognitive impairments were included. Individuals with severe aphasia; dementia; major depressive disorder, bipolar, or psychotic disorder; recent drug or alcohol abuse; and anticipated length of stay less than five days were excluded. INTERVENTION: Participants received strategy training or an attention control session in addition to usual rehabilitation care. Sessions in both groups were 30-40 minutes daily, five days per week, for the duration of inpatient rehabilitation. MAIN OUTCOME MEASURES: We assessed feasibility through participants' recruitment and retention; research intervention session number and duration; participants' comprehension and engagement; intervention fidelity; and participants' satisfaction. We assessed disability at study admission, inpatient rehabilitation discharge, 3 and 6 months using the Functional Independence Measure. RESULTS: Participants in both groups (5 per group) received the assigned intervention (>92% planned sessions; >94% fidelity) and completed follow-up testing. Strategy training participants in this small sample demonstrated significantly less disability at six months (M (SE) = 117 (3)) than attention control participants (M(SE) = 96 (14); t 8 = 7.87, P = 0.02). CONCLUSIONS: It is feasible and acceptable to administer both intervention protocols as an adjunct to acute inpatient rehabilitation, and strategy training shows promise for reducing disability.

Taylor, S. M., Cheung, E. O., Sun, R., Grote, V., Marchlewski, A., & Addington, E. L. (2018). Applications of complementary therapies during rehabilitation for individuals with traumatic Spinal Cord Injury: Findings from the SCIRehab Project. *J Spinal Cord Med*, 1-8. doi:10.1080/10790268.2018.1481693

OBJECTIVE: Evaluate the use of complementary therapies during rehabilitation for patients with traumatic spinal cord injury (SCI). DESIGN: Secondary analyses were conducted to identify the use and associated outcomes of complementary therapies provided by occupational therapists (OTs) and physical therapists (PTs) during rehabilitation from a public dataset. SETTING: Inpatient rehabilitation. PARTICIPANTS: A public dataset composed of 1376 patients with SCI that were enrolled in a five-year, multi-center investigation, the SCIRehab Project. Secondary analyses focused on a subset of 93 patients (47 who received complementary therapy during treatment and 46 case-matched controls who received no complementary therapy). INTERVENTIONS: OTs and PTs recorded use of complementary therapies during sessions, including yoga, Pilates, tai chi, aromatherapy, relaxation techniques, imagery and other. OUTCOME MEASURES: Pain interference, pain severity, mobility, and social integration. RESULTS: Three percent of participants received any complementary therapies. Patients who received complementary therapies showed greater reductions in pain severity from 6 months to 12 months relative to matched controls. Furthermore, the amount of time that patients received complementary therapies during physical therapy sessions was associated with reduced pain interference at 6 months and with reduced pain severity at the 6-month and 12-month follow-ups. Complementary therapy use was not associated with mobility or social integration. CONCLUSION: The current study provides preliminary evidence documenting the limited use of complementary therapies in rehabilitation settings and highlights the opportunity for further research, particularly regarding pain-related outcomes.

Wang, H., Camicia, M., Terdiman, J., Mannava, M. K., Sidney, S., & Sandel, M. E. (2013). Daily treatment time and functional gains of stroke patients during inpatient rehabilitation. *Pm r, 5*(2), 122-128. doi:10.1016/j.pmrj.2012.08.013

OBJECTIVE: To study the effects of daily treatment time on functional gain of patients who have had a stroke. DESIGN: A retrospective cohort study. SETTING: An inpatient rehabilitation hospital (IRH) in northern California. PARTICIPANTS: Three hundred sixty patients who had a stroke and were discharged from the IRH in 2007. INTERVENTIONS: Average minutes of rehabilitation therapy per day, including physical therapy, occupation therapy, speech and language therapy, and total treatment. MAIN OUTCOME MEASURES: Functional gain measured by the Functional Independence Measure, including activities of daily living, mobility, cognition, and the total of the Functional Independence Measure (FIM) scores. RESULTS: The study sample had a mean age of 64.8 years; 57.4% were men and 61.4% were white. The mean total daily therapy time was 190.3 minutes, and the mean total functional gain was 26.0. A longer daily therapeutic duration was significantly associated with total functional gain (r = .23, P = .0094). Patients who received a total therapy time of <3.0 hours per day had significantly lower total functional gain than did those treated >/=3.0 hours. No significant difference in total functional gain was found between patients treated >/=3.0 but <3.5 hours and >/=3.5 hours per day. The daily treatment time of physical therapy, occupational therapy, and speech and language therapy also was significantly associated with corresponding subscale functional gains. In addition, hemorrhagic stroke, left brain injury, earlier IRH admission, and a longer IRH stay were associated with total functional improvement. CONCLUSIONS: The study demonstrated a significant relationship between daily therapeutic duration and functional gain during IRH stay and showed treatment time thresholds for optimal functional outcomes for patients in inpatient rehabilitation who had a stroke.

Winstein, C. J., Stein, J., Arena, R., Bates, B., Cherney, L. R., Cramer, S. C., . . . Zorowitz, R. D. (2016). Guidelines for Adult Stroke Rehabilitation and Recovery: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. *Stroke, 47*(6), e98-e169. doi:10.1161/str.0000000000000098

PURPOSE: The aim of this guideline is to provide a synopsis of best clinical practices in the rehabilitative care of adults recovering from stroke. METHODS: Writing group members were nominated by the committee chair on the basis of their previous work in relevant topic areas and were approved by the American Heart Association (AHA) Stroke Council's Scientific Statement Oversight Committee and the AHA's Manuscript Oversight Committee. The panel reviewed relevant articles on adults using computerized searches of the medical literature through 2014. The evidence is organized within the context of the AHA framework and is classified according to the joint AHA/American College of Cardiology and supplementary AHA methods of classifying the level of certainty and the class and level of evidence. The document underwent extensive AHA internal and external peer review, Stroke Council Leadership review, and Scientific Statements Oversight Committee review before consideration and approval by the AHA Science Advisory and Coordinating Committee. RESULTS: Stroke rehabilitation requires a sustained and coordinated effort from a large team, including the patient and his or her goals, family and friends, other caregivers (eg, personal care attendants), physicians, nurses, physical and occupational therapists, speech-language pathologists, recreation therapists, psychologists, nutritionists, social workers, and others. Communication and coordination among these team members are paramount in maximizing the effectiveness and efficiency of rehabilitation and underlie this entire guideline. Without communication and coordination, isolated efforts to rehabilitate the stroke survivor are unlikely to achieve their full potential. CONCLUSIONS: As systems of care evolve in response to healthcare reform efforts, postacute care and rehabilitation are often considered a costly area of care to be trimmed but without recognition of their clinical impact and ability to reduce the risk of downstream medical morbidity resulting from immobility, depression, loss of autonomy, and reduced functional independence. The provision of comprehensive rehabilitation programs with adequate resources, dose, and duration is an essential aspect of stroke care and should be a priority in these redesign efforts. (Stroke.2016;47:e98-e169. DOI: 10.1161/STR.0000000000000098.).

Wysocki, A., Thomas, K. S., & Mor, V. (2015). Functional Improvement Among Short-Stay Nursing Home Residents in the MDS 3.0. *J Am Med Dir Assoc, 16*(6), 470-474. doi:10.1016/j.jamda.2014.11.018

OBJECTIVES: To examine the completeness of the activities of daily living (ADL) items on admission and discharge assessments and the improvement in ADL performance among short-stay residents in the newly adopted Minimum Data Set (MDS) 3.0. DESIGN: Retrospective analysis of MDS admission and discharge assessments. SETTING: Nursing homes from July 1, 2011, to June 30, 2012. PARTICIPANTS: New nursing home residents admitted from acute hospitals with corresponding admission and discharge assessments between July 1, 2011, and June 30, 2012, who had a length of stay of 100 days or less. MEASUREMENTS: ADL self-performance items, including bed mobility, transfer, walking in room, walking in corridor, locomotion on unit, locomotion off unit, dressing, eating, toilet use, and personal hygiene, at admission and discharge. RESULTS: The ADL self-performance items are complete at both admission and discharge, with less than 1% missing for any item. More than 60% of residents improved over the course of their post-acute stay. New short-stay nursing home residents with conditions such as cognitive impairment, delirium, dementia, heart failure, and stroke showed less improvement in ADL performance during their stay. CONCLUSION: The discharge assessment data in the MDS 3.0 provide new information to researchers and providers to examine and track ADL performance. Nursing homes can identify and track patients who require more intensive therapies or targeted interventions to achieve functional improvement during their stay. Future research can examine facility-level measures to better understand how ADL improvement varies across facilities.

**Scoping Review Methodology**

To prepare for the NQF Endorsement Maintenance Review for this measure, we sought to identify relevant literature since our 2014 NQF submission. The literature search focused on how one intervention/service, therapy, is associated with the measure, functional outcomes. Therapy is one of the processes listed in the Structure-Process-Outcome Model (see Figure 1a). This model shows that IRF staff, including therapists, can implement interventions that result in improving their patients’ functional outcomes, specifically their mobility and self-care outcomes.

Our team conducted a scoping review that included a systematic search of published literature relevant to our cohort of IRF measures (NQF 2633, 2634, 2635, and 2636). To identify the relevant literature, we identified the search strategy with input from all team members. The search strategy included relevant terms for the setting, interventions and outcomes that align with these IRF measures. We included articles that met all three criteria. Below, we outline our search strategy. Note these are only examples and are not fully comprehensive of the search terminology we used.

1. **Setting search terms:** IRFs are the primary setting of focus as these measures assess patient functional outcomes (mobility and self-care) in IRFs. We used a variety of terms that are commonly used to describe IRFs such as, “inpatient rehabilitation facility” “rehabilitation centers” or “intensive rehabilitation”. We also included searches for articles about “Skilled Nursing Facilities” or “SNFs” or “short-stay nursing home” as SNFs offer similar rehabilitation treatments as IRFs. More generally, we also searched for “post-acute care settings” as some research articles focus on post-acute care (PAC) settings and may be relevant to IRFs or SNFs.
2. **Intervention search terms:** We searched a variety of key terms such as “therapy” or “mobilization” or “intervention”.
3. **Functional outcomes:** We used key words such as: “functional outcome” or “functional improvement” or “activities of daily living”.

Exclusion criteria were pre-determined by the team before the search was conducted. Exclusion criteria were: any articles published before January 1, 2013; any articles published outside of the US that did not use US based data; articles not written in English; articles not focused on human outcomes; and any articles that were focused on Long-term Care Hospitals or LTCHs, and other publication types that were not research-based such as opinion pieces or commentaries were excluded. We also included 6 additional articles we found that meet our inclusion criteria that were not identified by our PubMed search.

Our initial search yielded 181 articles. For every publication identified, we assigned two coders to independently review each abstract to determine if the study was relevant (i.e., should be included or excluded). The team met to compare decisions, and for abstracts for which we disagreed, the team re-reviewed the abstract together and we made a consensus decision. All Case Reports were excluded, because these articles focus on one individual and the findings are not generalizable. We also excluded articles for other reasons including those that describe outcomes that are not a focus of our measures, including cognition outcomes, readmissions or discharge destination. In addition, we excluded those articles focused on outpatient or acute care settings.

Our final scoping review results yielded 26 articles for inclusion. Following our inclusion decisions, we also grouped the articles by type of setting (IRF, SNF, IRF and SNF, or other), of functional outcome (self-care, mobility, motor function), and if the study focused on a specific diagnosis (e.g. stroke) or multiple diagnoses.

**Previous NQF Submission 2014**

Treatments furnished by IRF clinicians focus on reducing patients’ impairments and activity limitations as well as managing patients’ medical, psychological and other health needs. The relationship between rehabilitation interventions and patients’ functional outcomes has been challenging to examine (Foley et al., 2012), because rehabilitation interventions tend to be multidisciplinary, tailored to each patient’s specific needs and there are no standardized definitions and no standardized measurement of interventions. In addition, research examining the optimal “dose” of therapy has been limited in IRFs due, in part, to the provision of intensive therapy services to all patients, and concern about the lack of variability in the amount of therapy provided. The rehabilitation treatment-outcome knowledge gap is recognized, and several efforts are underway to classify interventions using standardized terminology in order to better understand the relationship between interventions and outcomes; that is, the active ingredients of a rehabilitation program (Natale et al., 2009; Ozelie et al., 2009; Johnson et al., 2009; Rundquist et al., 2011; Taylor-Schroeder, 2011). Several studies have examined the therapy dose-outcome relationship, and reported higher amounts of therapy were associated with better functional improvement (Jette, Warren & Wirtalla, 2010; Lenze et al., 2012; Ozelie et al., 2012; Wang et al., 2013; Mallinson et al, 2014; Lohse, Lang & Boyd, 2014). In addition, O’Brien, Xue, Ingersoll & Kelly ([2013](#_ENREF_11)) reported that shorter IRF stays were associated with lower patient functioning at discharge; the average IRF length of stays decreased 1.8 days between 2002 and 2007, and the patients in 2007 had lower functional abilities at discharge compared to patients in 2002.

**Citations**

Foley, N., Pereira, S., Salter, K., Meyer, M., McClure, J. A., & Teasell, R., (2012). Are recommendations regarding inpatient therapy intensity following acute stroke really evidence-based? *Topics in Stroke Rehabilitation*. 19(2):96-103.

Jette, D. U., R. L. Warren, & C. Wirtalla. (2005). The relation between therapy intensity and outcomes of rehabilitation in skilled nursing facilities. *Archives of Physical Medicine and Rehabilitation,* 86 (3), 373-9.

Johnson K., Bailey J., Rundquist J., Dimond P., McDonald CA., Reyes IA., … Gassaway J. (2009). SCIRehab Project series: the supplemental nursing taxonomy. *Journal of Spinal Cord Medicine*. 32(3):329-35.

Lenze, E. J., Host, H. H., Hildebrand M. W., Morrow-Howell, N., Carpenter, B., Freedland, K. E., … Binder, E, F. (2012). Enhanced medical rehabilitation increases therapy intensity and engagement and improves functional outcomes in postacute rehabilitation of older adults: a randomized-controlled trial. *Journal of the American Medical Directors Association*. 13(8):708-12.

Lohse, K. R., Lang, C. E., & Boyd, L. A. (2014). Is more better? Using metadata to explore dose-response relationships in stroke rehabilitation. *Stroke*. 45(7):2053-8.

Mallinson, T., Deutsch, A., Bateman, J., Tseng, H. Y., Manheim, L., Almagor, O., Heinemann, A., W. (2014). Comparison of discharge functional status after rehabilitation in skilled nursing, home health, and medical rehabilitation settings for patients after hip fracture repair. *Archives of Physical Medicine & Rehabilitation*. 95(2):209-17.

Natale A., Taylor S., LaBarbera J., Bensimon L., McDowell S., Mumma S.L., … Gassaway J. (2009). SCIRehab Project series: the physical therapy taxonomy. *Journal of Spinal Cord Medicine*. 32(3):270-82.

O'Brien, S. R., Xue, Y., Ingersoll, G., & Kelly, A. (2013). Shorter length of stay is associated with worse functional outcomes for Medicare beneficiaries with stroke. *Physical Therapy, 93,* 1592–1602.

Ozelie R., Sipple C., Foy T., Cantoni K., Kellogg K., Lookingbill J., … Gassaway J. (2009).

SCIRehab Project series: the occupational therapy taxonomy. *Journal of Spinal Cord Medicine*. 32(3):283-97.

Ozelie R., Gassaway J., Buchman E., Thimmaiah D., Heisler L., Cantoni K., … Whiteneck G. (2012). Relationship of occupational therapy inpatient rehabilitation interventions and patient characteristics to outcomes following spinal cord injury: the SCIRehab project. *Journal of Spinal Cord Medicine*. 35(6):527-46.

Rundquist J., Gassaway J., Bailey J., Lingefelt P., Reyes IA., & Thomas J. (2011). The SCIRehab project: treatment time spent in SCI rehabilitation. Nursing bedside education and care management time during inpatient spinal cord injury rehabilitation. *Journal of Spinal Cord Medicine*. 34(2):205-15.

Taylor-Schroeder S., LaBarbera J., McDowell S., Zanca J.M., Natale A., Mumma S., … Backus D. (2011). The SCIRehab project: treatment time spent in SCI rehabilitation. Physical therapy treatment time during inpatient spinal cord injury rehabilitation.  *Journal of Spinal Cord Medicine*. 34(2):149-61.

Wang, H., Camicia, M., Terdiman, J., Mannava, M. K., Sidney, S., & Sandel, M. E. (2013). Daily treatment time and functional gains of stroke patients during inpatient rehabilitation. *Physical Medicine & Rehabilitation, 5*(2), 122-128.

We identified evidence from literature searches using PubMed and the Cumulative Index of Nursing and Allied Health Literature (CINAHL) and in reviews of references cited in the relevant identified studies.

1. Foley, N., Pereira, S., Salter, K., Meyer, M., McClure, J. A., & Teasell, R., (2012). Are recommendations regarding inpatient therapy intensity following acute stroke really evidence-based? *Topics in Stroke Rehabilitation*. 19(2):96-103.

Six clinical practice guidelines were retrieved and examined to determine what recommendation, if any, had been made regarding the daily provision of therapy during inpatient rehabilitation. All studies cited by the guideline authors to support their recommendations were identified and retrieved. Studies in which treatment was (a) focused on motor recovery, (b) initiated during inpatient rehabilitation, and (c) provided within 3 months of stroke onset were reviewed in greater detail. Three of the 6 identified guidelines recommended daily minimum amounts of therapy, ranging from 45 to 60 minutes each day of occupational and physiotherapy, and 3 made general statements indicating that increased intensity of therapy was either recommended or was not recommended. We believe the evidence base cannot support a specific recommendation related to therapy intensity during inpatient rehabilitation following stroke.

1. Jette, D. U., R. L. Warren, & C. Wirtalla. (2005). The relation between therapy intensity and outcomes of rehabilitation in skilled nursing facilities. *Archives of Physical Medicine and Rehabilitation,* 86 (3), 373-9.

The aim of the study is to examine the relation between therapy intensity, including physical therapy, occupational therapy, and speech and language therapy, provided in a skilled nursing facility setting and patients' outcomes. Higher physical therapy and occupational therapy intensities were associated with greater odds of improving by at least 1 stage in mobility and activities of daily living functional independence across each condition. The speech and language therapy intensity was associated with improved motor and executive control functional stages for patients with stroke. Therapy intensities accounted for small proportions of model variances in all outcomes. Higher therapy intensity was associated with better outcomes as they relate to LOS and functional improvement for patients who have stroke, orthopedic conditions, and cardiovascular and pulmonary conditions and are receiving rehabilitation in skilled nursing facilities.

1. Johnson K., Bailey J., Rundquist J., Dimond P., McDonald CA., Reyes IA., … Gassaway J. (2009). SCIRehab Project series: the supplemental nursing taxonomy. *Journal of Spinal Cord Medicine*. 32(3):329-35.

Spinal cord injury rehabilitation nurses document the occurrence of educational and care management efforts in traditional nursing documentation methods but not the intensity (or dose) of such interactions. This article describes a process to capture these nursing interventions. Nurses at 6 US inpatient spinal cord injury centers developed a taxonomy of nursing patient education efforts and care management. This was subsequently incorporated into a point-of-care documentation system and used to capture details of nursing care for 1,500 Spinal cord injury rehabilitation patients. The taxonomy consists of 10 education and 3 care management categories. The point-of-care system includes time spent on each category along with an indication of whether the patient and/or family received the education/care management. In addition, a subjective measure of patient participation in nursing activities is included.

1. Lenze, E. J., Host, H. H., Hildebrand M. W., Morrow-Howell, N., Carpenter, B., Freedland, K. E., Binder, E, F. (2012). Enhanced medical rehabilitation increases therapy intensity and engagement and improves functional outcomes in postacute rehabilitation of older adults: a randomized-controlled trial. *Journal of the American Medical Directors Association*. 13(8):708-12.

This study tested Enhanced Medical Rehabilitation, an intervention designed to increase patient engagement in, and intensity of, daily physical and occupational therapy sessions in a skilled nursing facility. This was a randomized controlled trial of Enhanced Medical Rehabilitation versus standard-of-care rehabilitation. Participants were 26 older adults admitted from a hospital for postacute rehabilitation. Participants randomized to Enhanced Medical Rehabilitation had higher intensity therapy and were more engaged in their rehabilitation sessions; they had more improvement in gait speed and 6-minute walk, with a trend for better improvement of Barthel Index, compared with participants randomized to standard-of-care rehabilitation. Higher intensity and patient engagement in the postacute rehabilitation setting is achievable, with resultant better functional outcomes for older adults.

1. Lohse, K. R., Lang, C. E., & Boyd, L. A. (2014). Is more better? Using metadata to explore dose-response relationships in stroke rehabilitation. *Stroke*. 45(7):2053-8.

The primary objective of this meta-analysis was to explore the relationship between time scheduled for therapy and improvement in motor therapy for adults after stroke by (1) comparing high doses to low doses and (2) using metaregression to quantify the dose-response relationship further. Databases were searched to find randomized controlled trials that were not dosage matched for total time scheduled for therapy. Regression models were used to predict improvement during therapy as a function of total time scheduled for therapy and years after stroke. Overall, treatment groups receiving more therapy improved beyond control groups that received less. There is a positive relationship between the time scheduled for therapy and therapy outcomes.

1. Mallinson, T., Deutsch, A., Bateman, J., Tseng, H. Y., Manheim, L., Almagor, O., Heinemann, A., W. (2014). Comparison of discharge functional status after rehabilitation in skilled nursing, home health, and medical rehabilitation settings for patients after hip fracture repair. *Archives of Physical Medicine & Rehabilitation*. 95(2):209-17.

The aim of this study was to examine differences in rehabilitation outcomes across 3 post-acute care rehabilitation settings for patients after hip fracture repair. Participants were patients (N=181) receiving rehabilitation following hip fracture. Inpatient rehabilitation facility and home health agency patients had lower self-care function at discharge relative to skilled nursing facility patients controlling for patient characteristics, severity, comorbidities, and services. Inpatient rehabilitation facility and skilled nursing facility patients received about the same total minutes of therapy over their PAC stays (~2100 min on average), whereas home health patients received only approximately 25% as many minutes. Setting-specific effects varied depending on whether self-care or mobility was the outcome of focus.

1. Natale A., Taylor S., LaBarbera J., Bensimon L., McDowell S., Mumma S.L., … Gassaway J. (2009). SCIRehab Project series: the physical therapy taxonomy. *Journal of Spinal Cord Medicine*. 32(3):270-82.

The objective of this study was to describe a taxonomy (system to categorize and classify interventions) to examine the effects of physical therapy interventions on rehabilitation outcomes. Physical therapy clinicians and researchers from 6 centers developed a taxonomy to describe details of each PT session. The physical therapy taxonomy consists of 19 treatment activities (e. g., bed mobility, transfers, wheelchair mobility, strengthening and stretching exercises) and supplementary information to describe the associated therapeutic interventions. The detailed physical therapy taxonomy documentation process, which offers efficiency in data collection, is being used for all physical therapy sessions with 1,500 patients with acute traumatic spinal cord injury at the 6 participating centers.

1. O'Brien, S. R., Xue, Y., Ingersoll, G., & Kelly, A. (2013). Shorter length of stay is associated with worse functional outcomes for Medicare beneficiaries with stroke. *Physical Therapy, 93,* 1592–1602.

This study examined the trends and associations between length of stay and discharge outcomes in Medicare beneficiaries with stroke treated in IRFs. Medicare beneficiaries with stroke treated in IRFs experienced shorter length of stay, had worsening admission and discharge function, and had fewer community discharges. Worsening admission function and shorter length of stay may contribute to worsening discharge outcomes, which may indicate a lack of readiness for IRF treatment and that facility-level factors may be playing a role in shorter length of stay.

1. Ozelie R., Sipple C., Foy T., Cantoni K., Kellogg K., Lookingbill J., … Gassaway J. (2009). SCIRehab Project series: the occupational therapy taxonomy. *Journal of Spinal Cord Medicine*. 32(3):283-97.

Occupational therapy clinicians and researchers from 6 spinal cord injury rehabilitation centers developed a taxonomy to describe details of each occupational therapy session. The occupational therapy taxonomy consists of 26 occupational therapy activities (e. g., training on activities of daily living, communication, home management skills, wheelchair mobility, bed mobility, transfers, balance, strengthening, stretching, equipment evaluation, and community reintegration). Treatment descriptions are enhanced further with identification of assistance needs, patient direction of care, and family involvement, which help to describe and guide occupational therapy activity selection. The electronic documentation system is being used at 6 centers for all occupational therapy sessions with 1,500 patients with acute traumatic spinal cord injury.

1. Ozelie R., Gassaway J., Buchman E., Thimmaiah D., Heisler L., Cantoni K., … Whiteneck G. (2012). Relationship of occupational therapy inpatient rehabilitation interventions and patient characteristics to outcomes following spinal cord injury: the SCIRehab project. *Journal of Spinal Cord Medicine*. 35(6):527-46.

Occupational therapists at 6 inpatient rehabilitation centers documented detailed information about treatment provided. Occupational therapy treatment variables explain a small amount of variation in FIM outcomes for the full sample and significantly more in two functionally homogeneous subgroups. For patients with motor complete paraplegia, more time spent in clothing management and hygiene related to toileting was a strong predictor of higher scores on the lower body items of the self-care function. Among patients with motor complete low tetraplegia, higher scores for the FIM lower body self-care items were associated with more time spent on lower body dressing, manual wheelchair mobility training, and bathing training. The impact of occupational therapy treatment on functional outcomes is more evident when examining more homogeneous patient groupings and outcomes specific to the groupings.

1. Rundquist J., Gassaway J., Bailey J., Lingefelt P., Reyes IA., & Thomas J. The SCIRehab project: treatment time spent in SCI rehabilitation. Nursing bedside education and care management time during inpatient spinal cord injury rehabilitation. *Journal of Spinal Cord Medicine*. 34(2):205-15, 2011.

Nurses providing usual care to patients with spinal cord injury documented the content and amount of time spent on each bedside interaction including details of education or care management for 42 048 shifts of nursing care. The mean number of minutes per week was 264.3. The time that nurses spent on each activity was significantly different in each neurological injury group. Fifty percent of care management time was devoted to psychosocial support, while medication, skin care, bladder, bowel, and pain management were the main education topics. Nurses in spinal cord injury rehabilitation spend a significant amount of time providing education and psychosocial support to patients and their families. Quantification of these interventions will allow researchers to discern whether there are pertinent associations between the time spent on bedside activities and patient outcomes.

1. Taylor-Schroeder S., LaBarbera J., McDowell S., Zanca J.M., Natale A., Mumma S., … Backus D. (2011). The SCIRehab project: treatment time spent in SCI rehabilitation. Physical therapy treatment time during inpatient spinal cord injury rehabilitation.  *Journal of Spinal Cord Medicine*. 34(2):149-61.

Physical therapists documented details, including time spent, of treatment provided during 37,306 physical therapy sessions that occurred during inpatient SCI rehabilitation. SCIRehab patients received a mean total of 55.3 hours of physical therapy over the course of their rehabilitation stay. Significant differences among four neurologic groups were seen in the amount of time spent on most activities, including the most common physical therapy activities of strengthening exercises, stretching, transfer training, wheelchair mobility training, and gait training. Most physical therapy work (77%) was provided in individual therapy sessions; the remaining 23% was done in group settings. Patient and injury characteristics explained only some of the variations seen in time spent on wheelchair mobility, transfer and bed mobility training, and range of motion/stretching. Significant variation was seen in time spent on physical therapy activities within and among injury groups.

1. Wang, H., Camicia, M., Terdiman, J., Mannava, M. K., Sidney, S., & Sandel, M. E. (2013). Daily treatment time and functional gains of stroke patients during inpatient rehabilitation. *Physical Medicine & Rehabilitation, 5*(2), 122-128.

The average total minutes of rehabilitation therapy per day, including physical therapy, occupation therapy, speech and language therapy for 360 patients who had a stroke and were discharged from the IRH in 2007 was 190.3 minutes. The mean total functional gain was 26.0. A longer daily therapeutic duration was significantly associated with total functional gain. Patients who received a total therapy time of <3.0 hours per day had significantly lower total functional gain than did those treated ≥3.0 hours. No significant difference in total functional gain was found between patients treated ≥3.0 but <3.5 hours and ≥3.5 hours per day. The daily treatment time of physical therapy, occupational therapy, and speech and language therapy also was significantly associated with corresponding subscale functional gains. The study demonstrated a significant relationship between daily therapeutic duration and functional gain during the inpatient rehabilitation facility stay and showed treatment time thresholds for optimal functional outcomes for patients in inpatient rehabilitation who had a stroke.

**1a.3.****SYSTEMATIC REVIEW(SR) OF THE EVIDENCE (for intermediate outcome, PROCESS, or STRUCTURE PERFORMANCE measures, including those that are instrument-based) If the evidence is not based on a systematic review go to section 1a.4) If you wish to include more than one systematic review, add additional tables.**

**What is the source of the systematic review of the body of evidence that supports the performance measure? A systematic review is a scientific investigation that focuses on a specific question and uses explicit, prespecified scientific methods to identify, select, assess, and summarize the findings of similar but separate studies. It may include a quantitative synthesis (meta-analysis), depending on the available data. (IOM)**

☐ Clinical Practice Guideline recommendation (with evidence review)

☐ US Preventive Services Task Force Recommendation

☐ Other systematic review and grading of the body of evidence (*e.g., Cochrane Collaboration, AHRQ Evidence Practice Center*)

Other

Not Applicable. This measure is an outcome measure.

|  |  |
| --- | --- |
| **Source of Systematic Review:**   * **Title** * **Author** * **Date** * **Citation, including page number** * **URL** |  |
| Quote the guideline or recommendation verbatim about the process, structure or intermediate outcome being measured. If not a guideline, summarize the conclusions from the SR. |  |
| Grade assigned to the **evidence** associated with the recommendation with the definition of the grade |  |
| Provide all other grades and definitions from the evidence grading system |  |
| Grade assigned to the **recommendation** with definition of the grade |  |
| Provide all other grades and definitions from the recommendation grading system |  |
| Body of evidence:   * Quantity – how many studies? * Quality – what type of studies? |  |
| Estimates of benefit and consistency across studies |  |
| What harms were identified? |  |
| Identify any new studies conducted since the SR. Do the new studies change the conclusions from the SR? |  |

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**1a.4 OTHER SOURCE OF EVIDENCE**

*If source of evidence is NOT from a clinical practice guideline, USPSTF, or systematic review, please describe the evidence on which you are basing the performance measure.*

**1a.4.1** **Briefly SYNTHESIZE the evidence that supports the measure.** A list of references without a summary is not acceptable.

Not Applicable. This measure is an outcome measure.

**1a.4.2 What process was used to identify the evidence?**

Not Applicable. This measure is an outcome measure.

**1a.4.3.** **Provide the citation(s) for the evidence.**

Not Applicable. This measure is an outcome measure.