Published in final edited form as:

Am J Phys Med Rehabil. 2011 March ; 90(3): 177–189. doi:10.1097/PHM.0b013e31820b18d7.

The Uniform Data System for Medical Rehabilitation Report of Patients with Hip Fracture Discharged from Comprehensive Medical Programs in 2000 – 2007

Carl V. Granger, MD⁽¹⁾, Timothy A. Reistetter, PhD, OTR⁽⁴⁾, James E. Graham, PhD, DC⁽²⁾, Anne Deutsch, RN, PhD, CRRN⁽³⁾, Samuel J. Markello, PhD⁽¹⁾, Paulette Niewczyk, MPH, PhD⁽¹⁾, and Kenneth J. Ottenbacher, PhD, OTR⁽²⁾

(1) Uniform Data System for Medical Rehabilitation, a division of UB Foundation Activities, Inc., Buffalo, NY

(2) Division of Rehabilitation Sciences, University of Texas Medical Branch, Galveston, TX

(3) Rehabilitation Institute of Chicago and Department of Physical Medicine and Rehabilitation, Feinberg School of Medicine and Institute for Healthcare Studies, Feinberg School of Medicine, Northwestern University, Chicago, IL

(4) Department of Occupational Therapy, University of Texas Medical Branch, Galveston, TX

Abstract

Objective—To provide benchmarking information for a large national sample of patients receiving inpatient rehabilitation due to a hip fracture.

Design—Secondary data analysis of records from 893 medical rehabilitation facilities located in the United States that contributed information to the Uniform Data System for Medical Rehabilitation (UDSMR) from January 2000 through December 2007. Variables analyzed included demographic information (age, sex, marital status, race/ethnicity, pre-hospital living setting, discharge setting), hospitalization information (length of stay, program interruptions, payer, onset date, rehabilitation impairment group, ICD-9 codes for admitting diagnosis, comorbidities), and functional status information (FIM® instrument [“FIM”] ratings at admission and discharge, FIM efficiency, FIM gain).

Results—Descriptive statistics from 303,594 patients showed length of stay decreasing from a mean of 14.5 (± 7.9) days to 13.3 (± 5.5) over the 8-year study period. FIM total admission and discharge ratings also decreased. Mean admission ratings decreased from 72.5 (± 14.5) to 59.9 (± 15.7). Mean discharge ratings decreased from 95.8 (± 18.1) to 86.0 (± 19.8). FIM change per day remained relatively stable; mean for the entire sample was 2.1 (± 1.6). The percent of persons discharged to the community also decreased across the study period ranging from 77.8% in 2000 to 70.0% in 2007. All results are likely influenced by various policy changes affecting classification and/or documentation processes.

Conclusion—National rehabilitation data from persons with hip fracture in 2000–2007 indicate patients are spending less time in inpatient rehabilitation care than in previous years and are experiencing improvements in functional independence during their stay. In addition, a majority of patients are discharged to the community following inpatient rehabilitation.

Correspondence: K. Ottenbacher, University of Texas Medical Branch, 301 University Blvd., Galveston, TX 77555-1137 Phone: 409.747.1637 Fax: 409.747.1638 kottenba@utmb.edu.

Disclosures: Financial disclosure statements have been obtained, and no conflicts of interest have been reported by the authors or by any individuals in control of the content of this article.

Keywords

Rehabilitation Outcomes; Benchmark; Quality Improvement; Hip Fracture

INTRODUCTION

This article is the fourth in the series of impairment-specific longitudinal reports from the Uniform Data System for Medical Rehabilitation (UDSMR®) database. The objective of this and other reports is to provide benchmarking information for key rehabilitation outcomes such as length of stay, functional status, and discharge setting within common inpatient rehabilitation impairment groups. This report includes information from patients with hip fracture who received comprehensive inpatient rehabilitation services in facilities that subscribed to the UDSMR from 2000 through 2007. Previous reports presented the same information on patients receiving inpatient rehabilitation for stroke,¹ traumatic brain injury,² and lower extremity joint replacement.³ The current series represents an extension of prior reports published in this journal providing single year summaries from 1990 through 1999.⁴⁻¹³ Those reports contained benchmarking data across several rehabilitation impairment categories. The current format allows the examination of trends in rehabilitation outcomes over time while continuing to provide yearly summaries that serve as a resource for rehabilitation researchers, administrators, policy makers and consumers to help guide quality improvement efforts.

Data Source

The UDSMR is a not-for-profit organization affiliated with the UB Foundation Activities, Inc. at the University at Buffalo. The UDSMR maintains the largest non-governmental database for medical rehabilitation outcomes in the U.S. Since 1987 the UDSMR has collected data from rehabilitation hospitals and units, long-term care hospitals, skilled nursing facilities, as well as pediatric and outpatient rehabilitation programs. Approximately 70% of inpatient rehabilitation facilities in the United States use the UDSMR services. Subscribing facilities receive detailed summaries comparing their patient data to both regional and national benchmarks. This information is used to evaluate quality management efforts and to comply with criteria required by The Joint Commission and the Commission on Accreditation of Rehabilitation Facilities as well as other accrediting organizations. Additional information on the UDSMR is available from their web site at: <http://www.udsmr.org/>

This report contains information for persons receiving inpatient medical rehabilitation services from 1/1/2000 through 12/31/2007. The data are aggregated and presented using an October to September fiscal year schedule (see Variable Definitions below). Thus, in all tables and figures 2000 includes only three-quarters (1/1/2000 – 9/30/2000) of the calendar year and 2008 includes only one-quarter (10/1/2007 – 12/31/2007) of the calendar year.

Data Set

The UDSMR® database contains information related to demographic, hospitalization, diagnostic, and functional status data for patients who received inpatient rehabilitation services. Demographic data includes age, sex, marital status, race or ethnicity, pre-hospital living setting and discharge setting. Hospitalization and diagnostic information include length of stay (LOS), program interruptions, payer, impairment/event onset date, the rehabilitation impairment group, and ICD-9 codes for the admitting diagnosis and complications or comorbidities. Functional status information includes ratings from the

FIM® instrument (“FIM”) for admission and discharge, FIM efficiency and FIM gain (see descriptions below).

The FIM includes 18 items covering six domains (self-care, sphincter control, mobility, locomotion, communication and social cognition). Each item is rated on a scale from 1 (complete dependence) to 7 (complete independence) with higher ratings representing greater functional independence (range 18 to 126). The FIM was designed as an indicator of disability, which is measured in terms of assistance required to complete a task. FIM ratings are also presented as Motor and Cognitive subscales. The Motor subscale includes 13 items assessing self-care, sphincter control, mobility and locomotion. The Cognitive subscale includes 5 items examining communication and social cognition. The reliability, validity and responsiveness of the FIM have been established.^{14–16}

The data collected in 2000 and 2001 included the original UDSMR protocol for administering the FIM instrument (version 5.1). In 2002, the FIM was integrated into the *Inpatient Rehabilitation Facilities-Patient Assessment Instrument* (IRF-PAI) developed by the Centers for Medicare and Medicaid Services (CMS) as part of the prospective payment system for inpatient rehabilitation facilities.¹⁷ Some changes were made to the FIM protocol and rating procedures. These changes have been described in documents produced by CMS¹⁸ and in recent publications and will not be presented in detail here.^{19,20} The major changes potentially impacting comparisons between pre-PPS and PPS FIM data include the following: 1) admission and discharge assessment time frame, 2) use of 0 for some admission motor items, 3) change in recording for bowel and bladder management, and 4) change in definition for program interruption.

Variable Definitions

Consistent with prior reports in this series, specific terms and variables used within rehabilitation and the UDSMR datasets are described below.

Case-mix groups (CMGs) refer to the patient classification system and are used to determine facility reimbursement for Medicare Part A fee-for-service inpatient care. Each Medicare beneficiary is assigned to a CMG at admission to an inpatient rehabilitation facility depending on his or her primary medical condition or impairment, FIM rating, and (for select CMGs) age.²¹ We include five CMGs related to unilateral and bilateral hip fracture in this report (CMGs 701–705), but do not include the small percentage of patients within these CMG categories with femur or pelvic fractures. In addition, there are four potentially related CMGs that include multiple fractures (CMGs 1701–1704). Due to differing clinical presentation and management of these two groups, and to make interpretation easier, this report focuses on data from the larger hip fracture group. Only limited information pertaining to the femur, pelvic, and multiple fracture groups is presented in this report.

CMG comorbidity tiers represent another factor that affects facility reimbursement from the CMS. Relative weightings (which are converted to payments) are stratified by tier across each CMG based on the presence of specific comorbidities associated with increased costs.²² These payment adjustments for comorbidities consist of a four-tier system: Tier 1 (high cost), Tier 2 (medium cost), Tier 3 (low cost), and no Tier.²³

Community discharge identifies patients discharged to a community-based setting: home or an assisted living, a board and care, or a transitional living setting.

FIM efficiency refers to the average change in total FIM instrument ratings per day. It is calculated for each patient by subtracting FIM admission from FIM discharge ratings and then dividing by length of stay in days.

FIM gain is the difference between total FIM instrument admission and total FIM discharge ratings.

Length of stay (LOS) is the total number of days spent in the rehabilitation facility. Interim days spent in an acute care setting resulting in a program interruption are not included in this value.

Onset to admit quantifies the duration (in days) from impairment onset to rehabilitation admission.

Program interruption identifies patients who were temporarily (≤ 30 days in 2000 and 2001 and ≤ 3 days beginning in 2002) transferred to an acute care setting and then returned for additional inpatient rehabilitation services.

Year discharged refers to the date of discharge from inpatient rehabilitation in relation to the Federal fiscal year. The Federal fiscal year runs from October 1 through September 30; e.g., fiscal year 2006 includes 10/1/2005 – 9/30/2006. CMS policy changes governing inpatient rehabilitation are traditionally implemented at the beginning of the fiscal rather than the calendar year.

Inclusion Criteria

We applied five criteria for cases to be included in this report: 1) the patient received initial rehabilitation services following hip fracture (i.e., no admits for evaluation or readmissions, etc.), 2) the record could not have missing data for key benchmarking variables such as discharge setting or FIM ratings, 3) the patient had to be between the ages of 7 and 105 years at admission, 4) the duration from impairment onset to rehabilitation admission could not exceed 365 days (1 year), and 5) the total length of stay could not exceed 548 days (1.5 years). These criteria have been used in previous reports in this series.

Descriptive Summary of Aggregate Data

The number of contributing facilities ranged from 785 to 893 across the 8-year study period. Table 1 shows the patient characteristics, the percentage of patients receiving care by hospital type, primary insurance classification and outcomes of interest from 2000 to 2008.

Of the original 325,527 patients admitted to IRF following hip fracture, 16,385 were not admitted for initial rehabilitation, 5,016 experienced their fracture more than 1 year prior to rehabilitation admission, 516 either died or their discharge setting was missing, and 16 did not fit the desired age range. All descriptive statistics (means, standard deviations, counts, and percentages) represent unadjusted aggregate values from the remaining 303,594 patients meeting the inclusion criteria. Thus, 93% of the original sample is included in this report.

The text below provides summary statistics and trends for select variables. While the content and arrangement of this report suggest longitudinal comparisons, caution must be used when interpreting trends. As stated in the previous section, the IRF-PAI developed for PPS contained assessment and coding changes beginning in 2002. Moreover, additional PPS-related modifications have been introduced over the years. Thus, some of the year-to-year differences may not reflect true changes in rehabilitation services or patient care/outcomes. Rather, the observed differences may reflect changes in classification and/or documentation processes.^{19,20}

Patient Characteristics

Table 1 displays total and yearly summary statistics for general characteristics of hip fracture rehabilitation patients. Mean age of the entire sample was 78.5 years and it remained consistent over the 8-year study period.

Gender, marital status, and race/ethnicity demonstrated consistent patterns across all years; the sample was approximately 70% women, 60% unmarried, and 90% non-Hispanic white across each study year. Medicare was the most common primary payer category (84%) followed by commercial insurance (6%). Medicare managed care (advantage) programs showed the largest percentage increases over time, whereas private managed care demonstrated the largest percentage decreases.

Overall, 97% of patients were admitted to inpatient rehabilitation directly from acute care. Approximately three-quarters of the individuals were discharged to the community following rehabilitation. There was, however, a steady downward trend across the 8-year period: 78% (2000) to 70% (2008). The decline in community discharges corresponds to a sudden rise in acute-care readmissions in 2002 which reflect PPS-changes in the definition and coding of program interruptions as well as real changes in the percentage of patients who returned home.¹⁹ Figure 1 shows these changes in terms of discharges to acute care and program interruptions.

Length of Stay and Functional Status

Table 1 also provides descriptive information for length of stay and functional status (FIM total) at admission and discharge as well as gains in functional status. Figures 2 and 3 display trends in these outcomes over time. After the PPS-related changes from 2001 to 2002, length of stay and both FIM admission and FIM discharge ratings demonstrated consistent gradual decreases from each year.

Table 2 shows mean admission, discharge, and change values for individual items within each of the 6 functional domains of the FIM. All 6 domains demonstrated gradual decreases across the study period in both admission and discharge ratings. Not surprisingly, locomotion items yielded the lowest admission and discharge mean ratings among the 4 domains of the motor subscale.

Table 3 shows summary comparisons by community discharge setting for patient age, length of stay, functional status at admission and discharge as well as changes during rehabilitation. Patients who returned to the community following rehabilitation had higher admission and discharge FIM ratings, shorter lengths of stay, and were younger than their institutionalized counterparts. Those discharged to the community also had greater gains during rehabilitation (functional gain and efficiency). In 2000, those discharged to the community stayed on average 1.5 days less and their mean discharge FIM rating was 21.7 points higher than those discharged to institutional settings. By 2008, the difference in mean length of stay decreased to 0.3 days and the difference in mean FIM ratings remained stable at 21.3 points in favor of those going to community settings.

Figures 4–7 display mean ratings for all 18 FIM items. The figure legends present the average discharge ratings over 8 years for the motor and cognitive subscale items. Among the 13 motor items, patients with hip fracture showed the most difficulty with stair use, followed by transfers to or from a tub/shower, walking/wheelchair use, and lower body dressing (see Figures 4 and 5). Figure 6 depicts a trend of decreasing cognition at admission across the 8-year period, with a similar but less pronounced decrease in discharge cognitive ratings over the same period (see Figure 7).

Case Severity

Unilateral hip fractures represented more than 99% of the cases within each yearly cohort. Case-mix Group (CMG) assignment was introduced as part of the PPS in 2002 so we report data from that point forward (Table 4). The number of CMGs for hip fracture was decreased from 5 to 4 in fiscal year 2006. Prior to the decrease, the most severe category (CMG 705) was the most commonly assigned category representing between 47% and 56% of cases from 2002–2005. Following the change in 2006 the most severe category (CMG 704) represented a greater percentage of cases; it increased from approximately 51% to 56% during the 2006 to 2008 period.

With regard to CMG comorbidity tier, Figure 8 shows the percentages of patients assigned to each level. The tier criteria have been revised over the years and the Figure displays the tier structure in place for that year. Overall, more than 75% of cases were classified as non-tier over the study period. Among the 3 tier levels that affect Medicare reimbursement, tier 1 (high cost) ranged from 1–3% of cases over the 8-year study period.

Deaths

Approximately 0.15% of patients died during their rehabilitation stay over the 8-year study period. Comparing yearly values for those who died (Table 5) with those who survived (Table 1) shows that the patients who died were approximately 5 years older with a functional status at admission 15 FIM points lower than those who survived.

Lower Extremity and Multiple Fractures Group

The brief summaries for lower extremity and multiple fracture patients in this section are included to describe similarities and differences between the distinct orthopedic impairment groups, but the data are not presented in the tables or figures in this report. The lower extremity fracture group (16%) within CMGs 701–705 and the multiple fracture group (10%) within CMGs 1701 to 1704 represent smaller portions of the overall inpatient rehabilitation fracture population and these cohorts are different than the larger hip fracture only group. The lower extremity (72.3 yrs) and multiple fracture (58.2 yrs) cohorts were younger than hip fracture only patients (78.5 yrs). Persons with multiple fracture were more likely to be men (43%) and to be married (44%) compared to the lower extremity and hip fracture groups: men = 27% and married = 38% for both groups. Percentage of patients with Medicare coverage decreased from hip (84%) to lower extremity (72%) to multiple (39%) fracture groups. Duration from impairment onset to admission for the hip and lower extremity fracture groups was 7.2 and 8.0 days, respectively. Duration for the multiple fracture group was 12.5 days. Length of stay was similar (approximately 13.5 days) across all 3 cohorts. Admission (68) and discharge (94) FIM ratings were slightly higher in both the lower extremity and multiple fracture groups compared with the hip fracture only group: admission = 65 and discharge = 89. FIM efficiency ranged from 2.1 for the hip and lower extremity fracture groups to 2.4 for the multiple fracture group.

DISCUSSION AND CONCLUSIONS

This report provides aggregated national summary statistics for a broad range of patient characteristics and outcomes from more than 300,000 patients with hip fracture discharged from inpatient medical rehabilitation programs from 2000 through 2007. Caution must be used in interpreting the year-to-year changes or trends in the data presented in this report. Changes over time may be related to CMS-mandated modifications in documentation, eligibility, and/or reimbursement processes implemented during the period covered by this report.¹⁹

Gender and race/ethnicity and marital status show consistent patterns across years with women, non-Hispanics whites, and non-married patients representing the majority of their respective demographic categories. The 75+ age group represents the largest group of patients with Medicare being the most common primary insurance. More patients lived with others than alone prior to rehabilitation, and a majority was admitted from acute care settings. Over the course of the study period the number of days to admission remained relatively stable.

Both admission and discharge functional ratings show gradual declines over the 8-year period (Figure 2). The decline has been greater in admission functional rating than in discharge ratings resulting in higher functional gains over time (Figure 3). Length of stay decreased slightly over the 8-year period. With regard to FIM items, stair use is the most difficult functional area for patients after hip fracture just as it is for other rehabilitation impairment groups.¹⁻³ Stairs, transfers, walking, and lower body dressing are the most problematic functional areas (FIM items) following hip fracture (Figures 4 & 5).

Over the 8-year study period the percentage of patients discharged to community settings gradually decreased. This decline is likely due to multiple factors that include the patients' functional abilities, the amount of social supports and resources, and policies and procedures influencing admission and discharge patterns. For example, PPS definition changes in program interruptions had a direct effect on discharge settings²⁴ (Figure 1).

The UDSMR recommends that when rehabilitation facilities compare their own data to published benchmark information they should: 1) identify by the discharge date the period of interest using at least a full calendar year's data, 2) include information on all patients within the pertinent impairment group and period under review, and 3) include statistics that show patient variability such as standard deviations. Meaningful comparison of outcomes across settings (e.g., facility vs. national data) requires case-mix adjustment. The process of case-mix adjusting "levels the playing field" by controlling factors (i.e., impairment severity, patient age) other than treatment that may influence the outcome.²²

The information presented in this report using national data from the UDSMR provides descriptive statistics for the rehabilitation impairment category of hip fracture. It is important to understand that the current article, and previous articles in this series, examining UDSMR data are designed to provide the field with descriptive benchmark information. These articles are not hypothesis driven investigations. We have not proposed a specific research question, developed a hypothesis, and then attempted to statistically evaluate or interpreted the data based on that hypothesis. Rather, our goal is to report facts and figures that convey information regarding the status of indicators relevant to rehabilitation practice and outcomes. This information can be used to generate scientific and policy questions that will be of interest to rehabilitation professionals, researchers, administrators, and consumers. Our hope is that this benchmark information will prove useful in documenting the current status of inpatient rehabilitation outcomes and planning future efforts to improve rehabilitation services.

Acknowledgments

This work was funded in part by grants H133G080163 (Ottenbacher, PI) and H133F090030 (Graham) from the National Institute on Disability and Rehabilitation Research, U.S. Department of Education. The FIM® instrument is a registered trademark of the Uniform Data System for Medical Rehabilitation, a division of UB Foundation Activities, Inc.

References

1. Granger CV, Markello SJ, Graham JE, Deutsch A, Ottenbacher KJ. The uniform data system for medical rehabilitation: report of patients with stroke discharged from comprehensive medical programs in 2000–2007. *Am J Phys Med Rehabil.* 2009; 88(12):961–972. [PubMed: 19935180]
2. Granger CV, Markello SJ, Graham JE, Deutsch A, Reistetter TA, Ottenbacher KJ. The Uniform Data System for Medical Rehabilitation: Report of Patients with Traumatic Brain Injury Discharged from Rehabilitation Programs in 2000–2007. *Am J Phys Med Rehabil.* 2010; 89(4):265–278. [PubMed: 20299850]
3. Granger CV, Markello SJ, Graham JE, Deutsch A, Reistetter TA, Ottenbacher KJ. The Uniform Data System for Medical Rehabilitation report of patients with lower extremity joint replacement discharged from rehabilitation programs in 2000 – 2007. *Am J Phys Med Rehabil.* 2010 In press.
4. Granger CV, Hamilton BB. The Uniform Data System for Medical Rehabilitation Report of First Admissions for 1990. *Am J Phys Med Rehabil.* 1992; 71(2):108–113. [PubMed: 1532719]
5. Granger CV, Hamilton BB. The Uniform Data System for Medical Rehabilitation report of first admissions for 1991. *Am J Phys Med Rehabil.* 1993; 72(1):33–38. [PubMed: 8431265]
6. Granger CV, Hamilton BB. The Uniform Data System for Medical Rehabilitation report of first admissions for 1992. *Am J Phys Med Rehabil.* 1994; 73(1):51–55. [PubMed: 8305182]
7. Granger CV, Ottenbacher KJ, Fiedler RC. The Uniform Data System for Medical Rehabilitation. Report of first admissions for 1993. *Am J Phys Med Rehabil.* 1995; 74(1):62–66. [PubMed: 7873116]
8. Fiedler RC, Granger CV, Ottenbacher KJ. The Uniform Data System for Medical Rehabilitation: report of first admissions for 1994. *Am J Phys Med Rehabil.* 1996; 75(2):125–129. [PubMed: 8630192]
9. Fiedler RC, Granger CV. Uniform data system for medical rehabilitation: report of first admissions for 1995. *Am J Phys Med Rehabil.* 1997; 76(1):76–81. [PubMed: 9036916]
10. Fiedler RC, Granger CV. Uniform data system for medical rehabilitation: report of first admissions for 1996. *Am J Phys Med Rehabil.* 1998; 77(1):69–75. [PubMed: 9482382]
11. Fiedler RC, Granger CV, Russell CF. Uniform Data System for Medical Rehabilitation: report of first admissions for 1997. *Am J Phys Med Rehabil.* 1998; 77(5):444–450. [PubMed: 9798838]
12. Fiedler RC, Granger CV, Post LA. The Uniform Data System for Medical Rehabilitation: report of first admissions for 1998. *Am J Phys Med Rehabil.* 2000; 79(1):87–92. [PubMed: 10678608]
13. Deutsch A, Fiedler RC, Granger CV, Russell CF. The Uniform Data System for Medical Rehabilitation report of patients discharged from comprehensive medical rehabilitation programs in 1999. *Am J Phys Med Rehabil.* 2002; 81(2):133–142. [PubMed: 11807350]
14. Dodds TA, Martin DP, Stolov WC, Deyo RA. A validation of the functional independence measurement and its performance among rehabilitation inpatients. *Arch Phys Med Rehabil.* 1993; 74(5):531–536. [PubMed: 8489365]
15. Ottenbacher KJ, Hsu Y, Granger CV, Fiedler RC. The reliability of the functional independence measure: a quantitative review. *Arch Phys Med Rehabil.* 1996; 77(12):1226–1232. [PubMed: 8976303]
16. Segal ME, Gillard M, Schall R. Telephone and in-person proxy agreement between stroke patients and caregivers for the functional independence measure. *Am J Phys Med Rehabil.* 1996; 75(3):208–212. [PubMed: 8663929]
17. Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) Training Manual. Buffalo, NY: Uniform Data System for Medical Rehabilitation; 2001.
18. Carter GM, Relles DA, Ridgeway GK, Rimes CM. Measuring function for Medicare inpatient rehabilitation payment. *Health Care Financ Rev.* 2003; 24(3):25–44. [PubMed: 12894633]
19. Deutsch A, Granger C, Russel C, Heinemann A, Ottenbacher K. Apparent changes in inpatient rehabilitation facility outcomes due to change in the definition of program interruption. *Arch Phys Med Rehabil.* 2008; 89:2274–2277. [PubMed: 19061738]
20. Granger CV, Deutsch A, Russell C, Black T, Ottenbacher KJ. Modifications of the FIM instrument under the inpatient rehabilitation facility prospective payment system. *Am J Phys Med Rehabil.* 2007; 86(11):883–892. [PubMed: 17873825]

21. UB Foundation Activities. The Inpatient Rehabilitation Facility - Patient Assessment Instrument (IRF-PAI) Training Manual. Centers for Medicare and Medicaid Services; 2004.
<http://www.cms.hhs.gov/InpatientRehabFacPPS/downloads/irfpaimanual040104.pdf>
22. Carter, GM.; Buchanan, JL.; Buntin, MB.; Hayden, O.; Paddock, S.; Relles, DA., et al. Executive Summary of Analyses for the Initial Implementation of the Inpatient Rehabilitation Facility Prospective Payment System. Santa Monica, CA: Rand Corporation; 2002.
23. US Department of Health and Human Services. Federal Register. Vol. 68. 2003. p. 45674-45728.
24. Deutsch A, Granger CV, Russell C, Heinemann AW, Ottenbacher KJ. Apparent changes in inpatient rehabilitation facility outcomes due to a change in the definition of program interruption. *Arch Phys Med Rehabil.* 2008; 89(12):2274–2277. [PubMed: 19061738]

Figure 1.

Percentage of program interruptions and cases discharged to acute care by discharge year. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes. In 2002 the definition for program interruption changed from ≤ 30 days to ≤ 3 days.

Figure 2.

Mean admission and discharge FIM® total ratings by discharge year. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes. In 2002 some rules for completing the FIM instrument items were changed.

Figure 3. Mean FIM® total change and length of stay by discharge year. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes.

Figure 4.

Mean ratings for individual FIM® motor items at admission to inpatient rehabilitation. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes.

Figure 5. Mean ratings for individual FIM® motor items at discharge from inpatient rehabilitation. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes.

Figure 6. Mean ratings for individual FIM® cognitive items at admission to inpatient rehabilitation. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes.

Figure 7. Mean ratings for individual FIM® cognitive items at discharge from inpatient rehabilitation. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes.

Figure 8.

Relative proportions of CMG comorbidity tier assignment under the prospective payment system by discharge year. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. The CMG comorbidity tier system changed over the years.

Table 1

Facility and patient characteristics stratified by discharge year: percentage or mean (sd).

	Total	2000	2001	2002	2003	2004	2005	2006	2007	2008
N	303,594	18,567	29,469	33,369	37,747	40,494	43,266	45,257	44,287	11,138
Facility Type										
Hospital unit	63.7%	65.3%	57.3%	57.2%	62.1%	64.8%	66.4%	67.1%	66.3%	65.3%
Freestanding	36.2%	34.2%	42.6%	42.8%	37.9%	35.2%	33.6%	32.9%	33.7%	34.7%
Age, yrs	78.5 (11.2)	78.1 (11.6)	77.8 (11.7)	78.4 (11.1)	78.3 (11.1)	78.5 (11.1)	78.6 (11.1)	78.8 (11.3)	78.9 (11.1)	78.9 (11.3)
<45	1.4%	2.0%	2.0%	1.5%	1.3%	1.3%	1.3%	1.2%	1.2%	1.0%
45-64	9.0%	8.5%	9.2%	8.6%	9.0%	8.9%	9.2%	9.2%	9.1%	10.0%
65-74	17.2%	17.9%	17.7%	17.7%	17.5%	17.3%	17.3%	16.6%	16.6%	16.6%
75+	72.4%	71.6%	71.0%	72.2%	72.2%	72.4%	72.3%	73.0%	73.2%	72.4%
Gender										
Male	27.6%	26.3%	26.9%	25.8%	27.4%	27.0%	27.9%	28.5%	28.9%	29.9%
Female	72.4%	73.7%	73.1%	74.2%	72.6%	73.0%	72.1%	71.5%	71.1%	70.1%
Married										
yes	38.6%	37.1%	37.5%	37.5%	38.9%	38.1%	38.5%	39.4%	40.0%	40.0%
no	61.4%	62.9%	62.5%	62.5%	61.1%	61.9%	61.5%	60.6%	60.0%	60.0%
Race/ethnicity										
White	90.0%	90.4%	90.5%	90.8%	90.1%	90.1%	89.6%	89.5%	89.5%	89.4%
Black	4.3%	5.1%	4.9%	4.2%	4.4%	4.3%	4.2%	4.1%	4.1%	4.1%
Hispanic	3.7%	2.7%	2.8%	3.1%	3.8%	3.7%	4.1%	4.1%	4.0%	4.5%
Other	2.0%	1.8%	1.8%	1.8%	1.7%	1.8%	2.1%	2.3%	2.4%	2.0%
Primary insurance										
Medicare	83.7%	81.6%	82.2%	84.9%	85.1%	85.2%	85.1%	83.9%	81.5%	79.6%
Medicare managed care	3.6%	3.1%	2.5%	2.7%	2.9%	3.0%	3.2%	3.8%	5.4%	7.2%
Commercial	6.3%	6.9%	7.0%	6.3%	5.9%	5.7%	5.7%	6.1%	6.7%	6.9%
Managed care	2.0%	3.4%	3.9%	2.1%	1.6%	1.4%	1.4%	1.5%	2.0%	1.9%
Medicaid	1.3%	1.5%	1.6%	1.2%	1.4%	1.4%	1.4%	1.2%	1.2%	1.2%
Medicaid managed care	0.3%	0.2%	0.2%	0.3%	0.4%	0.3%	0.4%	0.4%	0.3%	0.4%
Other	2.8%	3.2%	2.6%	2.5%	2.8%	2.9%	2.8%	3.0%	2.8%	2.7%
Living situation (pre)										

	Total	2000	2001	2002	2003	2004	2005	2006	2007	2008
With others	60.3%	57.8%	58.2%	58.7%	60.0%	59.9%	60.8%	61.4%	62.3%	63.0%
Alone	39.1%	41.2%	40.5%	40.7%	39.6%	39.7%	38.7%	38.1%	37.3%	36.5%
Admitted from										
Acute care	97.4%	96.1%	97.2%	97.1%	97.4%	97.5%	97.5%	97.7%	97.7%	97.8%
LTCF	1.4%	2.1%	1.3%	1.4%	1.6%	1.4%	1.4%	1.2%	1.2%	1.1%
Community	0.8%	1.3%	1.3%	1.1%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Setting (post)										
Community	73.2%	77.8%	77.4%	74.6%	74.3%	74.1%	72.2%	70.4%	70.1%	70.0%
LTCF	14.6%	14.1%	14.3%	15.0%	14.2%	14.2%	14.3%	15.5%	15.1%	14.0%
Acute care	6.7%	4.0%	4.5%	6.5%	7.1%	6.9%	7.4%	7.4%	7.3%	7.9%
Rehab/subacute	5.2%	3.4%	3.2%	3.5%	4.1%	4.5%	5.8%	6.6%	7.4%	7.9%
Onset to admission, days	7.2 (12.0)	7.0 (9.5)	7.1 (11.5)	7.5 (13.7)	7.4 (12.0)	7.3 (12.3)	7.3 (12.1)	7.1 (12.1)	6.9 (11.3)	7.2 (12.7)
Length of stay, days	13.6 (6.5)	14.5 (7.9)	14.8 (8.5)	13.9 (6.8)	13.4 (6.4)	13.3 (6.4)	13.6 (6.1)	13.1 (5.7)	13.2 (5.6)	13.3 (5.5)
FIM® total admission	64.8 (16.1)	72.5 (14.5)	71.5 (14.9)	67.5 (15.8)	65.6 (15.9)	64.7 (15.7)	63.0 (15.8)	61.5 (15.9)	60.6 (15.8)	59.9 (15.7)
FIM® total discharge	89.3 (19.6)	95.8 (18.1)	95.3 (18.5)	91.1 (19.8)	89.1 (19.4)	88.9 (19.0)	88.0 (19.6)	86.6 (19.8)	86.4 (19.7)	86.0 (19.8)
Efficiency, change/day	2.1 (1.6)	2.0 (1.6)	2.0 (1.6)	2.0 (1.6)	2.0 (1.6)	2.1 (1.5)	2.1 (1.6)	2.1 (1.5)	2.2 (1.5)	2.2 (1.6)

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes. FIM total ratings include all 13 motor items across all years.

Table 2

Mean ratings for individual items (range 1–7) within each FIM® subscale stratified by discharge year: mean (sd).

FIM® Subscale	Total	2000	2001	2002	2003	2004	2005	2006	2007	2008
Admission										
Self-care	3.5 (0.9)	4.0 (0.9)	3.9 (0.9)	3.7 (0.9)	3.6 (0.9)	3.5 (0.9)	3.4 (0.9)	3.4 (0.9)	3.3 (0.9)	3.3 (0.9)
Sphincter	3.6 (1.8)	4.3 (1.8)	4.2 (1.8)	3.8 (1.8)	3.6 (1.8)	3.6 (1.7)	3.5 (1.7)	3.4 (1.7)	3.3 (1.7)	3.3 (1.7)
Transfer	2.4 (1.0)	2.7 (1.0)	2.6 (1.0)	2.5 (1.0)	2.5 (1.0)	2.5 (1.0)	2.4 (1.0)	2.3 (1.0)	2.3 (1.0)	2.2 (0.9)
Locomotion	1.3 (0.6)	1.4 (0.7)	1.4 (0.7)	1.4 (0.6)	1.3 (0.6)	1.3 (0.6)	1.3 (0.6)	1.3 (0.5)	1.3 (0.5)	1.2 (0.5)
Communication	5.5 (1.4)	6.1 (1.2)	6.1 (1.3)	5.8 (1.4)	5.6 (1.4)	5.5 (1.4)	5.4 (1.4)	5.3 (1.5)	5.2 (1.5)	5.1 (1.5)
Social Cognition	5.1 (1.6)	5.7 (1.4)	5.6 (1.5)	5.3 (1.6)	5.1 (1.6)	5.1 (1.5)	4.9 (1.6)	4.8 (1.6)	4.8 (1.6)	4.7 (1.6)
Discharge										
Self-care	5.1 (1.2)	5.5 (1.1)	5.4 (1.1)	5.2 (1.2)	5.1 (1.2)	5.1 (1.1)	5.0 (1.2)	5.0 (1.2)	4.9 (1.2)	4.9 (1.2)
Sphincter	5.1 (1.7)	5.7 (1.5)	5.7 (1.5)	5.2 (1.7)	5.0 (1.7)	5.0 (1.7)	5.0 (1.7)	4.9 (1.7)	4.9 (1.7)	4.9 (1.7)
Transfer	4.4 (1.3)	4.8 (1.2)	4.7 (1.2)	4.5 (1.3)	4.4 (1.3)	4.4 (1.3)	4.4 (1.3)	4.3 (1.3)	4.3 (1.3)	4.3 (1.3)
Locomotion	3.2 (1.5)	3.5 (1.5)	3.4 (1.5)	3.3 (1.5)	3.2 (1.5)	3.2 (1.5)	3.2 (1.5)	3.1 (1.5)	3.1 (1.5)	3.1 (1.5)
Communication	6.0 (1.2)	6.3 (1.1)	6.3 (1.1)	6.1 (1.2)	6.0 (1.2)	5.9 (1.2)	5.9 (1.2)	5.8 (1.2)	5.8 (1.2)	5.8 (1.2)
Social Cognition	5.6 (1.4)	6.0 (1.3)	5.9 (1.3)	5.7 (1.4)	5.6 (1.4)	5.6 (1.4)	5.5 (1.4)	5.4 (1.4)	5.4 (1.4)	5.4 (1.4)
Change										
Self-care	1.6 (0.9)	1.5 (0.8)	1.5 (0.8)	1.5 (0.9)	1.5 (0.9)	1.5 (0.9)	1.6 (0.9)	1.6 (0.9)	1.6 (0.9)	1.7 (0.9)
Sphincter	1.5 (1.7)	1.3 (1.5)	1.4 (1.5)	1.5 (1.7)	1.4 (1.7)	1.5 (1.7)	1.5 (1.7)	1.5 (1.7)	1.5 (1.7)	1.5 (1.7)
Transfer	2.0 (1.1)	2.1 (1.1)	2.1 (1.1)	2.0 (1.1)	1.9 (1.1)	2.0 (1.1)	2.0 (1.1)	2.0 (1.1)	2.0 (1.2)	2.0 (1.2)
Locomotion	1.9 (1.4)	2.1 (1.4)	2.1 (1.4)	1.9 (1.4)	1.9 (1.4)	1.9 (1.4)	1.9 (1.4)	1.8 (1.4)	1.9 (1.4)	1.9 (1.4)
Communication	0.4 (0.9)	0.2 (0.6)	0.2 (0.6)	0.3 (0.8)	0.4 (0.8)	0.4 (0.9)	0.5 (0.9)	0.5 (0.9)	0.6 (1.0)	0.6 (1.0)
Social Cognition	0.5 (0.9)	0.3 (0.7)	0.3 (0.7)	0.4 (0.8)	0.5 (0.9)	0.5 (0.9)	0.6 (0.9)	0.6 (0.9)	0.7 (1.0)	0.7 (1.0)

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes. Cell values represent mean ratings for individual FIM items within the particular subscale.

Table 3
Patient characteristics according to discharge setting stratified by discharge year: mean (sd).

Community Discharge		Total	2000	2001	2002	2003	2004	2005	2006	2007	2008
Age, yrs	yes	77.2 (11.6)	76.9 (11.9)	76.7 (12.0)	77.2 (11.4)	77.1 (11.4)	77.2 (11.4)	77.2 (11.5)	77.4 (11.7)	77.5 (11.4)	77.4 (11.7)
	no	82.0 (9.4)	82.2 (9.3)	81.8 (9.8)	81.8 (9.6)	81.9 (9.4)	82.0 (9.3)	82.1 (9.3)	82.2 (9.4)	82.1 (9.4)	82.3 (9.4)
Length of stay, days	yes	13.4 (6.3)	14.2 (7.5)	14.4 (8.2)	13.6 (6.5)	13.1 (6.1)	13.1 (6.2)	13.4 (5.8)	12.9 (5.4)	13.0 (5.4)	13.2 (5.2)
	no	14.1 (7.2)	15.7 (8.9)	15.9 (9.2)	14.5 (7.6)	13.9 (7.1)	14.0 (7.1)	14.0 (6.9)	13.6 (6.4)	13.7 (6.1)	13.5 (6.4)
FIM@ total	yes	68.1 (14.9)	75.2 (13.3)	74.4 (13.5)	70.7 (14.5)	68.8 (14.7)	67.8 (14.6)	66.4 (14.6)	65.1 (14.7)	64.1 (14.7)	63.4 (14.6)
admission	no	55.6 (15.6)	63.1 (14.9)	61.8 (15.1)	58.1 (15.9)	56.6 (15.6)	55.8 (15.4)	54.2 (15.3)	53.0 (15.1)	52.4 (15.0)	51.6 (15.0)
FIM@ motor	yes	40.6 (10.1)	45.0 (9.6)	44.4 (9.7)	42.1 (10.1)	41.1 (10.1)	40.4 (10.0)	39.6 (9.9)	38.7 (9.9)	38.1 (9.9)	37.8 (9.8)
admission	no	32.4 (9.8)	37.1 (9.8)	36.1 (9.8)	33.9 (10.0)	33.0 (9.9)	32.6 (9.7)	31.6 (9.5)	30.8 (9.4)	30.4 (9.2)	30.0 (9.3)
FIM@ cognition	yes	27.5 (6.7)	30.2 (5.8)	30.0 (5.9)	28.6 (6.5)	27.7 (6.7)	27.4 (6.6)	26.8 (6.7)	26.4 (6.8)	26.0 (6.8)	25.6 (6.8)
admission	no	23.2 (7.9)	26.1 (7.4)	25.7 (7.7)	24.2 (8.0)	23.6 (7.9)	23.2 (7.8)	22.6 (7.9)	22.2 (7.8)	22.0 (7.8)	21.6 (7.8)
FIM@ total	yes	95.6 (15.4)	100.6 (14.5)	100.5 (14.5)	97.2 (15.5)	95.1 (15.2)	94.8 (15.0)	94.6 (15.2)	93.4 (15.5)	93.2 (15.4)	93.0 (15.4)
discharge	no	72.1 (19.6)	78.9 (19.4)	77.5 (19.6)	73.3 (20.1)	71.9 (19.7)	72.0 (19.0)	70.8 (19.6)	70.3 (19.2)	70.3 (19.1)	69.7 (19.4)
FIM@ motor	yes	65.5 (11.6)	69.2 (11.0)	69.2 (11.0)	66.7 (11.7)	65.1 (11.5)	64.9 (11.5)	64.9 (11.4)	64.0 (11.7)	63.9 (11.7)	63.8 (11.7)
discharge	no	46.9 (14.6)	51.7 (14.5)	50.7 (14.6)	47.9 (14.9)	46.7 (14.6)	46.9 (14.3)	46.0 (14.6)	45.6 (14.3)	45.6 (14.2)	45.4 (14.5)
FIM@ cognition	yes	30.0 (5.4)	31.4 (5.0)	31.3 (5.0)	30.5 (5.4)	30.0 (5.4)	29.9 (5.3)	29.7 (5.4)	29.4 (5.5)	29.3 (5.4)	29.2 (5.4)
discharge	no	25.2 (7.4)	27.2 (7.2)	26.8 (7.3)	25.5 (7.6)	25.2 (7.5)	25.2 (7.2)	24.8 (7.3)	24.6 (7.2)	24.6 (7.2)	24.3 (7.2)
FIM@ total	yes	27.4 (11.6)	25.4 (9.7)	26.1 (10.0)	26.5 (11.2)	26.3 (11.8)	27.0 (11.8)	28.2 (11.8)	28.3 (12.0)	29.2 (12.1)	29.6 (12.0)
change	no	16.5 (13.5)	15.7 (12.1)	15.7 (12.4)	15.2 (13.5)	15.2 (13.6)	16.2 (13.5)	16.6 (13.6)	17.3 (13.6)	17.9 (13.8)	18.1 (14.0)
FIM@ motor	yes	24.9 (9.9)	24.2 (9.0)	24.8 (9.1)	24.7 (9.9)	24 (10.3)	24.5 (10.2)	25.3 (9.9)	25.3 (10.1)	25.8 (10.1)	26.0 (10.0)
change	no	14.5 (11.2)	14.6 (10.5)	14.6 (10.8)	13.9 (11.4)	13.7 (11.3)	14.3 (11.3)	14.4 (11.3)	14.9 (11.2)	15.2 (11.3)	15.3 (11.6)
FIM@ cognition	yes	2.5 (3.9)	1.2 (2.6)	1.3 (2.7)	1.8 (3.5)	2.3 (3.8)	2.5 (3.9)	2.9 (4.1)	3.0 (4.2)	3.3 (4.3)	3.5 (4.3)
change	no	2.0 (4.5)	1.1 (3.5)	1.1 (3.7)	1.3 (4.3)	1.5 (4.4)	1.9 (4.4)	2.2 (4.6)	2.4 (4.7)	2.7 (4.8)	2.7 (4.9)
Efficiency, change/day	yes	2.4 (1.4)	2.2 (1.5)	2.3 (1.5)	2.3 (1.4)	2.3 (1.4)	2.4 (1.4)	2.4 (1.4)	2.5 (1.4)	2.5 (1.4)	2.5 (1.4)
	no	1.2 (1.6)	1.1 (1.6)	1.1 (1.6)	1.1 (1.6)	1.1 (1.8)	1.2 (1.6)	1.2 (1.6)	1.3 (1.5)	1.3 (1.5)	1.4 (1.8)

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes.

Table 4

Case-mix group (CMG) stratified by discharge year: percentage.

CMG	2002	2003	2004	2005	2006	2007	2008
0701	8.0%	6.8%	5.5%	4.5%	6.3%	5.8%	5.5%
0702	16.2%	15.3%	14.4%	12.6%	20.0%	18.6%	17.1%
0703	13.7%	14.2%	13.5%	12.4%	22.9%	21.8%	21.6%
0704	15.2%	14.5%	14.7%	14.4%	50.8%	53.9%	55.7%
0705	46.9%	49.3%	51.9%	56.1%			

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. The number of lower extremity fracture CMGs was reduced from 5 to 4 beginning in fiscal year 2006.

Table 5
 Characteristics of patients who died during inpatient rehabilitation by year of death: mean (sd).

	Total	2000	2001	2002	2003	2004	2005	2006	2007	2008
Died, N	449	40	36	51	57	64	63	66	55	17
Died, %	0.1%	0.2%	0.1%	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.2%
Age, yrs	83.5 (8.5)	82.4 (10.0)	80.7 (10.6)	84.6 (7.6)	83.6 (7.6)	82.7 (9.6)	82.4 (8.2)	83.5 (8)	85.9 (6.7)	86.7 (7.6)
FIM@ total admission	49.5 (18.1)	57.6 (17.3)	56.3 (16.7)	51.3 (17.4)	49.6 (18.8)	50.5 (17.8)	50.3 (15.4)	43.6 (18.7)	45.8 (17.9)	39.4 (19.9)
Onset to admission, days	7.5 (5.9)	8.5 (8.7)	5.7 (3.6)	6.6 (3.2)	7.3 (5.7)	7.4 (4.5)	8.7 (6.6)	6.4 (5.0)	8.5 (8.3)	7.9 (4.5)
Length of stay, days	9.2 (7.4)	11.4 (9.4)	12.1 (9.9)	10.2 (7.9)	9.5 (7.3)	7.9 (5.9)	8.5 (6.2)	8.4 (7.1)	8.7 (6.2)	6.8 (5.5)

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Dashed vertical line signifies introduction of the prospective payment system (PPS), resulting in substantial changes to functional evaluation and patient management processes. Note: % is calculated from the total sample with complete data, including both survivors and non-survivors: N = 304,043.