

# Outcomes for Aging Adults Following Total Hip Arthroplasty in an Acute Rehabilitation Facility Versus a Subacute Rehabilitation Facility: A Pilot Study

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## ABSTRACT

**Purpose:** The purpose of our study was to determine if aging adults who received rehabilitation following total hip arthroplasty (THA) due to osteoarthritis had better short-term outcomes in an Inpatient Rehabilitation Facility (IRF) compared with those currently receiving rehabilitation in subacute rehabilitation units. **Methods:** Thirty-six adults, aged 65 to 88 years, who received inpatient rehabilitation following THA secondary to osteoarthritis participated in this study. A prospective descriptive study of 4 aging adults receiving rehabilitation in 2 subacute rehabilitation facilities and a retrospective descriptive study of 32 aging adults who received rehabilitation in an IRF were conducted. Socioeconomic, medical, rehabilitative care, and demographic data were obtained by review of participants' medical charts. FIM scores of the aging adults in the IRF were obtained by chart review, while FIM scores of the aging adults in the subacute facilities were collected by one of the investigators. **Results:** In this sample, the aging adults in the IRF appeared to have greater changes in total FIM score, motor subscale FIM score, and self-care subscale FIM score than the aging adults in the subacute facilities. In this sample, discharge setting appeared similar for the aging adults in the two rehabilitation settings. **Conclusions:** It is imperative that further research determine if rehabilitation provided in different settings that offer different intensities and durations of rehabilitation affects functional outcomes for aging adults following THA procedures.

**Key Words:** total hip arthroplasty, inpatient rehabilitation facility, subacute rehabilitation facility

## INTRODUCTION

Osteoarthritis (OA) of the hip, common among aging adults, accounts for the majority of the 168,000 total hip arthroplasties (THA) performed in the US per year.<sup>1-3</sup> The average total cost of care following a total hip arthroplasty in 1996 was

\$12,382.<sup>4</sup> From 2000 to 2040, the number of people aged 65 or older is projected to increase from 34.8 million to 77.2 million,<sup>5</sup> thereby substantially increasing the projected number of aging adults undergoing total hip arthroplasty. Potential rehabilitation settings for these aging adults following the acute care hospital stay include inpatient rehabilitation facilities (IRF), subacute rehabilitation units, at home care, or outpatient facilities. The intensity of therapy varies across these rehabilitation settings. The decision for discharge setting following acute care can be influenced by health care policy. Thus, the outcomes and costs associated with this procedure are becoming increasingly important to health care providers, the Centers of Medicare and Medicaid Services (CMS), and health care consumers.

Recently, CMS has suggested enforcing Section 412.23(B) (2) of the IRF Prospective Payment System (PPS), commonly known as the 75% rule. This rule states that at least 75% of the patient population receiving rehabilitation services in an IRF must have one or more of the following conditions: stroke, spinal cord injury, congenital deformity, amputations, major multiple trauma, fracture of femur (hip fracture), brain injury, polyarthritis including rheumatoid arthritis, neurological disorders, or burns, in order for that facility to qualify as an IRF. CMS' suggested enforcement of the 75% rule has likely altered the postacute care rehabilitation setting from IRFs to subacute units for some aging adults following hip arthroplasty.<sup>6,7</sup> An IRF must provide each patient with 3 or more hours of skilled therapy at least 5 times per week and physician visits every 2 to 3 days.<sup>8,9</sup> In comparison, there is no time requirement for patients' skilled therapy in a subacute rehabilitation facility and physicians are only required to visit the facility every 30 days.<sup>7</sup> The greater intensity of therapy required in IRFs may provide greater functional outcomes than subacute units for aging adults following total hip arthroplasty, but there are currently no data to support this assumption.<sup>7</sup>

Little is known about the effects of IRF and subacute rehabilitation settings on outcomes following total hip arthroplasty, but some investigators have studied the effects of different rehabilitation settings for aging adults with hip fractures. Kane et al<sup>10</sup> studied adults 65 years of age or older with hip fractures discharged from acute care hospitals to IRFs, subacute rehabilitation facilities, nursing homes, home with formal home health services, or home without formal home health services. In an earlier study, Kane et al<sup>9</sup> analyzed 371 aging adults with hip fractures discharged from acute care hospitals to IRFs, subacute rehabilitation facilities, and nursing homes. In both studies, patients with higher premorbid activities of daily living (ADL) scores who were discharged to IRFs had significantly greater ADL scores at 6 weeks, 6 months, and 1 year postdischarge from the acute care hospital than those discharged to subacute rehabilitation facilities.

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There was no difference for aging adults with lower premorbid ADL scores by facility at any of the data collection times. Kramer et al<sup>11</sup> prospectively studied subjects 65 years or older admitted to IRFs and subacute rehabilitation facilities within 30 days of an acute hospital stay following hip fracture. These authors reported that more of these aging adults were discharged to a community setting from IRFs than from subacute facilities, but this related to differences in the characteristics of the aging adults between the facilities, rather than treatment variations between the facilities (aging adults admitted to subacute rehabilitation facilities were more likely to be older, have more co-morbidities, less likely to have a caregiver, and have lower premorbid function and cognition than aging adults admitted to IRFs).

There is some evidence that greater number of therapy visits and/or length of each visit improves outcomes for aging adults following hip arthroplasty, especially those following total hip arthroplasty. Freburger<sup>4</sup> studied the effect of intensity of physical therapy treatment in an acute care setting on outcomes for patients following THA. Increased intensity of physical therapy treatment, as measured by the total episodic cost of physical therapy services, was significantly associated with greater probability of a discharge to home and a reduction in total cost of care. Munin and colleagues<sup>2</sup> investigated the effect of transferring aging adults to an IRF to receive more intensive rehabilitation, on postoperative day 3, versus day 7, following total hip arthroplasty. The aging adults receiving the higher intensity rehabilitation services sooner had reduced length of stay in the IRF, reduced total costs, and a greater increase in daily Functional Independence Measure (FIM) scores. However, FIM scores at 4 months postoperatively were no different than the aging adults who transferred to an IRF 7 days postoperatively. Potentially, the lack of sensitivity of the FIM to higher community level functioning may have accounted for the lack of differences in FIM scores at the 4-month follow-up.

Chen et al<sup>12</sup> investigated the effect of therapy intensity on FIM scores for aging adults with a variety of orthopedic conditions (29% of the conditions were hip fracture and 19% were post-total hip arthroplasty) receiving rehabilitation in subacute rehabilitation facilities. The average age of their subjects was 76 years (SD 12 years). They reported more intense therapy was significantly associated with greater gains in self-care activities, but not mobility activities. Hoenig et al<sup>13</sup> investigated the effect of the frequency of physical therapy (PT) and occupational therapy (OT) on the outcomes of patients 65 years or older admitted to acute care hospitals from community settings following acute hip fractures that were treated surgically. The aging adults in their study receiving high frequency PT/OT ambulated 2.2 days sooner than those receiving low-frequency PT/OT, but high frequency PT/OT did not significantly reduce length of stay or increase discharge to a home setting. Hoenig and colleagues defined ambulation as any level of ambulation, whether assisted/unassisted or with or without ambulation device, as distinguished from bed rest or transfers to sitting. Huusko et al<sup>14</sup> investigated the effect of higher frequency of physical therapy visits on aging adults undergoing rehabilitation following hip fracture. Aging adults in the more intensive rehabilitation group had significantly shorter lengths of hospital stay and better short-term ADL scores, but there was no difference in ADL scores one year following surgical intervention for the fracture.

In summary, there may be a correlation between type of rehabilitation setting and discharge setting, as well as intensity of therapy and change in FIM scores. Previous research has investigated this issue more extensively for aging adults with hip fractures than with total hip replacements secondary to osteoarthritis. The purpose of this study was to compare the short-term functional outcomes in an IRF for aging adults following total hip arthroplasty (who would not now qualify for an IRF setting under the 75% rule) with the short-term functional outcomes in a subacute unit for aging adults following total hip arthroplasty (who would have qualified for an IRF prior to the proposed enforcement of the 75% rule). The hypothesis was that aging adults who previously received postacute rehabilitation in an IRF had greater short-term functional outcomes than aging adults who currently receive postacute care rehabilitation in a subacute unit.

## METHODS

### Research Design

This was a descriptive study. A prospective study of aging adults undergoing rehabilitation in 2 subacute rehabilitation facilities and a retrospective study of aging adults discharged from an inpatient rehabilitation facility were conducted.

### Participants

Thirty-six participants aged 65 to 88 years who received rehabilitation in an inpatient setting following a total hip arthroplasty procedure participated in this study. Thirty-two of these participants were discharged from one inpatient rehabilitation facility housed in an acute geriatric hospital. The remaining 4 participants were admitted to, and discharged from, 2 subacute rehabilitation facilities housed in skilled nursing facilities. In the subacute rehabilitation facilities, 11 aging adults met the eligibility criteria; however, only 5 enrolled in the study, and 1 of the 5 withdrew from the study. The patient who withdrew from the study stated that a family member feared her participation in the study would result in an extension of her time undergoing rehabilitation. All patients in both rehabilitation settings met the selection criteria of 65 to 88 years of age and a minimum stay of 5 days in an inpatient rehabilitation facility (either an IRF or subacute facility) following an acute care hospital stay to receive a THA due to osteoarthritis. Data about those receiving care in the IRF was collected via retrospective chart review of aging adults discharged between April of 2002 and October of 2003. The participants in the subacute rehabilitation units were recruited to enroll in the study between January of 2005 and April of 2006. All participants in the subacute rehabilitation units signed an informed consent form prior to participation in the study.

Aging adults were excluded from the study if they had a body mass index (BMI) of 50 or more or underwent 2 or more joint arthroplasty procedures or a revision of an arthroplasty procedure during the preceding acute care hospital stay. These exclusion criteria were chosen because the CMS provides exceptions to the "75% rule" for aging adults following hip arthroplasty procedures based on these three criteria.<sup>6</sup> Aging adults were also excluded if they were diagnosed with a co-morbidity consisting of one of 10 conditions the CMS considers when classifying a facility as an inpatient rehabilitation facility (stroke, spinal cord injury, congenital deformity, amputation, major multiple trauma, fracture

of femur, brain injury, neurological disorders [including multiple sclerosis, motor neuron diseases, polyneuropathy, muscular dystrophy, and Parkinson disease] and burns).

The Institutional Review Board (IRB) at Emory University approved the protocol, informed consent, a full HIPAA waiver for the participants previously discharged from the IRF, and a partial HIPAA waiver (to study potential participants' medical records to determine their eligibility for the study) for participants to be recruited from the subacute rehabilitation facilities.

### Measures

Functional Independence Measure (FIM) scores at admission and discharge for participants in the subacute facilities were all obtained by the same investigator. The FIM provides an estimate of the burden of care.<sup>15</sup> It consists of 18 items, which are rated from complete dependence (score of 1) to complete independence (score of 7). The lowest total FIM score possible is 18 and the highest 126.<sup>15</sup> Other measures were obtained from the medical records of participants discharged from the IRF or subacute rehabilitation facilities.

### Outcome measures

Functional Independence Measure (FIM) total scores and motor and self-care subscale scores were recorded at admission and discharge. The scoring was determined by observed performance, except for the aging adults' toilet, tub, and shower transfers in the subacute facilities, which were determined by self-report. Validity of the FIM has been established for patients receiving inpatient rehabilitation<sup>16</sup> and reliability among adults across a wide spectrum of health conditions has also been established.<sup>17</sup> Walker et al<sup>18</sup> established validity and reliability of the FIM specifically among adults receiving inpatient rehabilitation following THA and reported an average increase of 18 points on the FIM for adults following primary THA.

The outcome variables were change in total FIM score (defined as total FIM at discharge minus the total FIM score at admission), change in motor FIM score, change in self-care FIM score, and discharge setting. Discharge setting after leaving the IRF or subacute rehabilitation facilities was categorized as: private home/apartment, board and care/assisted living/group home, nursing home, acute care hospital, psychiatric hospital, rehabilitation hospital, or other.

### Medical variables

Length of stay in the acute care hospital was measured as the number of calendar days the participant remained in the hospital. The number of postoperative complications and co-morbidities were extracted from the hospital admission form for each participant in the inpatient rehabilitation settings. The continence score at discharge for each participant was recorded as the sum of the 2 bowel and bladder items on the FIM. Height and weight, measured in inches and pounds, respectively, were recorded from either the nutritional evaluation form or the nursing admission form. Body mass index was determined based on height and weight as defined by the Centers for Disease Control.

### Socioeconomic status variables

All of the socioeconomic status (SES) variables were obtained from the standard admission face sheet. The highest educational

level was measured as: completing no schooling, 8<sup>th</sup> grade or less, 9-11 grades, high school, technical or trade school, some college, bachelor's degree, or graduate degree. Each participant's occupation or former occupation, was coded using the US Bureau of Census occupational categories<sup>5</sup> and occupational prestige scores were assigned using the National Opinion Research Center's scoring system.<sup>19</sup> Primary and secondary insurance were categorized by Medicare Part A, Medicare Part B, Blue Cross & Blue Shield, Medicaid, or other.

### Demographic variables

Demographic variables, including sex and race, were obtained from the standard admission face sheet.

### Social variables

The social variables were extracted from the standard admission face sheet. Participants' marital status was categorized as: never married, married, widowed, separated, or divorced. Participants' living status prior to admission was categorized as either living in a private home/apartment or living in another facility. If the participant was admitted to the acute care hospital from home, their prior living status was categorized as lived alone or with other(s). If the participant was discharged home after rehabilitation, presence of a caregiver was measured as present or absent.

### Rehabilitative care variables

The amount of physician care was measured in number of interventions to reflect the intensity of physician care. Interventions were defined as a new prescription, a change or a discontinuation of a medication, or performance of a medical test such as x-rays, CT scans, MRIs, and laboratory procedures. Prescriptions of medical equipment or referral of the participant to another medical service following discharge from the hospital were not included as physician interventions. All orders at admission were documented as one physician intervention. The LOS in the rehabilitation facility was measured as the amount of calendar days from admission to discharge. The FIM cognitive subscale at admission and discharge was determined by summing the last 5 items on the FIM performance measure. The amount of PT and OT interventions, measured in total units of time and average units per day were based on Medicare guidelines, as charged by the physical or occupational therapist for each participant.

### Procedures

Potentially eligible participants discharged from the IRF between April 1, 2002 and October 1, 2003 were identified by an electronic database search of diagnoses of osteoarthritis of the hip or total hip arthroplasty. Each potential participant's medical record was assessed to determine eligibility for this study. If eligible for the study, all variables of interest were documented based on the medical record. Investigators performed a retrospective review of medical charts for medical, demographic, socioeconomic, and social variables as well as FIM scores and discharge setting from the IRF.

Every fourth chart was reviewed by a second investigator to determine the interrater reliability of data extraction for nine variables. The 9 variables were total units of physical therapy time, total units of occupational therapy time, number of physician interventions,

the setting from which the aging adult was admitted to the acute care hospital, discharge setting, number of postoperative complications, number of co-morbidities, length of stay in the acute care hospital, and the length of stay in the rehabilitation facility.

Simultaneous to determining eligibility and collecting data from participants previously discharged from the IRF, admissions personnel in the subacute rehabilitation facilities identified potentially eligible participants admitted with diagnoses of osteoarthritis of the hip or total hip arthroplasty to one investigator. That investigator then accessed the potential participant's medical records to determine their eligibility. If eligible for the study, the investigator approached the potential participant, explained the study, and asked if he or she was interested in enrolling. The investigator obtained signed informed consent forms from those who agreed to participate.

The investigator obtained Functional Independence Measure (FIM) data within 72 hours of the participants' admittance to the subacute facility and then again within 72 hours of discharge from the facility (the investigator received FIM certification prior to data collection). The investigator involved in conducting the FIM on the participants in subacute facilities was blinded to the FIM scores and discharge setting of the participants discharged from the IRF.

Following discharge from the subacute rehabilitation facility, each participant's chart was then reviewed for the additional variables of interest. Due to the low number of participants, all 4 subacute participant's charts were reviewed by a second investigator to assess interrater reliability for the 9 variables previously identified.

### Data Analysis

Participant characteristics were summarized using means and standard deviations for continuous variables (Table 1) or percentages for categorical variables (Table 2). Statistical analyses of differences between the 2 groups were not appropriate due to the low number of subjects in the subacute facilities. The interrater reliability of 7 continuous variables was analyzed using an interclass correlation coefficient (ICC). These included total units of PT time, total units of OT time, number of physician interventions, number of postoperative complications, number of co-morbidities, length of stay in the acute care hospital, and length of stay in the rehabilitation facility. The interrater reliability of two categorical variables was analyzed using a kappa statistic (the setting from which the patient was admitted to the acute care hospital and discharge setting).

### RESULTS

Descriptive statistics for the IRF and subacute patients are presented in Tables 1 and 2. Interrater reliability for the 7 continuous variables among the IRF and the subacute participants were above the accepted reliability level of 0.80 with an ICC of 0.80-0.99 except for the number of postoperative complications, which had an ICC of 0.76. Interrater reliability for the 2 categorical variables (setting from which the patient was admitted to the acute care hospital and discharge setting) was high with a kappa statistic of 1.00 due to perfect agreement between both raters for all participants with reliability data.

### DISCUSSION

Previous research demonstrated that aging adults receiving rehabilitation for hip fractures and joint replacements in subacute facilities had an average positive FIM change score of less than 24 and a

**Table 1. Characteristics of Participants in Inpatient Rehabilitation Facilities (IRFs) and Subacute Facilities Reported in Means (Standard Deviations)**

Patient Characteristics	Rehabilitation Setting	
	IRF(n=32)	Subacute(n=4)
Age (years)	77.28 (4.81)	79.00 (5.83)
Body Mass Index (kg/m <sup>2</sup> )	29.58 (4.81)	28.00 (8.22)
LOS <sup>a</sup> acute care (days)	5.56 (2.91)	6.50 (3.00)
Number of post-operative complications	0.68 (1.09)	0.80 (0.84)
Number of co-morbidities	7.22 (2.11)	5.40 (2.07)
Continence at discharge <sup>b</sup>	12.84 (1.97)	11.00 (6.00)
Number of Physician Interventions	15.22 (5.98)	11.40 (14.40)
LOS in rehabilitation facility (days)	8.59 (2.56)	20.25 (10.72)
Total FIM <sup>c</sup> at admission	72.09 (10.90)	80.25 (20.45)
Total FIM at discharge	98.44 (9.45)	98.5 (17.25)
FIM cognitive subscale at discharge	1.78 (2.27)	0.25 (0.50)
PT <sup>d</sup> total units of time	23.81 (9.73)	52.25 (4.11)
PT units of time per day	2.73 (0.61)	2.99 (1.13)
OT <sup>e</sup> total units of time	28.06 (10.26)	51.75 (12.37)
OT units of time per day	3.24 (0.55)	2.85 (0.92)
Total FIM score change	26.34 (7.58)	18.25 (4.11)
Motor FIM score change	25.88 (6.57)	20.00 (4.69)
Self-Care FIM score change	11.53 (3.39)	1.75 (1.71)

<sup>a</sup>LOS=length of stay, <sup>b</sup>sum of the 4 FIM items related to bowel and bladder function <sup>c</sup>FIM=Functional Independence Measure, <sup>d</sup>PT=physical therapy, <sup>e</sup>OT=occupational therapy

**Table 2. Characteristics of Participants in Inpatient Rehabilitation Facilities (IRF) and Subacute Facilities Reported in Percentages**

Patient Characteristics	IRF (n=32)	Subacute (n=4)
D/C Setting		
Private home/ Apartment	87.5	75
Boardcare/ Assist Living/ Group Home	9.4	25
Nursing Home	3.1	0
Primary Insurance		
Medicare	93.8	100
Blue Cross and Blue Shield	3.1	0
Medicaid	3.1	0
Gender		
Female	93.8	100
Male	6.3	0
Race		
White/not of Hispanic origin	62.5	100
Black/not of Hispanic origin	37.5	0
Marital Status		
Never Married	18.8	0
Married	25	0
Widowed	56.3	50
Separated/ Divorced	0	50
Setting from which admit to acute care		
Private Home/ Apartment	93.8	75
Boardcare/ Assistive Lvng/ Grp Home	6.3	25
Living Alone Prior to Acute Care Stay		
Yes	59.4	50
No	34.4	25
In Another Facility	6.3	25
Caregiver in the home at d/c		
Present	56.3	75
Absent	31.3	25
Does not apply	9.4	0
Unknown	3.0	0

discharge to community rate of less than 85%.<sup>20</sup> Our results are consistent with this research, as our participants in the subacute facilities demonstrated an average positive FIM change score of 18.3 and a discharge to home rate of 75%. Based on Deutsch et al's<sup>20</sup> data from subacute facilities, we expected that aging adults receiving rehabilitation in the IRF would have an average positive FIM change score of 24 or higher and a discharge to community rate of 85% or more. Our results were consistent with that expectation, as the aging adults in the IRF showed an average positive FIM change score of 26.3 and a discharge to home rate of 88%.

Previous research suggests that greater intensity of therapy may increase functional outcomes, decrease LOS, and therefore decrease total costs.<sup>12,21</sup> However, most of these previous works have studied aging adults following hip fractures or with neurological conditions rather than following THA. In our sample, there does not appear to be differences in intensity of therapy between the aging adults in the IRF and subacute settings as measured with PT and OT units per day (differences between the 2 settings are within 1 standard deviation of the measure). However, the intensity of therapy and LOS have been shown to vary among different types of subacute facilities. Subacute units housed in free standing skilled nursing facilities (SNF) provide more PT over a longer LOS when compared to subacute units in acute care hospitals or free standing rehabilitation facilities.<sup>12</sup> This might explain why our participants in the subacute facilities, which were in free standing SNFs, received intensities of PT and OT comparable to the aging adults in the IRF.

Although the aging adults in the IRF appear to have greater total FIM score change and greater motor and self-care subscale FIM score changes than the aging adults in the subacute facilities, the largest percentage change appears to be in the self-care FIM score. This could indicate that in our sample, PT and OT, provided in an IRF following a THA had a greater effect on self-care items of the FIM than motor items, such as ambulation. This is an important finding because a greater self-care FIM subscore indicates increased independence with daily self-care activities, such as eating, grooming, dressing, and toileting, which may result in decreased burden on caregiver(s) in the home if the aging adult is discharged to the home setting.

It also appears that total therapy was greater for the aging adults in the subacute facilities due to increased LOS rather than increased intensity. The longer LOS divided by increased total number of therapy units in the subacute setting, when compared to a shorter LOS divided by a decreased total numbers of therapy units in the IRF, resulted in similar intensities of therapy (as measured by units per day) between settings. Chen et al<sup>12</sup> reported that greater intensity of therapy combined with a longer LOS resulted in greater gains in both self-care and mobility activities among aging adults. However, greater intensity of therapy (irrespective of LOS) was related to greater gains in self-care activities, but not mobility activities. Though the aging adults in our study receiving rehabilitation in the subacute facilities had longer LOS than those in the IRF, their intensity of therapy appeared to be no greater and they generally had lower FIM score changes than aging adults receiving rehabilitation in the IRF facilities.

The number of co-morbidities for aging adults in the subacute rehabilitation settings appears to be lower than the aging adults in the IRF, but the difference is within a standard deviation of the mean. Kane et al<sup>10</sup> compared functional outcomes across settings following an acute care stay (including nursing home, rehabilitation

hospital, home without rehabilitation, and home with home health services) for aging adults following stroke or hip fracture (who were insured under Medicare) for up to 1 year following hospitalization. They scored co-morbidities on a scale of 0-20 based on the severity of each co-morbidity. They found that the aging adults with more severe co-morbidities were transferred to nursing homes and rehabilitation hospitals rather than being discharged to home with home health services. We did not account for the severity of co-morbidities in our sample, so this might have affected our findings. Previous research by Kramer et al,<sup>11</sup> suggested that aging adults in subacute settings are "older and sicker" than those in an IRF following hip fracture, as measured by age, cognitive status, and severity of co-morbidities. These authors reported that aging adults in subacute facilities were about 2 years older, scored 5 points lower on the Mini-Mental Status Examination (MMSE), and had more extensive and severe co-morbidities than the patients in the IRF. In our study, the aging adults in the subacute facilities averaged about 6 months older than the patients in the IRF, which does not appear to be a clinical meaningful difference. The cognitive FIM score at discharge for the aging adults in the subacute facilities averaged about 0.5 points lower than the aging adults in the IRF. We did not measure severity of co-morbidities, but our sample data regarding age and cognitive status is not consistent with Kramers.<sup>11</sup> Though speculative, it is possible that some aging adults who currently go to subacute facilities following THA may have more similar characteristics with aging adults who previously went to IRFs prior to the proposed enforcement of the "75% rule."

Kramer et al<sup>11</sup> also reported that while LOS was significantly different for aging adults recovering from hip fracture in subacute facilities (average of 33 days) than in IRFs (average of 19 days), functional outcomes were not significantly different. Our data show that LOS for aging adults undergoing rehabilitation in subacute facilities appears to be longer than the aging adults undergoing rehabilitation in the IRF. However, functional outcomes appear greater in the IRF, though without statistical analysis (including control of other influencing factors), this is purely speculative. There may be variables we did not measure (such as severity of co-morbidities) or statistically control (such as age) that might have shown differences in aging adults' characteristics between the 2 settings that could account for these lower functional outcomes, despite greater LOS for the aging adults in the subacute facilities.

### Limitations of Study

Due to a low number of participants overall, and a very low number in the subacute facilities, we were unable to statistically analyze the baseline characteristics of the 2 groups, the postrehabilitation outcome differences between the 2 groups or statistically control for factors other than rehabilitation setting. Therefore we are unable to ascertain whether the apparent differences between aging adults in the IRF and subacute settings, based on descriptive statistics, were true differences. Also, the low number of participants in the subacute settings means that their descriptive data may not represent a larger sample of aging adults in that setting.

This study is subject to selection bias. The decision to transfer an aging adult from the acute care hospital to either an IRF or subacute rehabilitation facility (or to discharge an aging adult to a community setting versus a subacute rehabilitation facility) may include factors not controlled, such as aging adult/family/physician preference or

ability and willingness of an aging adult to pay privately for an IRF or at-home care, even if Medicare were likely to deny payment. Further, the obtainment of consent from the participants undergoing rehabilitation in the subacute rehabilitation facilities may result in a different sample than the aging adults previously discharged from the IRF whose consent did not need to be obtained.

Comparison of the retrospective data from the IRF to the prospective data from the subacute facilities may be flawed by changes related to time, such as changes in surgical and therapeutic methodology. Moreover, different health care professionals involved in the assigning of FIM scores may not be as reliable as if the same health care professionals did so.

Outcome measures from this study are limited to short-term outcomes. Any apparent differences between the short-term outcomes for aging adults previously rehabilitated in an IRF and those more currently rehabilitated in a subacute rehabilitation facility may not reflect any differences beyond discharge from the two inpatient rehabilitation environments. Future research needs to include a long term follow-up of patients following a THA undergoing rehabilitation in settings that provide different intensity and duration of therapy, such as subacute facilities and home health care, in order to compare functional outcomes and total costs.

## CONCLUSIONS

In our study we found that aging adults who previously received rehabilitation following THA in an IRF prior to the enforcement of the 75% rule appear to have had shorter LOS and similar intensity of therapy, but greater increases in FIM scores when compared to aging adults who more recently received rehabilitation in subacute facilities. Future research is needed to determine if rehabilitation for aging adults following THA in settings that provide different intensity and duration of therapy affects functional outcomes and total costs.

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