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Factors Affecting Functional Outcomes among Trauma Patients Admitted to an Acute Inpatient Rehabilitation Unit

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Abstract

Background: There is limited information regarding changes in functional outcome among trauma patients during acute inpatient rehabilitation and the factors associated with such changes. Examining the factors associated with functional outcome changes can provide a meaningful way to predict and prognosticate the needs of trauma patients during post-acute care rehabilitation.

Objective: The objective of this study was to evaluate the association between changes in functional mobility and factors such as age and gender among trauma patients admitted to an acute inpatient rehabilitation facility.

Design: The retrospective study consisted of a 330 patients treated in a Level I academic trauma center who were discharged to an acute inpatient rehabilitation facility. Admission- and discharge-acute inpatient rehabilitation functionality was measured using Functional Independence Measure (FIM) scores.

Methods: Information from the hospital's trauma database on patients admitted to the level 1 trauma center and subsequently discharged to the hospital's inpatient acute rehabilitation was retrospectively extracted and analyzed.

Main outcome Measure: FIM scores. Mean/proportion comparison tests were used to investigate whether admission- and discharge-FIM scores statistically differed by age and gender. Multivariate regression analyses were estimated to examine whether age and gender were associated with differences between patients admission- and discharge-acute inpatient rehabilitation FIM scores while controlling for confounding factors.

Results: Improvements in patients' FIM scores during acute inpatient rehabilitation (FIM-gains) were statistically higher ($p \leq 0.05$) among patients under 65 years old (FIM-gains: 21.3) relative to patients aged 65 years and older (FIM-gains: 18.13) despite the younger age group's higher injury severity scores and longer hospital length of stays. Increased age and admission-acute inpatient rehabilitation FIM scores were both associated with lower FIM score improvements during acute inpatient rehabilitation admissions. FIM-gains score was estimated to be 6.34 points (p=0.00) lower in patients aged 65 years and older relative to patients under the age of 65; while a one-unit increase in patients' admission-acute inpatient rehabilitation FIM score was associated with a 0.36 decrease (p=0.00) in their FIM-gains score. No gender based differences in patients' FIM-gains scores were found.

Conclusion: Patients under 65 years of age had a greater improvement in FIM-gains scores relative to patients aged 65 years and older. Besides age, we also found that patients with a higher admission-acute inpatient rehabilitation FIM score had a lower improvement in their FIM-gains score. No gender differences were noted.

Keywords: Trauma; Inpatient rehabilitation unit

Introduction

The most common mechanisms of non-fatal injuries among patients reporting to U.S. emergency departments in 2013 were falls, being struck by a person or object, overexertion, and motor vehicle accidents [1]. The rank order of these injury mechanisms was the same for patients aged below 65 years and patients aged 65 years and older. However, comorbidities associated with more mature patients entail that treatment regimens and clinical outcomes could differ between these two age groups. For instance, older patients who suffer an unintended fall may be more susceptible to fractures relative to younger patients due to the higher frequency of osteoporosis found among persons aged 65 years and over. Furthermore, evidence illustrates an age-related increased risk of morbidity and mortality in patients with multiple traumas, independent of trauma severity [2-8]. These differences remain during patients' recovery period post-trauma, younger patients regain functionality and mobility earlier than their older counterparts. Beyond age, research has illustrated that female gender is associated with improved mortality and decreased complications after moderate to severe TBI due to the neuro-protection offered by female sex hormones which suggests that gender may influence post-treatment outcomes and recovery times [2].

Inpatient rehabilitation is a key component to a patient's post-trauma care and a return to functional independence. Despite the possible differences in recovery times and trauma-related treatments

based upon age and gender, all adult patients are treated similarly in acute inpatient rehabilitation facilities. This study investigated whether functional gain, if any, from traditional acute inpatient rehabilitation (AIR) differ by age or gender allowing insight into whether treatment protocols should differ based upon age and gender. Specifically, this study retrospectively analysed the association between factors such as age and gender on admission- and discharge-AIR Functional Independence Measure (FIM) scores among trauma patients admitted to an acute inpatient rehabilitation facility. Descriptive statistics were estimated to examine whether patients' admission- and discharge-AIR FIM scores differed by age and gender as well as by hospital length of stay, injury severity, and number of comorbidities. Multivariate regression models were estimated to isolate the influence of age and gender, while controlling for confounding factors, on differences between patients admission- and discharge-AIR FIM scores.

The results of this study may assist inpatient rehabilitation teams in anticipating and requesting appropriate rehabilitation lengths of stay, and in providing families and patients with realistic expectations on anticipated functional improvements. In addition, examining the factors associated with functional recovery may provide a meaningful way to predict and prognosticate the needs of trauma patients during their acute inpatient rehabilitation.

Methods

This retrospective study was conducted at Nassau University Medical Center (NUMC). NUMC is a 500-bed, regional level 1 trauma center and tertiary care teaching facility located in Nassau County, New York. NUMC also serves as a federally qualified health center (FQHC), providing care to 33 medically underserved communities throughout Nassau County. The NuHealth Institutional Review Board approved this study. All of the patients included in the study were treated at NUMC's 25 bed inpatient rehabilitation center after discharge from the trauma service. NUMC's inpatient rehabilitation facility provides comprehensive rehabilitative care to patients with a myriad of diagnoses such as traumatic brain injury, strokes, major orthopaedic surgery, disabling arthritis, amputations, burns, and spinal cord injury. Patients are treated with a team approach by physicians, physical therapists, occupational therapists, registered nurses, recreational therapists, social workers, and speech therapists in a newly renovated unit.

Measuring functional independence

Functional recovery was gauged by recording patients' Functional Independence Measure (FIM) scores. The FIM scale was designed to evaluate a patient's level of disability and burden of care [9-11] (Tables 1 and 2). A total of 18 items are assessed out of which 13 assess motor function and 5 assess cognitive ability. The 18 items tested include: eating, grooming, bathing, upper body dressing, lower body dressing, toileting, bladder management, bowel management, bed to chair or wheelchair transfers, toilet transfers, tub to shower transfers, ambulation, stairs, comprehension, expression, social interaction, problem solving, and memory. Each item is rated on a 7-point scale system where a score of 1 indicates total assistance and a score of 7 indicates complete independence, as shown in the Table 3 below. Each patient's FIM score was calculated on admission (admission-FIM) and on discharge (discharge-FIM) from NUMC's acute inpatient rehabilitation facility.

Score	Level of Independence (Level of assistance required)
7	Complete Independence (Requires no assistance)
6	Modified Independence (Independent with the use of an assistive device)
5	Supervision (Requires supervision from helper)
4	Minimum Assistance (Requires 25% assistance from helper)
3	Moderate Assistance (Requires 50% assistance from helper)
2	Maximal Assistance (Requires 75% assistance from helper)
1	Total Assistance (Requires more than 75% assistance from helper)

Table 1: Functional independence measure (7-point scale scoring system).

	All patients	Under 65 years of age[3]	Aged 65 years and over
Demographic variables	β/σ	β/σ	β/σ
Age	-0.13*** (-0.03)	-0.01 (-0.05)	-0.18 (-0.17)
Gender (Referent: Female)			
Male	-0.04 (-1.30)	0.51 (-1.54)	-1.15 (-2.04)
Race (Referent: White)			
African American	-1.24 (-1.80)	0.63 (-2.41)	-3.23 (-2.73)
Other	5.6 (-3.08)	6.24 (-3.30)	3.97 (-5.11)

Hispanic	1.69 (-1.78)	0.29 (-1.98)	3 (-3.00)
Clinical measures:			
Injury severity score	-0.01 (-0.09)	-0.01 (-0.12)	-0.05 (-0.13)
Length of stay	-0.11 (-0.06)	-0.15* (-0.07)	-0.06 (-0.13)
Number of comorbidities	-1.37 (-0.70)	-1.37 (-0.93)	-1.22 (-0.93)
Admission-FIM[4]	-0.36*** (-0.06)	-0.47*** (-0.09)	-0.32*** (-0.08)
N	330	165	165

Notes: 1. FIM-gain denotes the difference between patients' post-acute inpatient rehabilitation functional independence measure (FIM) score and pre-acute inpatient rehabilitation FIM score. 2. Illustrated statistics are coefficients from multivariate ordinary least squares regression analyses. Robust standard errors, computed with the Huber-White Sandwich estimator are reported below the coefficients in parentheses. 3. Includes patients aged 18 to 65 years. 4. Admission-FIM denotes patients' pre-acute inpatient rehabilitation FIM score

Table 2: Association between FIM-gain outcomes[1] and select characteristics[2] with continuous age variable.

Data collection

The sample was drawn from adult patients admitted to NUMC's trauma unit between January 2004 and December 2012 and subsequently admitted to NUMC's acute inpatient rehabilitation facility. Patients aged 18 years or older with a principal diagnosis in the International Classification of Disease, Ninth Revision (ICD-9), and range of 800 to 960 were considered for sample selection. Patients meeting the selection criteria were extracted from NUMC's trauma registry. The trauma registry contains information regarding patients' demographics (e.g., age, sex, race), injuries (e.g., location of, cause, type and severity), management data (e.g., diagnoses, procedures, discharge placement), outcomes (e.g., length of stay, complications), and other measures. Charts of patients identified in the trauma registry that met the selection criteria were reviewed to extract additional information regarding comorbidities and FIM scores. Patients' FIM scores on admission to the acute inpatient rehabilitation facility (admission-FIM) and upon discharge (discharge-FIM) from the facility were both extracted from their charts.

Statistical analysis

Whether patients' admission- and discharge-AIR FIM scores differed by gender and age was investigated through descriptive statistics, mean/proportion comparison tests, and multivariate regression analysis. Descriptive statistics were generated for the entire sample as well by age groups (i.e., aged 18-64 years and aged 65 and older). Mean/proportion comparison tests were used to investigate whether statistically significant differences existed between the age groups and between the gender groups on the study's variables of interest: patients' admission-AIR FIM scores (admission-FIM), patients' discharge-AIR FIM scores (discharge-FIM), and the difference between these two scores (FIM-gains). FIM-gains scores were calculated as patients' admission-FIM score subtracted from patients' discharge-FIM score. Mean/proportion comparison tests were also used to examine whether the age groups and gender groups differed by: race, ethnicity, injury severity score, length of stay, and number of comorbidities. T-tests were used to examine whether statistical differences ($p \leq 0.05$) existed between the two age groups and between the two gender groups.

A number of confounding factors could help explain any statistical differences found between the age groups or between the gender groups. For instance, injury severity might vary between the age groups causing FIM-gains scores to differ by age groups. Accordingly, multivariate regression analyses were used to investigate whether age and gender were associated with differences between patients admission- and discharge-FIM scores (FIM-gains) while controlling for confounding factors. The dependent variable in the regression analyses was the FIM-gains variable.

The key independent variables in the regression models were a binary variable indicating whether patients were aged 65 years or older, and a binary variable denoting patients' gender (i.e., female or male). Confounding factors included in the model were: race (i.e., African American, Other Race, White, Hispanic ethnicity), injury severity score, hospital length of stay, number of comorbidities, and admission-FIM score. The admission-FIM score served as a baseline as some patients may have experienced a greater change in their FIM scores during AIR due to their initial FIM. The regression model was estimated with the entire sample as well as with samples stratified by the age groups and the gender groups. Robust standard errors were generated with the Huber White Sandwich Estimator. All analyses were performed in STATA 14.

Results

The patient extraction process yielded a possible 717 patients for inclusion in the study. Out of these 717 patients, 331 patients had admission- and discharge-FIM scores. The analytic sample consisted of 330 patients after excluding one patient for missing ethnicity covariate information. Table 3 illustrates the descriptive statistics for the sample. Half the sample was aged 65 years or older; the average age across the sample was 61.2 years. The sample consisted of slightly more males (51.5%) than females. Non-White and Hispanic patients consisted of 19.1% and 19.4% of the sample, respectively. On average, patients' admission- and discharge-AIR FIM scores were 70.7 and 90.4, respectively, with FIM-gains outcome of 19.7.

	All patients			Under 65 years of age[1]			Aged 65 years and over		
	Mean/%	Min	Max	Mean/%[2]	Min	Max	Mean/%[2]	Min	Max
Demographic variables									
Population over the age of 65 years	50%	-	-	-	-	-	-	-	-
Age	61.24	18	96	42.90*	18	64	79.58	65	96
Gender		-	-		-	-		-	-
Male (%)	51.52	-	-	57.58*	-	-	45.45	-	-
Female (%)	48.48	-	-	42.42*	-	-	54.55	-	-
Race		-	-	-	-	-		-	-
African American (%)	13.64	-	-	15.15	-	-	12.12	-	-
White (%)	80.91	-	-	79.39	-	-	82.42	-	-
Other (%)	5.45	-	-	5.45	-	-	5.45	-	-
Hispanic (%)	19.39	-	-	18.79	-	-	20	-	-
Clinical measures:	-	-	-	-	-	-	-	-	-
Injury severity score	14.27	1	59	15.84*	4	59	12.7	1	41
Length of stay	11.47	2	139	13.91*	2	139	9.02	2	57
Number of comorbidities	1.16	0	4	0.65*	0	4	1.67	0	4
Functional improvement mobility (FIM) measures									
Pre-acute inpatient rehabilitation FIM (admission-FIM)	70.69	18	102	75.95*	18	102	65.44	18	99
Post-acute inpatient rehabilitation FIM (discharge-FIM)	90.41	32	118	97.25*	37	118	83.57	32	115
Difference between admission-FIM and discharge-FIM (FIM-gain)	19.72	-14	65	21.30*	-3	64	18.13	-14	65
N	330			165			165		
Notes: 1. Includes patients aged 18 to 65 years.									
*Statistically different ($p \leq 0.05$) from statistic for aged 65 years and over group. Statistical differences were examined with a t-test									

Table 3: Descriptive statistics by age group.

The age groups statistically differed ($p \leq 0.05$) across a number of covariates (Table 3). The under 65 years of age group had a larger proportion of males (57.6%) relative to patients aged 65 years and over (45.6%). In addition, the younger group had significantly higher injury severity scores and longer lengths of stay (LOS) relative to the aged 65 years and over group. Patients over the age of 65 years, however, have a statistically greater number of comorbidities (1.67) relative to those less than 65 years of age (0.65). Despite the longer LOS and higher injury severity scores, the younger age group had significantly higher admission-FIM scores, discharge-FIM scores, and a greater improvement in their FIM scores during their rehabilitation course (FIM-gains) relative to the aged 65 and over group. The three FIM measures did not differ by gender in the overall sample or between the age groups (Table 4).

	Male[1]			Female		
	Admission-FIM[2]	Discharge-FIM[3]	FIM-gain[4]	Admission-FIM[2]	Discharge-FIM[3]	FIM-gain[4]
Patient group						
All patients	69.6	89.6	20	71.9	91.3	19.4

Under 65 years of age[5]	74.2	95.8	21.6	78.3	99.2	20.9
Aged 65 years and over	63.7	81.7	18	67	85.1	18.1

Notes: 1. No statistical differences ($p \leq 0.05$) were found between genders across all measures. Statistical differences were examined with a t-test. 2. admission-FIM denotes patients' pre-acute inpatient rehabilitation functional independence measure (FIM) score. 3. Discharge-FIM denotes patients' post-acute inpatient rehabilitation FIM score 4. FIM-gain denotes the difference between patients' post-acute inpatient rehabilitation FIM score and pre-acute inpatient rehabilitation FIM score. 5. Includes patients aged 18 to 65 years.

Table 4: Functional independence measure (FIM) scores by gender.

The regression results (Table 5) illustrate that after controlling for confounding factors, age remained associated with FIM-gains scores. Patients'FIM-gains scores were estimated to be 6.34 ($p \leq 0.00$) points lower in patients aged 65 years and older relative to patients under the age of 65. Patients'admission-AIR FIM score was also consistently associated with their FIM-gains scores; in the full sample model a one unit increase in patients'admission-FIM score was associated with a 0.36 ($p \leq 0.00$) decrease in their FIM-gains scores. Admission-AIR FIM scores remained significantly associated with FIM-gains scores in the age stratified models. A one-unit increase in patients' admission-AIR FIM score was associated with a FIM-gains score decrease of 0.29 ($p \leq 0.00$) points in the aged 65 and older model and a decrease of 0.47 ($p \leq 0.00$) points in the under 65 years of age model. Length of stay was also associated with FIM-gains scores in the under 65 years of age models. Each additional day a patient under the age of 65 spent in the hospital reduced their FIM-gains score by 0.15 ($p \leq 0.05$) points.

	All patients	**Under 65 years of age[3]**	**Aged 65 years and over**
Demographic variables:	β/σ	β/σ	β/σ
Age 65 years and over	-6.34*** (-1.46)		
Gender (Referent: Female)			
Male	-0.27 (-1.29)	0.49 (-1.52)	-1.3 (-2.06)
Race (Referent: White)			
African American	-0.96 (-1.82)	0.63 (-2.41)	-2.98 (-2.75)
Other	5.15 (-2.94)	6.16 (-3.24)	4.35 (-4.88)
Hispanic	1.75 (-1.79)	0.28 (-1.97)	3.14 (-2.99)
Clinical measures:			
Injury severity score	-0.02 (-0.09)	-0.01 (-0.12)	-0.05 (-0.13)
Length of stay	-0.1 (-0.06)	-0.15* (-0.07)	-0.03 (-0.13)
Number of comorbidities	-1.26 (-0.68)	-1.41 (-0.89)	-1.23 (-0.95)
Admission-FIM[4]	-0.36*** (-0.06)	-0.47*** (-0.09)	-0.29*** (-0.07)
N	330	165	165

Notes: 1. FIM-gain denotes the difference between patients post-acute inpatient rehabilitation functional independence measure (FIM) score and pre-acute inpatient rehabilitation FIM score. 2. Illustrated statistics are coefficients from multivariate ordinary least squares regression analyses. Robust standard errors, computed with the Huber-White Sandwich estimator are reported below the coefficients in parentheses. 3. Includes patients aged 18 to 65 years. 4. Admission-FIM denotes patients' pre-acute inpatient rehabilitation FIM score. * p<0.05; ** p<0.01; ***p<0.001.

Table 5: Association between FIM-gain outcomes[1] and select characteristics[2].

Results from models where the sample was stratified by gender (Table 6) were similar to those in Table 5; admission-FIM score and the binary variable noting membership in the aged 65 years or older group both remained negatively associated with FIM-gains scores. The results were also similar when a continuous age variable was used in the models instead of the binary age variable (Appendix).

Discussion

Knowledge regarding the factors associated with functional gains during inpatient rehabilitation may assist physiatrists in delivering patient-centered care that maximizes patients' overall functional improvement during acute inpatient rehabilitation admissions. The results of this study illustrate that the functional gains of patients,

transferred from a trauma unit to an inpatient rehabilitation unit, are associated with age and admission-FIM scores. The improvement in function during inpatient rehabilitation was 6.34 ($p \leq 0.00$) points lower among patients aged 65 years and older relative to patients aged under 65 years, while a one-unit increase in admission-FIM scores was associated with a 0.36 ($p \leq 0.00$) point decrease in the functional gains realized by patients during the acute inpatient rehabilitation stay. The functional gains patients made during inpatient rehabilitation did not differ by gender.

Previous studies have noted that trauma patients aged 65 and older have higher mortality rates, length of stays, and complications relative to their younger counterparts [3] and that younger patients regain functionality and mobility earlier than their older counterparts post-trauma [3,8]. The results of this study found that age and admission-FIM score are both important factors in the level of functional improvement patients' gain during their post-trauma inpatient rehabilitation stay. Our results support those of Ng et al. who investigated functional outcomes among patients from an inpatient rehabilitation facility in Singapore [12]. The admission-FIM score in the Singapore population (70.3) was similar to that found among our patient population (70.4) as was the overall FIM-gain score; the improvement in functional mobility was 17 points in the Singapore study and 19.7 in our patient population.

	All patients		**Under 65 years of age[3]**		**Aged 65 years and over**	
	Male	Female	Male	Female	Male	Female
Demographic variables:	β/σ	β/σ	β/σ	β/σ	β/σ	β/σ
Age 65 years and over	-7.22*** (-2.14)	-5.38** (-2.00)				
Race (Referent: White)						
African American	-0.35 (-2.26)	-2.13 (-3.10)	0.67 (-2.92)	1.91 (-4.13)	-2.03 (-3.72)	-3.57 (-3.95)
Other	1.56 (-5.08)	7.01* (-3.44)	10.45** (-3.48)	2.89 (-4.06)	-2.14 (-6.60)	11.71* (-5.50)
Hispanic	4.45 (-2.70)	-0.47 (-2.42)	2.25 (-3.11)	-1.86 (-2.54)	6.89 (-4.58)	0.06 (-3.95)
Clinical measures:						
Injury severity score	-0.05 (-0.12)	0.02 (-0.13)	-0.02 (-0.18)	0.07 (-0.15)	-0.06 (-0.16)	-0.01 (-0.23)
Length of stay	-0.12 (-0.07)	-0.1 (-0.12)	-0.15 (-0.08)	-0.11(-0.08)	-0.05 (-0.13)	-0.13 (-038)
Number of comorbidities	-1.05 (-1.01)	-1.41(-0.91)	-0.82 (-1.38)	-2.35*(-1.08)	-1.18 (-1.43)	-1.24 (-1.23)
Admission-FIM[4]	-0.32*** (-0.08)	-0.41*** (-0.08)	-0.40*** (-0.12)	-0.67*** (-0.13)	-0.24* (-0.11)	-0.31*** (-0.09)
N	170	160	95	70	75	90

Notes: 1. FIM-gain denotes the difference between patients' post-acute inpatient rehabilitation functional independence measure (FIM) score and pre-acute inpatient rehabilitation FIM score. 2. Illustrated statistics are coefficients from multivariate ordinary least squares regression analyses. Robust standard errors, computed with the Huber-White Sandwich estimator are reported below the coefficients in parentheses. 3. Includes patients aged 18 to 65 years. 4. Admission-FIM denotes patients' pre-acute inpatient rehabilitation FIM score. * p<0.05; ** p<0.01; ***p<0.001.

Table 6: Association between FIM-gain outcomes[1] and select characteristics[2] stratified by gender and age.

The differences in FIM score improvement between the older and younger patients could possibly be due to the higher level of comorbidities found among patients aged 65 years and older. However, a significant relationship was not found (Table 5) between FIM-gain scores and the number of comorbidities except for in the models limited to females under the age of 65 (Table 6). The absence of an association between the number of comorbidities and FIM-gain scores in the majority of models does not imply a patient's "starting point" is not important. Indeed, patients' pre-AIR functionality (admission-FIM) was associated with their FIM-gain scores across all models. In each model, a higher admission-FIM score was associated with a decreased FIM-gain score.

The role of admission-FIM scores on patients' FIM-gain scores could be due to a multitude of factors. Because the duration of most inpatient rehabilitation stays is determined by the number of days insurance companies are willing to cover, patients with higher admission-FIM scores might have been approved for fewer days limiting their overall improvement in functional independence. Conversely, the admission-FIM score could serve as an indicator for a possible "improvement ceiling". Patients with higher admission-FIM scores are likely to reach maximal functional benefit with AIR than patients with relatively lower admission-FIM scores who may require increased duration of AIR stay to reach adequate functional improvement.

The significance of admission-FIM scores and insignificance of injury severity scores in the regression models was likely a reflection of the former measuring post-trauma treatment health status while the latter measures health status before trauma treatment began. However, among patients aged under 65 years, the length of their hospital stay was associated with a 0.15 ($p \leq 0.05$) point reduction in-their FIM-gain scores. This implies, at least among younger patients, admission-FIM scores alone do not measure all aspects of patients' health, or the hospital-based treatment they received, when transferred to an acute inpatient rehabilitation facility. While the purpose of this paper was to

investigate whether FIM score improvement during acute inpatient rehabilitation differed on gender and age, knowledge of how these additional factors interact with FIM-gain scores is important as it illustrates the need for seamless care between the hospital or trauma unit and inpatient rehabilitation units. This is especially important under a bundled payment system where all providers engaged in a patient's treatment would receive one payment [13].

Identifying key factors that play a role in patient outcomes can also help physiatrists select patients appropriately for acute inpatient rehabilitation. This can also lead to a more effective discussion with families regarding appropriate post-acute admission rehabilitation options. This data can help clinicians provide patients and family members with evidence based information on expected functional outcomes. Based on our data we may now counsel patients below the age of 65 with a higher injury severity score and prolonged hospital course that their likelihood of functional improvement is better than someone over the age of 65. With further investigation we may also be able to predict expected level of functional improvement based on patients' risk factors and admission-FIM scores.

This study had several limitations. The results here pertain to data from a single level 1 trauma center and may not be generalizable. Additional studies are warranted to investigate whether the results found here pertain to other trauma centers. Due to the retrospective nature of the data, we were unable to explore psychosocial dynamics that may have limited recovery in our patient population. Also, FIM data was unavailable post-discharge to assess long term outcomes after discharge from acute inpatient rehabilitation, an important factor considering the increased focus on 30-day readmission rates [14]. While a number of factors that may influence FIM-gain scores were examined in this study, additional covariates should be examined in the future. For instance, the study analyzed the number of comorbidities, finding that comorbidities alone were not associated with FIM-gain scores. Yet, specific comorbidities might very well influence FIM-gain scores. Further research is needed to examine if this is the case.

Conclusion

This study retrospectively analysed whether functional recovery among trauma patients differed by gender and age. The results illustrated that trauma patients aged less than 65 years were likely to obtain higher levels of functional improvement during acute inpatient rehabilitation relative to patients aged 65 years and older. The younger group had significantly higher injury severity scores and LOS relative to the aged 65 years and over group. Gains in functional improvement during acute inpatient rehabilitation were not associated with gender. However, higher admission-FIM scores were associated with lower FIM improvement during AIR, implying that patients' "starting points" are important while setting AIR FIM improvement goals. Further research is necessary to create protocols for acute inpatient rehabilitation teams to accurately anticipate and request appropriate rehabilitation lengths of stay, and provide families and patients with realistic expectations on anticipated functional improvements.

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