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Functional Status After Injury: A Longitudinal Study of Geriatric Trauma

Lorraine Kelley-Quon, MD, **Lillian Min, MD**, **Eric Morley, MPH**, **Jonathan R. Hiatt, MD**, **Henry Cryer, MD PhD**, and **Areti Tillou, MD**
Department of Surgery, David Geffen School of Medicine at UCLA, Los Angeles, CA. Presented to the Annual Scientific Meeting, Southern California Chapter, American College of Surgeons, Santa Barbara, California, January 22, 2010

Abstract

We evaluated self-rated functional status measured longitudinally in the year following injury in a geriatric trauma population. The Longitudinal (L) group included 37 of 60 eligible trauma patients age ≥ 65 years admitted December 2006-November 2007 for > 24 hours who completed a Short Functional Status questionnaire (SFS) at 3, 6, and 12 months after injury. The SFS yields scores of 0-5 (5=independent in all five activities of daily living, ADLs) and has been validated among community-dwelling elders. The Control (C) group included 63 trauma patients age ≥ 65 years admitted December 2007-July 2009 for > 24 hours who reported their preinjury functional status using the SFS at hospital admission. We used characteristics and scores of the C group to impute preinjury ADL scores for L group. The groups were similar in baseline characteristics (age, ethnicity, ISS, CCI, and living arrangement; p >0.05). For the C group, the pre-injury ADL score was 4.6 (SD=0.9). For the L group, ADL scores declined at all intervals reaching statistical significance at 12 months. We conclude that in the year following traumatic injury, geriatric patients lost the equivalent of approximately one ADL, increasing their risk of further functional decline, loss of independence, and death.

Introduction

While older adults comprise 12% of the general population, their care represents 25% of hospital discharges and costs.[1] Traumatic injury in this patient group is often devastating, leading to permanent injury, disability and long-term dependence on high-level medical care. Currently, there is paucity of literature concerning geriatric trauma care, with most research focused upon initial stabilization and inpatient hospitalization without examining functional recovery in the months following discharge.

Functional ability is an important gauge of geriatric health because its loss results in loss of independence and ultimately predicts death.[2-5] Earlier studies estimated that more than 90% of geriatric trauma patients required home or institutional nursing care one year after injury.[6] However, recent studies have been more optimistic, estimating that as many as 85% of older trauma patients return to independent living.[7-10] Comparisons are difficult as few studies use standardized surveys of functional ability; “independent living” is defined variably or not at all; and many were published more than a decade ago.

To date no studies have prospectively described the long-term trajectory of functional capacity among geriatric patients who sustain trauma. The present study was undertaken to

Correspondance: Areti Tillou MD, 10833 Le Conte Avenue CHS Room 72-231, Los Angeles, CA 90095, P: (310) 206-5059, Fax: (310) 206-2472, atillou@mednet.ucla.edu.

describe the functional recovery of a small cohort of injured adults in their first year following injury. We measured recovery after traumatic injury using self-reported ability to perform activities of daily living (ADLs) as an indicator of functional status. ADLs were assessed at three intervals in the year following injury in order to explore trends in recovery.

Methods

This study was approved by the UCLA Office of Protection of Human Subjects and was performed at an academic Level-1 trauma center and tertiary referral hospital. The hospital has an annual trauma patient volume of approximately 1000, of whom 10% are 65 years of age or older. Our center has geriatricians who provide consultation at the discretion of the trauma surgery team. Prior to the start of this study, there was no treatment protocol for elderly trauma patients. This is an early report of the natural history of functional recovery among the non-intervention participants within a larger prospective intervention study of geriatric consultation in inpatient surgical trauma care.

Using the hospital trauma database, we identified a Longitiduinal (L) group of patients aged ≥ 65 years admitted to the trauma surgery service for > 24 hours from December 2006 - November 2007. We contacted eligible participants by phone or mail and administered the Short Functional Status Survey (SFS) at 3, 6, and 12 months after injury. If a participant was unable to provide consent, an appropriate proxy respondent for the interview was identified. The SFS measures individuals' self-reported ability to perform five ADLs (shopping, bathing, walking, light housework and managing finances), yielding scores of 0-5 (5=independent in all 5 activities of daily living). A functional status score was calculated for each patient, with a score of 5 indicating full functional ability. In a cross-sectional community sample, impairment in one of the SFS ADLs screened 93% of all older patients with any impairment in a gold-standard scale of 11 ADLs typically employed by geriatricians in clinical practice.[11] Among uninjured community-dwelling elders, the expected (median) decline in the SFS score is zero over 9-14 months.[12]

Because the SFS scale has only been validated for reporting current ADL abilities, and recall of past ADL ability is poor,[13] the L group lacked a baseline pre-injury ADL score. Therefore, we used the self-reported pre-injury functional status score of a separate Control group (C) of trauma patients age ≥ 65 years collected prospectively in the parent study. Using the same eligibility criteria as the L group, the C group completed the SFS within 48 hours of hospital admission (December 2007-July 2009). Demographic and clinical variables before injury were compared between L and C groups using Pearson's chi-square test for categorical data and analysis of variance for continuous data points. We then used gender, ethnicity, injury severity score (ISS), Charlson Comorbidity Index (CCI), and preinjury living situation of the L and C groups to impute each L group participant's likely pre-injury functional status. The CCI is a prognostic tool that predicts one year mortality based on medical comorbidities such as heart disease, liver failure, malignancy and AIDS. Additionally, the index accounts for advanced age and adds one point for every decade over 40.[14] Analysis was performed with STATA routine software using ologit models, 5 imputations.[15] Mean SFS scores for the L group at 3, 6, and 12 months were compared to mean baseline SFS scores (both actual and imputed) in the C group using unpaired t-tests.

Results

In the L group, 78 patients of age ≥ 65 years admitted for > 24 hours from December 2006 to 2007 were identified using the hospital trauma registry. Eight (10%) patients died during their initial hospitalization, and 10 (13%) patients died after discharge before we could reach them for an interview. The 60 patients remaining qualified for inclusion; 47 (79%) were

successfully contacted by phone and 37 agreed to participate and complete at least one interview for a response rate of 62%. Sixty-four interviews were completed over 12 months. In the C group, 63 of 92 (69%) eligible patients admitted from December 2007 to July 2009 completed a pre-injury functional survey.

Demographic and clinical characteristics of the L group and C group are shown in Table 1. The groups were similar in baseline characteristics including age, ethnicity, ISS, CCI and living arrangement prior to injury ($p>.05$), but differed in gender (C group had 69% male participants versus L group with 46% participants, $p=0.02$). Average CCI score was 4 indicating approximately a 13% one year mortality risk. Of note, the CCI scoring algorithm automatically gives 4 points to a person >70 years old so our average participant would automatically receive a score of 4 without the addition of CCI comorbidities.

The majority of patients in the L group were discharged home after their initial hospitalization (62%). Of those remaining, five (14%) were discharged to an acute rehabilitation facility, six (16%) to a skilled nursing facility and three (8%) were transferred to another hospital. We were able to contact 35 participants (95%) 12 months after discharge, and 34 (97%) were living at home. The one patient readmitted to the hospital one year after injury had been previously discharged to a nursing facility. Of the two participants we were unable to contact, one relocated to a residence outside of the United States, and the other declined both 6 and 12 month follow up interviews.

For the C group, we prospectively enrolled 63 participants over the course of 18 months. The average ADL score for the C group was 4.6 (SD=0.9) with 50 participants (79%) scoring 5 out of 5 possible points, reflecting few preinjury functional impairments. Imputed baseline ADL scores for the L group were calculated as 4.2, 4.2 and 4.3 (SD=0.9) for each interview group at 3, 6 and 12 months respectively. Post injury functional decline was seen in the L group at all time points and reached statistical significance at 12 months (Table 2). Examination of the decline in number of ADLs, calculated as the difference between C group and L group scores, revealed that the L group lost a total of one ADL 12 months after injury. Moreover, the magnitude of decline at 12 months was twice the decline at 3 months (1 ADL vs 0.5 ADL).

Discussion

Injury among older adults is a significant health event resulting in long term effects on overall health and wellbeing. The ability to complete basic activities of daily living is vital to maintaining independence and quality of life. Declining functional abilities occur with declining health and may lead to increased dependence on medical systems. In this study examining older adults in the year following injury, we found that functional capacity declines steadily following injury, reaching a loss of one ADL at 12 months.

Literature review identifies variability in reported functional recovery in geriatric trauma (Table 3). Early studies from 1979-1981 reported recovery of preinjury ability as low as eight percent overall[6] while subsequent studies reported more optimistic findings.[10,16,24,25] Much of this variation can be attributed to varying degrees of injury severity between groups, differing methods of measuring functional status, and the variable definition of independent living among authors. More recent studies using other functional assessment tools have examined less severely injured patients, which may explain reported rates of recovery as high as 85%.[10]

In comparison to prior studies of older trauma patients, our study group was similar in age,[16-18] average ISS,[17,19,20] and ethnicity.[18] Our response rate of 62% was superior to previous studies involving telephone interviews with response rates as low as 33%.[22] Our

study identified a loss of one ADL over the course of one year, predominantly in activities that require the help of informal caregivers to continue living independently in the community. A prior longitudinal study of uninjured elders over one year using the same SFS measure found a median decline of zero abilities.[12] Although we lacked the sample size to perform statistical comparisons, deficits appear to accumulate throughout the 12 month follow up, rather than in the immediate post-hospital period. Our interpretation of this result is that injured elders may have lower functional reserve preventing return to baseline. Additionally, persistent decline and worsening functional status may be due to subjective reporting bias as our data was based on patient recall rather than an objective measurement of functional status.

A unique strength of our study is the measurement of functional ability at more than one time point after injury, thereby enabling examination of trends. One weakness is that we lacked a pre-injury functional status measure in the L group. We attempted to address this disparity using statistical modeling and in a future study will report similar data regarding the long-term follow up data from the C group. Another weakness is that we likely lost patients to follow-up if they moved to live with relatives or to receive care in a nursing home due to functional impairment, but this limitation would be expected to result in an underestimation of functional decline in our study.

Past studies have shown that a loss of one ADL leads to future dependence, increased likelihood of admission to a skilled nursing facility and increased mortality.[4,5] Moreover, in the very elderly population (>85 years), once an ADL is lost, it is rarely regained.[23] Because preserved cognitive function, mobility and nutritional status are positive predictors for returning to independent living after trauma[24] future research should test hospital-based interventions to target these risk factors. Such interventions should include clinical pathways to prioritize post-acute rehabilitation, multi-disciplinary geriatric hospital care and tools to identify older patients at higher risk for post-injury functional impairment.

In summary, our group is the first to follow a longitudinal group of elderly adults in the year after injury and identify a significant and progressive loss of functional ability. Clinical consequences include increased risk of future decline, loss of independence, and mortality. We propose that the care of geriatric trauma patients should move beyond prevention of death and include multidisciplinary care targeted at prevention of permanent functional impairment.

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Table 1
Demographic and Clinical Characteristics

	L group (N=37)	C group (N=63)	P value
Age	77	79	0.27
Male gender	46%	69%	0.02
White race	86%	88%	0.88
Injury severity score	12	14	0.27
Charleston Comorbidity Index	4	4.2	0.49
Living alone before injury	16%	31%	0.10

Table 2

Functional Decline after Injury

	Months After Injury		
	3 mo (n=12)	**6 mo (n=17)**	**12 mo (n=35)**
Calculated L Group baseline ADL score	4.2	4.2	4.3
L Group ADL score	3.7	3.8	3.3
Total Number of ADLs Lost	0.5	0.4	1
P values	<0.14	<0.11	<0.0001

ADL – activities of daily living

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Table 3

Functional Outcomes in Geriatric Trauma: Collected Series

Author (ref)	Time Period	Trauma Type	N	Follow Up	Outcome
Oreskovich (6)	1979-1981	All*	100	1 y	8% regained preinjury function 72% required full nursing care
DeMaria (26)	1982-1984	Blunt Injury	63	1.6 y	57% return to independent living
Van Aalst (24)	1984-1989	Blunt Injury*	48	2.8 y	17% regain preinjury function 67% return to independent living
Carrillo (16)	1986-1988	Blunt Injury	82	1-3 y	87% return to independent living 66% need home assistance during recovery
Inaba (17)	1996-1999	All*	128	2.8 y	63% return to independent living Decreased functional abilities
McKevitt (25)	1997-1998	All*	12	2 y	75% return to independent living
Livingston, Mosenthal (7,8)	2000-2002	TBI	65	6 & 12m	Decreased functional ablities
Present study	2006-2007	All	37	3, 6 & 12m	1 ADL lost at 12 months

(*)ISS >16;

N = number of participants, y = years, m = months, PCP = Primary Care Provider, TBI = Traumatic Brain Injury, SF-36 = Short Form (36) Health Survey, FIM = Functional Independence Measure, SFS = Short Functional Survey, ADL = Activity of Daily Living