Screening hospitalized injured older adults for cognitive impairment and pre-injury functional impairment

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A R T I C L E   I N F O

Article history:
Received 20 November 2012
Revised 11 December 2012
Accepted 14 March 2013

Keywords:
Injury
Older adults
Cognitive impairment
Pre-injury functional impairment

A B S T R A C T

Cognitive and functional impairments are leading predictors of poor outcomes among older adults, yet few hospitals collect these variables for injured older adults (IOAs). In this prospective descriptive study, we sought to determine the feasibility of screening IOAs for cognitive and pre-injury functional impairment; and to examine the prevalence of impairment at two acute care hospitals, using the Mini-Cog or Informant Questionnaire on Cognitive Decline in the Elderly (IQCDE), and Vulnerable Elder Survey (VES-13). Eighty patients were screened. Demographics included: mean age 78.7; female gender 83%; falls 89%. Cognitive impairment was present in 36 (44%) patients, and pre-injury functional impairment was present in 62 (78%) patients. Screening respondents included: patients: 53 (66%); adult children: 18 (23%); spouses: 5 (6%), and other 4 (5%). A combination of brief screening instruments for use with IOAs or surrogates is useful for capturing important variables for risk adjustment and care management.

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As the U.S. population ages, the number of injured older adults admitted to hospitals from falls and motor vehicle events, continues to rise. Over a decade, older patients admitted with a primary injury diagnosis rose (nationally) from 638,000 (2000) to 759,000 (2010) (Agency for Healthcare Research and Quality [AHRQ], Healthcare Cost and Utilization Project [HCUPnet], 2012). From 2010 to 2025, the percentage of adults age 65 and older will increase from 12.9 to 17.9% (U.S. Census Bureau, 2012), resulting in an exponential increase in hospitalized injured older adults. Management of injured older adults is complex, in light of comorbidities, physiologic changes associated with aging, and pre-existing cognitive and functional impairments. As a result, traumatic injury in later life places patients at risk for incomplete recovery, functional decline, institutionalization, and death (Lang, Michel, & Zekry, 2009).

Among older medical patients, cognitive and functional impairments are leading predictors of poor outcomes, including increased length of stay (Campbell, Seymour, Primrose, & ACME plus project, 2004), increased mortality (Bachmann et al., 2010; Campbell et al., 2004), disposition other than home (Bachmann et al., 2010; Campbell et al., 2004), functional decline (Bachmann et al., 2010; Hoogerduijn, Schuurmans, Duijnste, De Rooij, & Grypdonck, 2007; McCusker, Kakuma, & Abrahamowicz, 2002) and increased readmission rates (Bachmann et al., 2010). Studies show that pre-injury functional status, or the ability to perform daily activities, is predictive of survival and health care utilization in acute care settings (Bachmann et al., 2010; Covinsky, Eng, Lui, Sands, & Yaffe, 2003). Among injured older adults, the presence of cognitive and pre-injury functional impairments and associations with patient outcomes is understood. Over the past 30 years, no studies have examined cognitive status on admission, and only one recent pilot study (Min, Ubhayakar, Saliba, & Kelley-Quon, 2011) examined associations between pre-injury functional impairment and outcomes. Min et al. reported a significant association between pre-injury functional impairment and greater risk of complications or death among older adults who were hospitalized for traumatic injury.

Failure to consider all potential risk factors in the data collection process can result in bias and erroneous study findings (Kane, 2006). Since cognition and functional status are prominent predictors of poor outcomes in the general older medical population, it is intuitive that these conditions be assessed in older injured patients for clinical management, as well as for risk adjustment in clinical studies. Identification of patients at higher risk for poor outcomes can target patients for interventions aimed at preventing complications (e.g., falls, delirium) and further functional decline. Many hospitals, including trauma centers, do not routinely screen older trauma patients for cognitive and pre-injury functional impairment. Furthermore, studies indicate that accessible standardized tools, for use by bedside nurses, are needed for greater accuracy of fall risk assessment.

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There are no financial relationships to disclose and no conflicts of interest. Special thanks to Dr. Lorraine Mion and Dr. Mary Dietrich for manuscript review and editing advice.
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0897-1897/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.apnr.2013.03.003
(Yates & Tart, 2012) and cognitive screening (Soderqvist, Stromberg, Ponzer, & Tidermark, 2006; Souder & O’Sullivan, 2000). With these factors in mind, the purpose of this study was: (1) to determine the feasibility of administering brief screening instruments for cognitive impairment and pre-injury functional impairment to hospitalized injured older adults after admission to an acute care hospital; and (2) to examine the prevalence of cognitive and pre-injury functional impairment in a sample of patients.

1. Methods

1.1. Overview

The study was conducted at two (350 to 450 bed) not-for-profit, community hospitals (level II trauma center and non-trauma center) in a southeastern city. The selection of two types of hospitals was an intentional, inclusive approach aimed at obtaining a broader perspective on geriatric trauma in a single community. The study was approved by the institutional review board of the university to which it was associated.

On 46 days (chosen for convenience) between January 2012 and August 2012, the principal investigator (PI) visited both hospitals and obtained complete listings of patients, age 65 and older admitted during the preceding 24 hours with a primary injury diagnosis. Patients’ age, primary and secondary injuries, gender, and room number were documented. The PI visited nursing units at each hospital and obtained permission from nursing staff to screen listed patients. Patients and families were given a full description of the study and informed consent was obtained. Patients or surrogates were interviewed using the (1) Vulnerable Elder Survey (VES-13) to ascertain pre-injury (immediately preceding the injury) functional status, and (2) either the Mini-Cog or the Informant Questionnaire on Cognitive Decline in the Elderly (IQCDE) to assess current cognitive status.

1.2. Measures

Selection of instruments was based on availability for users, brevity, and ease of use. The selection also enabled the PI to obtain surrogate responses for both cognitive and pre-injury functional status if the patient was unable to answer screening questions.

1.2.1. Mini-Cog

The Mini-Cog is a screening tool with high sensitivity (99%) for dementia, noted for brevity and ease of administration (Borson, Scanlan, Chen, & Ganguli, 2003). The test utilizes a clock-drawing test and three-item recall test, and is intended for screening and monitoring purposes only (Braes, Milisen, & Foreman, 2008). Patients are scored as either normal or abnormal.

1.2.2. IQCDE (Short)

The Short IQCDE supplements the Mini-Cog for use when the patient is unable to undergo screening. The Short IQCDE is a 16-item instrument, administered to surrogates who have been closely acquainted with the patient for 10 years (Jorm, 2004). Each item compares current factors related to memory and intelligence to the same factors 10 years prior. Patients are rated on a Likert scale (1–5) from “much improved” (1) to “much worse” (5). For example, the surrogate is asked, “Remembering what the patient was like 10 years ago, and comparing that with now, rate the following item(s): Handling money for shopping.” With a sensitivity range of 69–84% and specificity range of 65–94%, the IQCDE is a complementary tool that enhances the ability to screen for cognitive impairment (Jorm, 2004). Performance of the Short IQCDE has been validated with surrogate respondents in other studies (Del-Ser, Morales, Barquero, et al., 1997; Harwood, Hope, & Jacoby, 1997; Jorm, Christensen, Henderson, et al., 1994; Jorm, Christensen, Henderson, et al., 1996). For this study, the cutoff score for detecting dementia was based on Jorm's recommendation to refer to prior validation studies with a sample closest in composition to the population to be screened (Jorm, 2004). Thus, the cutoff of ≥ 3.44 was set for this study based on the Harwood et al. study that examined patients ≥ age 65 in an inpatient setting.

1.2.3. VES-13

The VES-13 is a 13-item instrument that assigns points to four categories: age, self-rated health, common physical tasks, and activities of daily living (Saliba, Elliott, Rubenstein, et al., 2001). A score of ≥ 3 indicates “vulnerability or frailty” and represents a 2-year risk for further functional decline and death (Saliba et al., 2001). The VES-13 has an 87% sensitivity, 62% specificity, and Cronbach’s alpha of 0.90 (Min, Elliott, Wenger, & Saliba, 2006; Min, Yoon, Mariano, et al., 2009; Saliba et al., 2001). Use of the VES-13 with both patient and proxy/surrogate respondents has been conducted in prior studies (Arora, Fish, Basu, et al., 2010; Min et al., 2011), however, validation of the VES-13 for use with surrogates has not been conducted.

Baseline demographic variables were collected for age, gender, mechanism of injury, type of primary injury, type of secondary injury, respondent (patient, spouse, child, other), and patient location (floor, ICU). The Mini-Cog was scored as normal/abnormal and a single score for the IQCDE was obtained by totaling the values (1 to 5) for the 16 items and dividing by 16. A single VES-13 score was obtained by following the scoring protocol: (1) age (one point for age 75–84, 3 points for age 85 or greater); (2) self-rated health (1 point for ‘poor’ or ‘fair’); (3) common physical tasks (one point for tasks with ‘some difficulty’, ‘a lot of difficulty’ or ‘unable to do’); and (4) activities of daily living (4 points for one or more starred ‘yes’ response).

1.3. Data analysis

Descriptive statistics (frequencies, percentages) were conducted for each variable, with additional analyses of variables by hospital type (trauma center or non-trauma center). Chi-square analyses were performed to examine statistically significant differences between the trauma center and non-trauma center. All analyses were conducted using SPSS 20.0.

2. Results

On the 46 screening days, 101 injured older adults were admitted to the two hospitals. Ten patients were unable to answer questions and had no surrogates present to answer. Six patients or surrogates declined participation in the study and five patients were unavailable for screening because they were in surgery. Among the sample (N = 101), 24 (24%) patients were admitted to the trauma center and 77 (77%) were admitted to the non-trauma center. Eighty (79%) patients or surrogates were successfully screened and screening attenuation was the same for both hospitals (trauma center: 86% at the trauma center and 77% at the non-trauma center. Eighty-three percent of patients (n = 19 of 24, 79%; non-trauma center: n = 61 of 77, 79%). Non-screened versus screened patients were similar for gender (female: non-screened [81%], screened [84%], Pearson chi-square: .093 (df 1, 100), p = .762). Non-screened patients were older (mean age: non-screened [81.8], screened [77.9], t(99) = 1.97, p = .052). Fifty-four patients and 27 surrogates answered the screening questions. Surrogates included: children of patients (18), spouses (3), and other (4). Instrument completion time ranged from 3 to 10 minutes for individual instruments, and 5 to 15 minutes for two instruments.

2.1. Characteristics of the sample

Table 1 provides a summary of demographic characteristics according to hospital type. Eighty-three percent of patients (N = 101) were female, with 86% at the non-trauma center and 75% at the trauma center [Pearson
Injuries (trauma center: 13%, non-trauma center: 8%), and thoracic injuries (trauma center: 29%, non-trauma center: 3%) vertebral/spinal fx: 29%; LE fx: 8%). The trauma center had more patients with intracranial (hip fracture [fx]: 49%; LE fx: 12%) as compared to the trauma center (primary mechanism of injury at both hospitals). Types of injuries differed statistically between the two hospitals (Pearson chi-square: 25.08(df 6,100), p = .001). Hip fractures and other lower extremity fractures were the primary injury type with a higher percentage at the non-trauma center (hip fracture: 45%; LE fx: 12%) as compared to the trauma center (hip fracture: 42%; non-trauma center: 44%). Pre-injury functional impairment (VES-13 of ≥ 3) was present in 62 (78%) patients. Seventeen (89%) of patients screened at the trauma center had pre-injury functional impairment, and 45 (74%) of patients screened at the non-trauma center had pre-injury functional impairment. The mean VES-13 score for the sample was 4.78 (range: 0–10).

### 3. Discussion

Experts agree that cognitive status and functional status are measures that should be assessed on hospital admission in older adults (Wenger, Roth, Shekelle, & the ACOVE Investigators, 2007). Over the past decade, collaborative work by the Assessing Care of Vulnerable Elders (ACOVE) project team produced a comprehensive set of quality indicators (QIs) to measure the care provided to vulnerable elders within the health care system (Chow & MacLean, 2001; Shekelle, MacLean, Morton, et al., 2001; Wenger et al., 2007). Many QIs are targeted to hospitalization, cognition, and functional status. Multidimensional assessment of cognitive ability and assessment of functional status on admission to the hospital were recommended by an ACOVE panel (Chow & MacLean, 2001). Early detection of impairment can lead to early initiation of targeted interventions aimed at preventing further decline (Chow & MacLean, 2001).

In this study, we examined the feasibility of screening for, and the prevalence of cognitive and pre-injury functional impairment in older patients admitted to acute care hospitals with an injury diagnosis. We were able to screen 80% of patients or proxy respondents. Among the 20% that we were unable to screen, only 6 patients or proxy respondents declined screening. The remainder of failures to screen (n = 15) was due to absence of a surrogate or patient absence (in surgery). Since the investigator only visited each hospital at a single time, we speculate that screening may have been possible with some additional time.

### Table 1

Characteristics of the study population (hospitalized injured older adults [HIOAs]) (N = 101).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total (N = 101)</th>
<th>Trauma center (TC) (n = 24)</th>
<th>Non-trauma center (NTC) (n = 77)</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17 (17%)</td>
<td>6 (25%)</td>
<td>11 (14%)</td>
<td>.221a</td>
</tr>
<tr>
<td>Female</td>
<td>84 (83%)</td>
<td>18 (75%)</td>
<td>66 (86%)</td>
<td></td>
</tr>
<tr>
<td>Age, mean ± SD</td>
<td>78.7 (8.1)</td>
<td>80.4 (6.4)</td>
<td>78.2 (8.5)</td>
<td>.234b</td>
</tr>
<tr>
<td>Mechanism of injury (MOI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>90 (90%)</td>
<td>21 (87%)</td>
<td>69 (90%)</td>
<td>.027c</td>
</tr>
<tr>
<td>Motor vehicle crash</td>
<td>2 (2%)</td>
<td>2 (8%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Otherd</td>
<td>9 (9%)</td>
<td>1 (4%)</td>
<td>8 (10%)</td>
<td></td>
</tr>
</tbody>
</table>

* Pearson chi-square: 1.50(df 1, 100).
* Mann-Whitney U: 775.0(df 26, 100).
* Pearson chi-square: 7.22(df 2, 100).
* Other MOIs included spontaneous fractures (6), sports injuries (2), and lightning (1).
* Pearson chi-square: 25.08(df 6, 100).
* Other types of secondary injuries included joint injuries.
* Pearson chi-square: 12.59(df 1, 100).

### Table 2

Descriptive summary of cognitive and pre-injury functional impairment in hospitalized injured older adults (HIOAs) (n = 80).

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Total (n = 80)</th>
<th>Trauma center (n = 19)</th>
<th>Non-trauma center (n = 61)</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Impaired Mean</td>
<td>SD</td>
<td>Impaired Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Mini-Cog (n = 54) (abnormal)</td>
<td>18 (22%)</td>
<td>-</td>
<td>4 (7%)</td>
<td>-</td>
</tr>
<tr>
<td>Informant Questionnaire on Cognitive Decline in the Elderly (IQCDE) (n = 26) (impaired ≥ 3.44)</td>
<td>18 (22%)</td>
<td>-</td>
<td>4 (15%)</td>
<td>4.0</td>
</tr>
<tr>
<td>Vulnerable Elder Survey (VES-13)</td>
<td>62 (78%)</td>
<td>4.78</td>
<td>2.9</td>
<td>4.89</td>
</tr>
</tbody>
</table>

* Pearson chi-square: .05(df 1,79).
* t(df 24, 79) = .037.
* Pearson chi-square: 8.36(df 10,79).
patients on subsequent attempts. In a real world setting it seems reasonable to assume that unit-based providers or interdisciplinary teams would have more opportunities to administer screening instruments to obtain a higher response rate. Additionally, the study demonstrates that screening is possible with most patients when a surrogate is present and when providers have the option to screen either the patient or a surrogate.

The study has both strengths and limitations. Strengths include the prospective design, screening by a single investigator, and use of two types of acute care hospitals. A limitation regarding the Mini-Cog was the inability to differentiate between pre-injury and current cognitive impairment. Other limitations include lack of validation of the VES-13 with proxy respondents, randomization of data collection days, a small sample size, and screening opportunity limited to one time. Despite these limitations, this study advances research on important predictor variables that should be included in early risk assessment of injured older adults.

In addition to assessment of screening feasibility, the study draws attention to the prevalence of cognitive impairment and pre-injury functional impairment in injured older adults. Although the study was a pilot study with a small sample, patients in the sample had a higher percentage of cognitive and pre-injury functional impairment than has been reported in other older adult populations (Paleschi, De Affili, Salani, et al., 2011; Saliba et al., 2001). Of note, although the Mini-Cog is designed to screen for dementia, we cannot unequivocally state that these patients did not exhibit delirium, however the IQCODE did demonstrate that patients had developed cognitive impairment over time, prior to admission to the hospital. Further steps could be taken to administer the Mini-Cog and IQCODE together to compare pre-injury with current cognitive impairment. It is likely that pre-injury impairments contributed to injury in this population, thus explaining the higher incidence. Future studies are needed to determine whether the extent of cognitive and pre-injury functional impairment in injured older adults is indeed as high as reported in this study.

From a broader perspective, later life is often characterized by lower physical activity, loss of strength and endurance, and decline in mobility and balance. Conceptual models on frailty and disability have described this process (Lang et al., 2009; Verbrugge & Jette, 1994); and recent papers have called for investigators and clinicians to incorporate these concepts into research (Collard, Boter, Schoevers, & Oude Voshaar, 2012; Porell & Carter, 2012) and clinical care (Magnam, Mitchell, Shiflett, et al., 2012). Addressing the need for accessible, standardized screening instruments for use by bedside nurses should be a priority (Kolanowski et al., 2012; Soderqvist et al., 2006; Yates & Tart, 2012). Incorporation of important predictor variables related to cognition and pre-injury function may lead to: (1) a better understanding of the causal pathways underlying outcomes after traumatic injury in older adults, and (2) greater accuracy in early risk assessment for falls, delirium and functional decline. This study takes a first step by examining the feasibility of patient screening, as well as the prevalence of impairments in a single sample. Next steps include studies that examine impairment prevalence in larger samples, as well as studies that explore feasibility of screening by frontline providers. Ultimately, studies that examine the relationship between pre-injury impairments and patient outcomes are needed to fill a gap in understanding the relative importance of both injury-specific, and geriatric-specific interventions in this important population.

References


