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Systematic review

Outcomes of elderly trauma patients discharged from the emergency department: predictors of revisit, admission, and mortality; systematic review

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ABSTRACT

Background: Older trauma patients discharged from the emergency department (ED) remain at risk of adverse outcomes. Predictors of revisit, admission, and mortality are not well studied. **Methods:** This systematic review identified studies of adults aged 65 years or older discharged from the ED after trauma-related presentations. A total of 190 records were identified from electronic databases. After removal of duplicates and other ineligible records, 33 full-text reports were assessed and 6 observational studies were included in the qualitative synthesis. **Results:** Included studies focused on fall-related trauma. Follow-up ranged from 3 days to 1 year. Reported outcomes included ED revisit, later hospital admission, recurrent falls, and mortality. ED revisits reached 25% at 1 year in one cohort, while another study reported 42.6% revisits and 31.1% later hospitalization within 6 months. Early 7-day revisits were reported in 11.7% of discharged fall patients. Mortality ranged from 1.2% at 3 days to 15% at 1 year in one study, and 10.4% 30-day mortality in another. Important predictors included male sex, higher comorbidity burden, older age, injury severity, abdominal or extremity injury, sedative or psychological medication use, psychiatric diagnosis, and alcohol or substance use disorder. **Conclusion:** Elderly trauma patients discharged from the ED were a high-risk group and benefit from discharge planning and transitional care.

Keywords: elderly trauma; emergency department discharge; ED revisit; hospital admission; mortality; recurrent falls.

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Introduction

Older adults are a major emergency department (ED) population, and in the United States they make 64 ED visits per 100 persons annually, twice the rate of younger people, while broader reviews show that older adults account for one quarter of ED attendees in many settings (Hughes et al. 2019; Conneely et al. 2022; Memedovich et al. 2024). This use of ED is clinically important because ageing is accompanied by multimorbidity, functional impairment, cognitive problems, polypharmacy, communication difficulty, and reduced social support, all of which complicate safe discharge planning after acute illness or injury (Aminzadeh and Dalziel 2002; Hughes et al. 2019; Conneely et al. 2022; Memedovich et al. 2024).

ED care is usually rapid and problem-focused, and important geriatric needs remain insufficiently addressed. One recent systematic review reported that 80% of older adults discharged from the ED had at least one unattended health concern (Hughes et al. 2019; Memedovich et al. 2024). Older adults often enter a vulnerable post-discharge period marked by repeat ED use, hospitalization, functional decline, and higher mortality, and previous reviews showing that adverse outcomes are concentrated in the first weeks to months after the index ED visit (Aminzadeh and Dalziel 2002; Conneely et al. 2022). Falls had particular attention in geriatric trauma because they are the most common mechanism of injury in older adults, create morbidity and healthcare burden, and represent more than an isolated accident by signaling underlying frailty, impaired balance, cognitive decline, medication-related risk, and social vulnerability (Carpenter et al. 2014; Tirrell et al. 2015; Montero-Odasso et al. 2022; Cox et al. 2022).

The importance of this problem is affected by that more than 70% of older adults presenting to the ED after a fall are discharged, and some experience recurrent fall (RF), ED revisits, hospitalization, or death during follow-up (Shankar et al. 2020; Sri-on et al. 2017). In one cohort of older ED fall patients, adverse events increase from 7.7% at 7 days to 21.4% at 30 days and 50.3% at 6 months, while 42.6% revisited the ED and 31.1% had subsequent hospitalization (Sri-on et al. 2017).

Older fallers returned to the ED sooner than non-fall patients, and 11.7% of discharged older adults with fall-related injury revisited an ED within 7 days (Shankar et al. 2020; Cox et al. 2022). Poor outcomes after discharge impacted by the injury and broader geriatric vulnerabilities, since psychological or sedative drug use, psychiatric disease, alcohol or substance use disorder, previous falls, polypharmacy, and high comorbidity burden have been linked to RFs, revisits, and later hospitalization (Carpenter et al. 2014; Sri-on et al. 2017; Cox et al. 2022; Montero-Odasso et al. 2022).literature of ED-based and transitional interventions for older adults have reported mixed effects on revisits, hospitalization, mortality, and patient-centered outcomes, partly because interventions are heterogeneous and the quality of evidence is often low (Hughes et al. 2019; Conneely et al. 2022; Memedovich et al. 2024). In this study we aimed to clarify the frequency of revisit, admission, and mortality after discharge, and to identify the clinical and social predictors associated with poor outcomes.

Methods

This systematic review was conducted to identify the available studies on outcomes of elderly trauma patients discharged from the ED, with focus on

predictors of ED revisit, hospital admission, and mortality after discharge. We followed a structured approach to study identification, screening, eligibility assessment, and qualitative synthesis. The study selection process was presented using a PRISMA flow diagram (Fig 1).

A literature search was performed in electronic databases to identify relevant studies. A total of 190 records were identified initially. Before screening, 26 duplicate records were removed. In addition, 19 records were marked as ineligible by automation tools and 13 records were excluded for other reasons. After these removals, 132 records remained for title and abstract screening. During this stage, 47 records were excluded because they did not meet the review objective. As a result, 85 reports were sought for retrieval. Of these, 52 reports were not retrieved, and 33 full-text reports were assessed for eligibility. After full-text review, 27 reports were excluded, leaving 6 studies that fulfilled the criteria for inclusion in the qualitative review.

Studies were considered eligible if examined older adults, aged 65 years or above, who were discharged from the ED after trauma-related presentations. The review focused on original studies that reported post-discharge outcomes relevant to the study question. These outcomes included ED revisit, later hospitalization or admission, RFs, and mortality after discharge from the index ED visit. Studies were included when they provided outcome data for elderly trauma populations discharged from the ED and reported factors associated with adverse outcomes.

The included studies were all observational in design, with most using retrospective methods. Four studies were conducted in the United States, one in Denmark, and one used statewide California administrative databases. The study populations mainly involved older adults discharged after fall-related trauma, although one study focused on traumatic ED visits among care home residents. Sample sizes varied ranged from 350 to 997,000 patients in a large secondary analysis.

Data from the included studies were extracted and summarized narratively. The main study characteristics were organized in one table, including country and setting, study design, population and sample size, index ED population, follow-up duration, and assessed outcomes (Table 2). A second table summarized the main findings of each study, including reported rates of revisit, admission, and mortality, together with the important predictors and associated factors identified in each analysis (Table 2). Because of variation in study design, populations, follow-up periods, and reported outcome measures, the findings were analyzed qualitatively.

Result

A total of 190 records were identified from electronic databases. The included studies were all observational in design, four studies were conducted in the United States, one in Denmark, and one used statewide California administrative databases. The included populations focused on older adults aged 65 years or above who were discharged from the ED after trauma, mainly fall-related injuries. Follow-up periods differed between studies, extending from 3 days or 7 days in short-term outcome studies to 6 months or 1 year in longer follow-up cohorts. The main outcomes assessed were ED revisit, hospital admission, RFs, and mortality after discharge from the index ED visit. In Liu et al., ED revisits increased from 2% at 3

days to 25% at 1 year, and mortality increased from 1.2% at 3 days to 15% at 1 year. 50.2% of patients returned to the ED during the study period, and 36% experienced ED revisit or death within 1 year.

Earl-Royal et al. found that 3.8% of older discharged injury patients were admitted within 9 days and 7.9% within 30 days. In Sarwari et al., 72.0% of traumatic ED visits were treated and released within 6 hours, but within 30 days, 25% had a new hospital referral, including 13% with another treat-and-release ED visit and 12% with subsequent admission. Thirty-day mortality in that study was 10.4%. Sri-on et al. also showed increasing adverse events over time, rising from 7.7% at 7 days to 21.4% at 30 days and 50.3% at 6 months. Within 6 months, 42.6% revisited the ED, 31.1% were later hospitalized, and 2.6% died. Cox et al. found that 11.7% of older fall patients revisited the ED within 7 days, with one quarter attending a different facility. Shankar et al. showed that older adults with a fall-related ED visit returned sooner for fall and non-fall complaints than non-fall patients.

Predictors of poor outcomes include male sex, comorbidity burden, older age, and injury severity. Admission risk after discharge was higher in patients with greater comorbidity burden, abdominal injury, pelvis or extremity injury, and lower neighborhood income in Earl-Royal et al. Sarwari et al. found that a recent treat-and-release traumatic ED visit and male sex increased the risk of 30-day admission. In Sri-on et al., sedative drug use predicted RFs, ED revisits, hospitalization, and composite adverse outcomes. Cox et al. identified Charlson Comorbidity Index of 3 or more, psychiatric diagnosis, and alcohol or substance use disorder as the strongest predictors of early ED revisit.

Fig 1: PRISMA flow chart

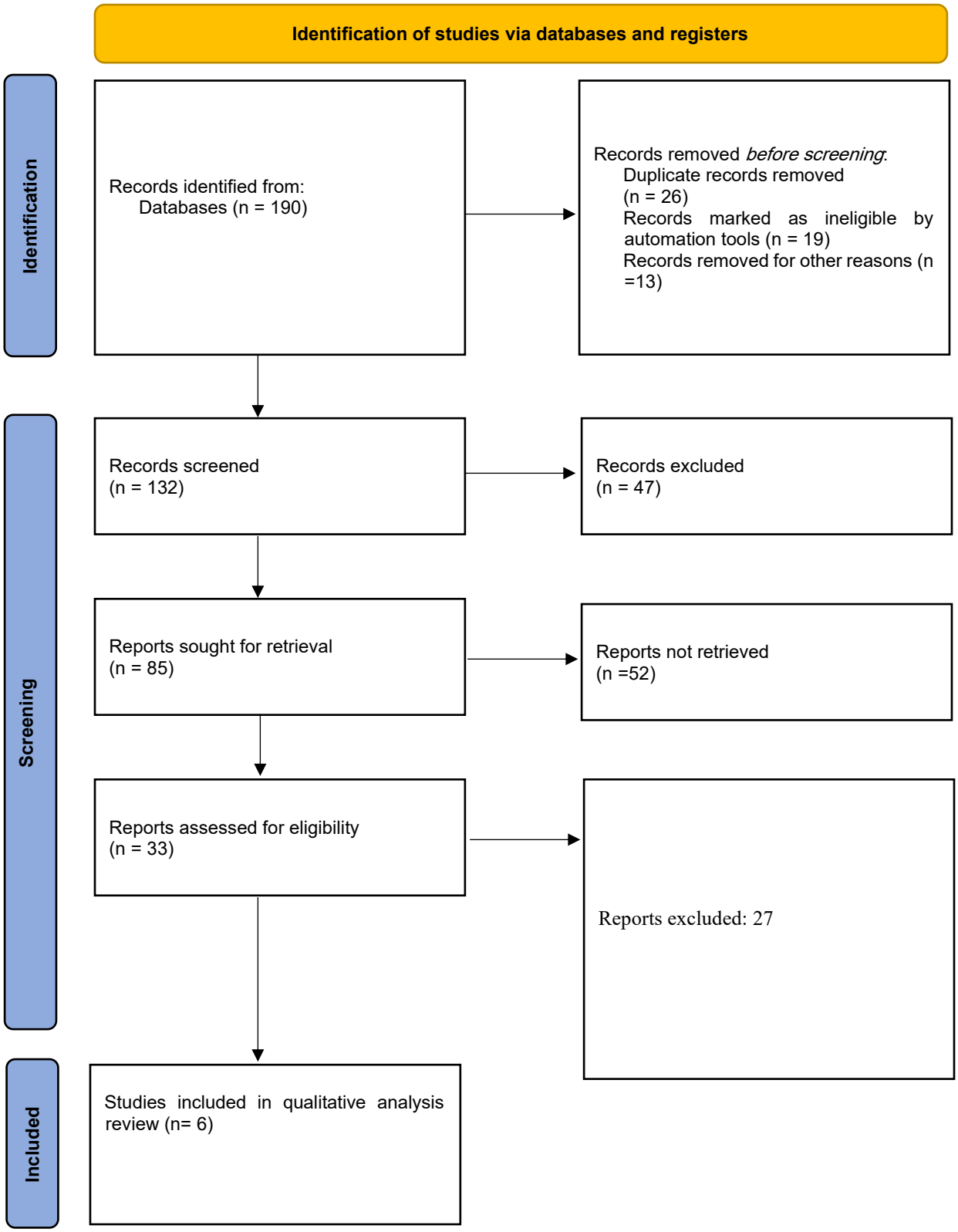

Table 1. Characteristics of the included studies

Study	Country and setting	Study design	Population and sample	Index ED population	Follow-up	Outcomes assessed
Liu et al., 2015	USA; two urban level-1 trauma teaching hospitals	Retrospective cohort analysis	21,340 older adults; mean age 78.6 years	Patients aged ≥65 years presenting with a fall-related ED diagnosis between 2005 and 2011	3 days, 7 days, 30 days, and 1 year	ED revisit and death after an ED fall visit
Earl-Royal et al., 2017	USA; 189 non-federal EDs in Florida	Retrospective statewide cohort study	163,851 index ED injury visits in adults aged ≥65 years	Community-dwelling older adults treated and released from the ED for traumatic injury in 2011	9 days and 30 days	Inpatient admission after ED discharge
Sarwari et al., 2024	Denmark; care home residents in Southern Jutland	Register-based cohort study	2,601 care home residents aged ≥65 years; treat-and-release subgroup n=506	Acute ED visits for traumatic events among care home residents during 2018–2019	30 days	New hospital referral, treat-and-release revisit, subsequent admission, and mortality
Shankar et al., 2020	USA; statewide California administrative databases	Longitudinal observational secondary analysis	997,524 fall patients and 2,805,508 non-fall older adults	Older adults aged ≥65 years with a fall-related vs non-fall ED visit from 2005 to 2010	Longitudinal follow-up with censor date in 2011	ED revisits and hospitalisations in fallers vs non-fallers
Sri-on et al., 2017	USA; one urban academic teaching hospital	Secondary analysis of a retrospective cohort	350 older adults; median age 81 years	Patients aged ≥65 years who presented to the ED after a fall in 2012	7 days, 30 days, and 6 months	RFs, ED revisits, subsequent hospitalisations, and death
Cox et al., 2022	USA; 321 California nonfederal hospitals	Multicenter retrospective longitudinal cohort study	242,572 index ED discharges representing 206,612 patients aged ≥65 years	Older adults discharged from the ED after a fall-related injury in 2017	7 days	All-cause ED revisit within 7 days

Table 2. Main findings and outcomes of the included studies

Study	Main findings on revisit, admission and mortality	Important predictors and associated factors
Liu et al., 2015	ED revisits increased from 2% at 3 days to 25% at 1 year; death increased from 1.2% at 3 days to 15% at 1 year; 50.2% returned to	In multivariable analysis, male sex and comorbidities were associated with ED revisits and

Study	Main findings on revisit, admission and mortality	Important predictors and associated factors
	the ED at some point during the full study period; 36% had ED revisit or death within 1 year.	death; age and injury severity score were associated with death.
Earl-Royal et al., 2017	Among discharged older injury patients, 3.8% were admitted within 9 days and 7.9% within 30 days after the index ED visit.	Increased odds of admission were associated with higher comorbidity burden, moderate abdominal injury, and moderate extremity injury; lack of private insurance supplement also increased 30-day admission risk.
Sarwari et al., 2024	72.0% of traumatic ED visits were treated and released within 6 hours; in-hospital mortality 2.3% and 30-day mortality 10.4%; among treat-and-release visits, 25% had a new hospital referral within 30 days, including 13% ED treat-and-release revisits and 12% subsequent admissions; 56% of retransfers occurred within 7 days.	Recent treat-and-release traumatic ED visit was associated with higher 30-day admission risk (HR 2.20, 95% CI 1.52–3.17); male sex was also associated with higher admission risk (HR 1.73, 95% CI 1.24–2.41).
Shankar et al., 2020	Older adults with a fall index visit were more discharged home than non-fall patients (61.1% vs 45.0%). Fallers returned sooner for another fall-related ED complaint than non-fallers after both discharge and hospitalization; among those initially discharged, fallers also returned sooner for non-fall complaints.	A fall-related ED visit functioned as a marker of higher future healthcare utilisation.
Sri-on et al., 2017	Adverse events increased from 7.7% at 7 days to 21.4% at 30 days and 50.3% at 6 months. Within 6 months, 22.6% had RFs, 42.6% revisited the ED, 31.1% had subsequent hospitalisation, and 2.6% died.	Psychological or sedative drug use predicted RFs, ED revisits, subsequent hospitalisations, and the composite adverse outcome.
Cox et al., 2022	Of discharged older fall patients, 11.7% returned to an ED within 7 days; 22.6% revisited a different facility and 18.2% had the same primary diagnosis on revisit.	Strongest predictors of 7-day ED revisit were CCI ≥3 (OR 2.79), psychiatric diagnosis (OR 1.75), and alcohol/substance use disorder (OR 1.70).

Discussion

The findings of this review show that elderly trauma patients discharged from the ED remain at a risk of later ED revisit, hospital admission, RFs, and death (Liu et al. 2015; Sri-on et al. 2017; Cox et al. 2022). This pattern is consistent with that older adults experience a vulnerable post-discharge period after an ED visit, during which functional decline, repeat ED use, and unplanned admission are common outcomes (Conneely et al. 2022; Memedovich et al. 2024). The present review supports the view that discharge from the ED should not be interpreted as resolution of risk in older trauma patients, especially when the index event is fall-related trauma (Shankar et al. 2020; Memedovich et al. 2024).

An important observation in this review is that most included studies involved older adults discharged after fall-related injuries, a fall-related ED visit act as a marker of future instability (Shankar et al. 2020; Sri-on et al. 2017). Literature show that RFs cluster early after the index event, with half of RFs

occurring within the first 90 days in one trauma cohort study (Curran-Groome et al. 2020). Psychological or sedative drug use, psychiatric diagnosis, alcohol or substance use disorder, and higher comorbidity burden were important predictors in the included studies, which is in line with prior ED-based falls studies identifying depression, cognitive problems, walking aid use, and polypharmacy as relevant markers of later falls risk (Sri-on et al. 2017; Cox et al. 2022; Carpenter et al. 2014). These findings indicate that adverse outcomes after ED discharge are not explained by injury characteristics alone (Carpenter et al. 2014; Curran-Groome et al. 2020).

The present review identified male sex, older age, injury severity, abdominal or extremity injury, low neighborhood income, and repeated recent traumatic ED use as factors associated with worse outcomes after discharge (Liu et al. 2015; Earl-Royal et al. 2017; Sarwari et al. 2024). Frailty offers an important explanatory framework because it captures reduced physiological reserve that will not be reflected by age alone (Alqarni et al. 2023). A recent systematic review and meta-analysis reported that frailty in older trauma patients was associated with higher in-hospital mortality, longer hospital stay, more complications, and worse discharge disposition (Alqarni et al. 2023). This explains why some older adults who appear stable for discharge after trauma still experience poor short-term and long-term outcomes (Alqarni et al. 2023; Peng et al. 2022).

From a clinical perspective, these findings support a comprehensive discharge approach for older trauma patients that goes beyond treatment of the acute injury and includes assessment of frailty, comorbidity burden, medication use, mental health, RFs risk, and social support needs (Alqarni et al. 2023; Carpenter et al. 2014). The intervention literature remains mixed, some reviews found limited benefit of ED-based interventions on return visits and hospitalization, largely because of heterogeneity and low study quality, while others found that structured needs assessment, discharge planning, and coordination of services reduce ED revisits and readmissions in older adults (Hughes et al. 2019; Conneely et al. 2022; van den Broek et al. 2023; Memedovich et al. 2024). The current review indicate that elderly trauma patients discharged from the ED are a high-risk group who benefit from targeted transitional care, and more high-quality trauma-specific prospective studies are needed to define which discharge interventions are most effective in reducing revisit, admission, and mortality (van den Broek et al. 2023; Memedovich et al. 2024).

Conclusion

This systematic review found that elderly trauma patients discharged from the ED remain at clear risk of ED revisit, later hospitalization, RFs, and death. Worse outcomes were associated with higher comorbidity burden, sedative or psychological medication use, and psychiatric or substance-related conditions. Further prospective trauma-specific studies are needed to improve prediction and reduce adverse post-discharge outcomes.

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