

BMJ Open Injuries and frequent use of emergency department services: a systematic review

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ABSTRACT

Objective To review all studies having examined the association between patients with physical injuries and frequent emergency department (ED) attendance or return visits.

Design Systematic review.

Data source Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PsycINFO databases were searched up to and including July 2019.

Eligibility criteria English and French language publications reporting on frequent use of ED services (frequent attendance and return visits), evaluating injured patients and using regression analysis.

Data extraction and synthesis Two independent reviewers screened the search results, and assessed methodological quality using the Joanna Briggs Institute tool for prevalence studies. Results were collated and summarised using a narrative synthesis. A sensitivity analysis was performed to evaluate the repercussions of removing a study that did not meet the quality criteria.

Results Of the 2184 studies yielded by this search, 1957 remained after the removal of duplicates. Seventy-eight studies underwent full-text screening leaving nine that met the eligibility criteria and were included in this study: five retrospective cohort studies; two prospective cohort studies; one cross-sectional study; and one case-control study. Different types of injuries were represented, including fractures, trauma and physical injuries related to falls, domestic violence or accidents. Sample sizes ranged from 200 to 1 259 809. Six studies included a geriatric population while three addressed a younger population. Of the four studies evaluating the relationship between injuries and frequent ED use, three reported an association. Additionally, of the five studies in which the dependent variable was return ED visits, three articles identified a positive association with injuries.

Conclusions Physical injuries appear to be associated with frequent use of ED services (frequent ED attendance as well as return ED visits). Further research into factors including relevant youth-related covariates such as substance abuse and different types of traumas should be undertaken to bridge the gap in understanding this association.

INTRODUCTION

Overcrowding in emergency departments (EDs) is a growing concern impeding the provision of care^{1 2} that has reportedly reached crisis proportions within many countries.^{3 4} This increasing utilisation of EDs, associated with a plethora of deleterious patient

Strengths and limitations of this study

- A systematic search strategy, developed in collaboration with an information specialist, was undertaken across three databases.
- Independent evaluators assessed the screening process, conducted the quality evaluation as well as the synthesis.
- There is a wide range of physical injuries evaluated by the studies included in this review.
- The heterogeneity of the definitions of frequent emergency department use makes it difficult to compare the population in the studies assessed.

outcomes, has garnered attention from policy-makers, enabling them to evaluate patient populations who are disproportionately contributing to these recurrent admissions. Indeed, frequent ED use, including both frequent attendance and return visits, contributes to this unreasonable burden on the healthcare system by consuming a substantial amount of medical care resources.

Even though many studies have sought to characterise the factors related to this excessive mobilisation of healthcare services, there is no universal consensus regarding the threshold to define frequent use of EDs. Definitions for frequent attendance range from 2 visits to 20 visits per year, but commonly, authors set the threshold at four visits or more within a calendar year.^{5 6} Time frame for a return visit ranges from 28 days to 6 months.⁷ Prior studies have identified frequent attendance and return visit as a proxy indicator of continuous decline of healthcare service particularly when they occur proximate to the index ED visit.⁸ Both frequent attenders and return visitors were therefore considered in order to draw up an overall portrait of frequent ED utilisation.

Studies across the globe state that this increase in ED utilisation is an international phenomenon⁹ which has not left Canada unscathed. Between 2017 and 2018, 11 266 609 ED visits were reported in Canada and frequent ED users account for 30.6% (3 442

223 visits). Among these consults, 2 096 583 were injury-related ED visits.¹⁰ Trauma rates have reached epidemic proportions which have a significant economic impact.¹¹ In this article, the term ‘injury’ is defined as damage ‘caused by acute exposure to physical agents such as mechanical energy, heat, electricity, chemicals, and ionising radiation interacting with the body in amounts or at rates that exceed the threshold of human tolerance’.¹² Injury-related diagnoses are prevalent in adulthood, but only a few studies have explored their association with the frequent use of EDs.

Sufficient understanding of the underlying motives of this heterogeneous patient group is important to fill the dearth in our current knowledge of ED utilisation and to implement appropriate and sustainable interventions to improve patient flow and care through hospitals. Thus, this systematic review aims to review all studies having examined the association between injuries and frequent ED use.

METHODS

Review design

This systematic review was conducted according to the principles stated in the Joanna Briggs Institute (JBI) Reviewers’ Manual 2014.^{13 14} This article was designed in accordance with the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses Checklist*.¹⁵ Systematic reviews present exhaustive, critical assessments of the published literature on a given topic in order to provide evidence on a broad problem to guide clinical practice.

Data sources and search strategy

A search strategy was undertaken in Medline, PsycINFO and CINAHL databases to extract studies dated up to and including July 2019. The search included medical subject heading terms and clustered keywords pertaining to a physically injured population, and to frequent users of ED services. The reference lists of relevant reviews and articles were hand searched to identify other studies of interest. A Master of Information Science helped design the search strategy, shown in online supplemental file 1.

Eligibility criteria

English- and French-language articles were included if they:

1. Documented frequent use of ED services (frequent attendance and return visits).
2. Evaluated physically injured patients.
3. Used an observational study design, which included prospective and retrospective cohort studies, case-control studies and cross-sectional studies using a regression analysis.

Articles reporting injuries arising directly from alcohol or drug intoxication were excluded since the association of this factor with frequent ED use has been long established and recognised by previous studies.¹⁶ In addition, self-harm injuries, defined as a deliberate direct

harming regardless of suicidal intent, were also excluded. Finally, studies addressing only a paediatric population or including only injured participants were excluded from this review, since injury could not be used as an independent variable.

Study selection, data extraction and synthesis

All screened literature was imported into Zotero to make organisation easier and to remove duplicates. The lead author (CL) conducted the first screening of article titles and abstracts independently to exclude studies that were clearly not eligible. A second reviewer (AD or CH) then performed a full-text assessment of the uncertain articles retrieved following the initial screening. A hand search was conducted by CL by examining reference lists to identify additional relevant studies. Subsequently, two reviewers (CL and CH) separately carried out a screening of full texts in light of eligibility criteria. Authors of the studies were contacted to complete any missing information. Finally, the lead author (CL) designed and completed a chart, validated by CH, which presents the search’s findings: authors, year of publication, country, study aim, sample characteristics, definition of injury and frequent ED use, results, and covariates. This chart was used to amalgamate, summarise and report the results discussed in the narrative synthesis.

Quality assessment

To assess overall methodological quality, two reviewers (CL and AD) independently used the quality assessment checklist found in the *Joanna Briggs Institute (JBI) Manual for Prevalence and Incidence Studies Handbook*¹³ presented in online supplemental file 2. This tool includes a set of nine standard questions covering topics such as sample frame and size, coverage and appropriateness of the analysis. In case of discrepancy, a third party (CH) joined the discussion in order to reach a consensus. A sensitivity analysis was conducted in order to assess the extent to which removing the studies that failed to meet more than five of the nine quality criteria would impact the conclusions of this review. An ‘unclear’ mention regarding a question indicates that according to the authors, the study in question does not fulfil this criterion.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

RESULTS

Literature search

Of the 2 184 studies yielded by this search, 1957 remained after the removal of duplicates. Seventy-eight underwent full-text screening and nine were included in this study. The flow chart (figure 1) presents the search and selection process, as well as the reasons behind the exclusion of the 69 studies that were rejected following the full-text

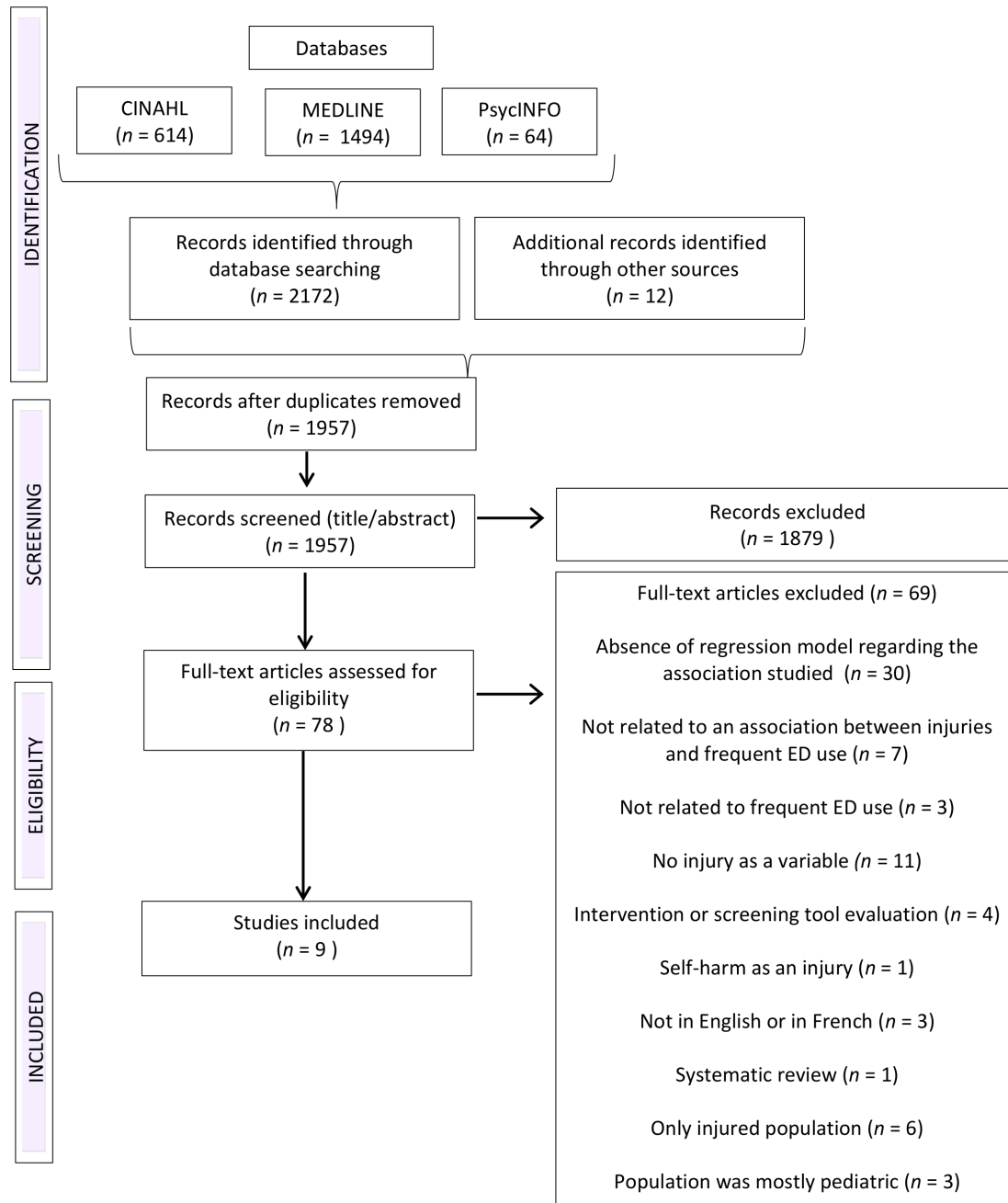


Figure 1 Flow chart summarising the literature search and study selection.

screening. The articles in the final data set include two prospective cohort studies,^{17 18} five retrospective cohort studies,^{19–23} one cross-sectional study²⁴ and one prospective case-control study.²³ All nine studies selected were published between 1994 and 2019. Four were conducted in the USA,^{18 19 22 23} two were conducted in Canada,^{21 24} one in Italy,²⁰ one in Israel²⁵ and one was conducted in seven countries.¹⁷

Description of studies

Population, sample size and data sources

Sample totals varied from 200 to 1 259 809 participants. Six studies recruited only an older population above 65 or 75 years old,^{17–19 21–23} whereas three studies^{20 24 25} included

younger individuals from the age of 14 or 16 years old. Data sources for the measures of associated variables also differed: five used administrative databases or medical records,^{19 22 23 25} two used questionnaires^{17 24} and two used a combination of both methods.^{18 21}

Definition of frequent ED use

The outcome variables had to target a measure of frequent ED use, either frequent attendance or return ED visits. Definitions of frequent attenders over a 1-year period differed between the four studies evaluating this variable. The threshold for frequent attendance varied from two to six ED visits. Additionally, the five studies exploring the association between injuries and return visits involved

heterogeneous study periods for this dependent variable. ED returns were evaluated within the month following the initial visit or during a 6-month to 18-month period. One examined patients had at least two significant trauma visits.²⁵

Definition of injury

Studies cover a spectrum of clinical disorders related to a physical injury. One study included all E-code diagnoses as injuries, four studies evaluated traumatic or accidental injuries,^{17 23–25} four studies specifically analysed falls,^{17 21–23} three inquired about fractures^{18 22 23} and one assessed domestic violence.²⁰

Associated variables

Multinomial logistic regression models were used in seven studies, one study used longitudinal Poisson regression models¹⁸ and one study used univariate logistic regression.¹⁷ Table 1 presents the covariates used to adjust regression models.

Synthesis of outcomes

Six of the nine studies concluded to an association between patients with physical injuries and frequent ED use. Three of four studies reported an association between patients suffering from traumatic injuries and frequent attendance. Of these three, a study by Castillo *et al*¹⁹ indicates that any injury identified with an E-code is more likely to occur among frequent attenders than less frequent users (OR 3.82; 95% CI 3.75 to 3.89). Furthermore, Brown and Goel²⁴ assessed that significant accidents are strongly correlated with two or more ED visits (OR, 3.06; 95% CI 2.33 to 4.04) compared with those who visited an ED only one time. Lastly, Leporatti *et al*²⁰ reported that in comparison with normal users, frequent and highly frequent ED attenders are more often defined by injury resulting specifically from domestic violence (RRR=2.245; $p<0.001$ and RRR=3.686; $p<0.001$ respectively). On the other hand, McCusker *et al*²¹ drew the conclusion that patients reporting two falls or more in the past 6 months were not significantly associated with three or more return ED visits in 6 months (OR 0.99; 95% CI 0.50 to 2.00).

Furthermore, studies have explored the relationship between injured patients and return ED visits. Of the five articles, three concluded to an association with repeat attendance after a history of injury. LaMantia *et al* state that patients discharged following an accident often returned to the ED within 30 days. Moreover, a study conducted by Zimmerman *et al*¹⁸ assesses that experiencing a fracture was a predictor of higher use of ED during the month (RR 18.78; 95% CI 14.28 to 24.69; $p<0.001$) and the 6-month to 12-month period post-fracture (RR 1.90; 95% CI 1.12 to 3.21; $p<0.05$). In addition, patients with a first hip fracture particularly showed higher use of ED during the month following the fracture (RR 6.61; 95% CI 3.33 to 13.41; $p<0.001$). Finally, Sayfan and Berlin²⁵ concluded that a history of previous significant traumatic events

was a strong predictor for recurrent trauma (AOR 10.36; 95% CI 3.10 to 34.58). In contrast, the analysis of Sri-on *et al*²² pointed out that patients with at least one fall in the previous 3 months or with a history of hip fracture were not statistically associated with an ED revisit within 6 months (OR 1.37; 95% CI 0.83 to 2.24 and OR 1.29; 95% CI 0.56 to 3.00, respectively). Similarly, Costa *et al*¹⁷ assessed that neither falls occurring in the past 90 days nor traumatic injuries were significantly associated with repeat ED or hospital use within 28 days post-index ED visit among outpatients (OR 1.04; 95% CI 0.72 to 1.50 and OR 0.94; 95% CI 0.48 to 1.82, respectively).

Quality assessment

Of the nine studies, eight reached the quality threshold established beforehand. The sensitivity analysis indicated that removal of the lowest quality study²⁵ did not alter our results. However, instead of a majority of six articles out of nine assessing a positive association, five out of eight reached this conclusion.

DISCUSSION

Of the nine studies assessed, six concluded to an association between injuries and frequent use of ED services. Among the four articles studying frequent attendance, a majority of three articles found an association between injuries and frequent use. Additionally, a smaller proportion of three out of five articles evaluating return visits concluded to an association. After removing the lower quality study, five out of eight presented this conclusion: three of the four articles assessing frequent ED use and two of the four evaluating repeat ED visits.

Repeat episodes of injury may represent up to 44% of trauma consults in urban settings.²⁶ Often assumed to be an acute episodic event, urban trauma could also epitomise a chronic recurrent issue related to the victims' lifestyle, environment and other personal factors.²⁶ A study²⁰ distinguished between frequent (3 to 5 visits/year) and highly frequent attenders (≥ 6 visits/year). Being a victim of an injury resulting from domestic violence was a stronger predictor of highly frequent ED use than frequent use in the logistic regression model, after controlling for other factors such as substance abuse and psychological distress. Moreover, a retrospective analysis concluded that domestic violence was at least two times more common among return visitors (defined as patients with two or more unrelated visits) than single-visit patients: 3.5% compared with 1.6% ($p<0.0003$).²⁷ Indeed, domestic violence is an example representing how traumas, reckoned as acute events, can indeed embody more chronic conditions. Thus, recidivist trauma should be screened for domestic violence in order to prevent further repeat episodes of injury.

In our review, half of the six articles including a geriatric population concluded in a positive correlation

Table 1 Characteristics of included studies

Authors, year of publication, country	Study design and data source	Population, sample size and demographics	Aim of the study	Definition of frequent ED use	Definition of the injury leading to an ED visit	Results	Covariates
Studies evaluating the association between injuries and frequent ED attendance							
Castillo <i>et al</i> , 2019 ⁹ USA	Multicentre, retrospective, longitudinal, cohort study Non-public statewide database	Patients >65 years old at their index visit in 2014 who visited one of the 326 California non-federal EDs 1 259 809 individuals Age: 65–74: 43.9% 75–84: 33.3% 85 and over: 22.8% Women: 57.8%	To evaluate patient characteristics and patterns of ED use among geriatric patients.	FA: ≥6 ED visits in a 1-year period SA: >20 ED visits in a 1-year period	An injury-related visit was identified by the presence of an E-code	The associations of frequent ED use with the largest magnitude were related to specific diagnoses and included injury-related visits (OR 3.82; 95% CI 3.75 to 3.89).	Age, female sex, ethnicity or race, admitted or transferred at any visit, psychiatric diagnosis at any visit, substance abuse diagnosis at any visit, and patient comorbidity score
Leporatti <i>et al</i> , 2016 ³⁰ Netherlands	Retrospective cohort study Administrative and clinical data	Patients >14 years old accessing one of the seven AEDs located in the metropolitan area of Genoa, Italy, in 2013 147 864 individuals Mean age: 52 Women: 50.9%	To understand the relationship between demographic and clinical patient characteristics and the likelihood of being a frequent user of AEDs, in order to suggest specific policy actions to improve AED organisation and management.	FA: (3–5) AED visits in a 1-year period HFA: >6 AED visits in a 1-year period	Domestic violence	Compared with normal users, frequent AED users seem to be defined strongly by domestic violence (RRR=2.245; p<0.001). Being a victim of domestic violence also impacts the probability of being a highly frequent AED user (RRR=3.686; p<0.001).	Age, gender, European Union foreign, Extra European Union foreign, residence, substance abuse, psychological distress, and chronic condition
McCusker <i>et al</i> , 2000 ³¹ Canada	Observational cohort study Questionnaire: 27 self-report screening questions Hospital utilisation database	Patients >65 years old at their index visit in 2014 who visited one of the four urban, university-affiliated hospital EDs located in Montreal, QC, Canada during the weekday shift over a 3-month recruitment period in 1996 1122 individuals Age: 65–74: 52.2% 75–84: 37.0% 85 and over: 10.8% Women: 57.0%	1. To describe the pattern of return visits to the ED among seniors over the 6 months following an index visit 2. To identify predictors of early return (within 30 days) and frequent return (>3 return visits in 6 months) 3. To evaluate a newly developed screening tool for functional decline, Identification of Seniors At Risk (ISAR), with regard to its ability to predict return visits.	FA: >3 episodes of ED care, excluding the index episode, during the 6-month follow-up period	Falls (2+) in past 6 months	Patients with two falls or more in the past 6 months were not significantly associated with three or more return ED visits in 6 months (OR, 0.99; 95% CI 0.50 to 2.00).	Age (increase of 5 years), sex (male), live alone, special residence, poor health, limit activities (premorbid), needs assistance (premorbid), reduced function, increased assistance, heart disease, diabetes, cancer, stroke, ED visit in past month, hospitalised in past 6 months, hearing impairment, visual impairment, memory impairment, depressed, bereavement, >3 medications, sleeping pills, alcohol use, no daily contact, no help if needed, low income, and diagnosis.
Brown and Goel, 1994 ²⁴ Canada	Population-based, cross-sectional study weighted to represent the entire non-institutionalised population of Ontario Questionnaire: the 1990 Ontario Health Survey (OHS) were not reported	≥16-year-old Ontarians 60 972 individuals were included in this analysis (but only the patients >16 years old were considered) Age and gender variables were not reported	To assess factors related to ED use in the Ontario population.	FA: >2 ED visits in a 1-year period	A significant accident that was serious enough to limit normal activities	Significant accidents are strongly associated with two or more ED visits (OR, 3.06; 95% CI 2.33 to 4.04) compared with those with one ED visit.	Overall rate, age, sex, education, employment status, self-reported health status, number of reported health problems

Studies evaluating the association between injuries and return ED visits

Continued



Table 1 Continued

Authors, year of publication, country	Study design and data source	Population, sample size and demographics	Aim of the study	Definition of frequent ED use	Definition of the injury leading to an ED visit	Results	Covariates
Sit-on <i>et al</i> , 2017 ²² USA	Secondary analysis of a retrospective cohort study Medical records	Patients >65 years old who visited an ED for a fall at the General Hospital of Boston, an urban teaching hospital that studied the ED evaluation of elderly fall patients in 2012. These patients had visited a primary care physician affiliated with the hospital network in the past 3 years (to improve the collection of follow-up data) 350 individuals Median age: 81 Women: 64.3%	To determine the risk for 6 months and specific risk factors for recurrent falls, ED revisits, subsequent hospitalizations, and death within 6 months after an older adult fall-related ED presentation.	RVs: ED revisits within 6 months	An accidental fall in the past 3 months A history of hip fracture	Patients with ≥1 fall in the past 3 months were not significantly associated with an ED revisit (OR, 1.37; 95% CI 0.83 to 2.24). Patients with a history of hip fracture were not significantly associated with an ED revisit (OR, 1.29; 95% CI 0.56 to 3.00).	Age >75 years old, male patient, psychoactive or sedative drug use
Costa <i>et al</i> , 2014 ¹⁷ Canada	Multinational prospective cohort study A short geriatric assessment, using the interRAI ED Contact Assessment completed by a nurse or a lead health professional	Patients >75 years old who were registered in one of the 13 ED sites from Australia, Belgium, Canada, Germany, Iceland, India, and Sweden during the weekday shift 2282 individuals Mean age: 88 Women: 59.0%	To identify older ED patients from a multinational context with clinical features associated with adverse postdischarge outcomes that may lead to improvement of clinical reasoning and better targeting for preventative interventions.	RVs: any ED or hospital use within 28 days post-index ED visit	Any falls (past 90 days) Traumatic injury	Any falls (past 90 days) were not significantly associated with repeat ED or hospital use within 28 days post-index ED visit among outpatients (OR, 1.04; 95% CI 0.72 to 1.50). Traumatic injury was not significantly associated with ED or hospital use within 28 days post-index ED visit among outpatients (OR, 0.94; 95% CI 0.48 to 1.82).	Univariate
LaMantia <i>et al</i> , 2010 ²³ USA	Retrospective cohort study 1. T-System (Dallas, Texas): clinical information pertaining to the patients' ED visit 2. WebCIS: electronic medical record system 3. International Classification of Diseases Version 9 coding records	Consecutive patients >75 years old who visited an academic tertiary care ED, Level 1 trauma centre serving rural and urban populations in North Carolina during a 1-year study period in 2007 3079 individuals Median age: 82 Women: 60.8%	To identify a set of variables in patients 75 years of age or older, available at the time of triage, that would predict 1) the probability of a patient's admission to the hospital or 2) a return visit to the ED within 30 days of an initial visit.	RVs: return to the ED within 30 days of initial visit (regardless of disposition)	Leg/hip fracture Accident, NOS (includes fall)	Patients, regardless of disposition (admitted or discharged), with a leg or hip fracture were not significantly associated with an ED return within 30 days (OR, 0.27; 95% CI 0.06 to 1.11, p value, 0.07). Patients discharged after an accident or NOS (includes fall) were associated with an ED return within 30 days (OR, 1.48; 95% CI 1.10 to 1.99, p value, 0.01).	Sex, temperature, diastolic blood pressure, general, chest pain, allergy/NOS, disorders of speech (speech disturbance), epistaxis, dyspnoea, general viral infection (influenza), symptoms referable to lips, stomach and abdominal pain, lower abdominal pain, abdominal distension, urinary tract infection, infection of skin of hand, arm, or finger, foot or toe swelling, hypertension, need for tube insertion, and altered level of consciousness

Continued

Table 1 Continued

Authors, year of publication, country	Study design and data source	Population, sample size and demographics	Aim of the study	Definition of frequent ED use	Definition of the injury leading to an ED visit	Results	Covariates
Zimmerman <i>et al</i> , 2002 ¹⁸ USA	Prospective cohort study Medical records (physician progress notes, consultation notes, radiologist reports, and hospital discharge summaries) Additional data were available from baseline interviews with nursing home residents and staff members and from medical record review	Female nursing home residents >65 years old from 47 randomly selected nursing homes in Maryland were followed up for fracture and healthcare use for 18 months following the baseline assessment between April 1995 and May 1997 1 427 individuals Mean age: 85 Women: 100%	To understand the amount of care following fracture in order to help determine the effects of fracture prevention on use and costs in this population.	RVs: return ED visit after an initial fracture presentation during 6 intervals: time of fracture to 1 mo, 1–2 mo, 2–3 mo, 3–6 mo, 6–12 mo, and 12–18 mo post fracture	All types of fractures Hip fracture	Patients who experienced a fracture were associated with a higher use of ED: before (RR, 3.32; 95% CI 2.56 to 4.29; p<0.001) during the month following the fracture (RR, 18.78; 95% CI 14.28 to 24.69; p<0.001) and during the 6-month to 12-month period post-fracture (RR, 1.90; 95% CI 1.12 to 3.21; p<0.05) Patients with a first hip fracture showed frequent use of ED: before (RR, 1.67; 95% CI 1.08 to 2.57; p<0.001) and during the month following the fracture (RR, 6.61; 95% CI 3.33 to 13.41; p<0.001)	Age, comorbid status, transfer independence, and mobility score
Sayfan and Berlin, 1997 ²³ Israel	Prospective case-control study Medical records	≥14-year-old patients: consecutive hospitalised trauma cases were compared with 100 consecutive emergency admissions for acute non-traumatic surgical conditions who served as a control group. The study was led in Haemek Medical Center, a regional teaching Israeli hospital designated trauma centre level 11 during 4 months. 100 individuals Age range: 14–86 Women: 29.0%	To evaluate the concept of 'trauma recidivism' by measurement of the association for previous trauma events with acute trauma in a rural region of northern Israel with a specific sociocultural population mixture, low drug and alcohol abuse, and low levels of criminal activity.	RVs: > 2 significant trauma events in their medical histories	A significant past traumatic event (since the age of 14) that necessitated hospitalisation or active ambulatory medical treatment. 3 injury types were defined: motor vehicle crashes, incidental injuries, and intentional injuries	A history of previous significant traumatic events was a strong predictor for recurrent trauma (AOR, 10.36; 95% CI 3.10 to 34.58).	Age, gender (male, female), and ethnic subgroups (established Jewish population, new Jewish immigrants, minorities)

*Author contacted, but information not available.
AEDs, accident and emergency departments; AOR, adjusted OR; ED, emergency department; FA, frequent attenders; HFA, highly frequent attenders; RR, relative rate; RRR, relative risk ratio; RVs, return visitors; SA, superattenders.



between injuries and frequent ED use. On the other hand, the three articles including younger participants concluded in a positive association between injuries and frequent ED use, even after correcting for 'age' in the models. However, only one study²⁰ out of the three controlled for substance abuse in their model. Further studies should be undertaken among a younger population to confirm this association between injuries and frequent ED use, controlling for relevant variables such as alcohol or drug intoxication.

Strengths and limitations

The greatest strengths of this systematic review are the systematic and rigorous literature search strategy implemented to identify relevant studies and the fact that a minimum of two evaluators assessed the screening process, as well as conducting the quality evaluation and the synthesis.

The limitations of this review include certain methodological limitations and considerable variation among the studies included. One of the main limitations of the selected articles concerns the heterogeneity of the definitions of frequent ED use, which presents an impediment to comparison of the injured patients participating in the studies assessed. Another limitation relates to the wide range of physical injuries evaluated by the nine articles included. This small number of selected articles hinders an analysis depending on the type of injury (accidents, falls, domestic violence, fractures, etc) and highlights that little research has been conducted to explore injuries and frequent ED use. While we have searched for studies that adjusted for covariates that might have influenced the association between injury and frequent ED use, each study considers different covariates and some studies do not appear to have included known predictors of repeat attendance.

CONCLUSIONS

This systematic review suggests that physical injuries are associated with frequent use of EDs. Further research should be undertaken to bridge the gap in understanding this association among young adults and to provide a more comprehensive picture by including key variables in subsequent studies, such as age, alcohol or drug intoxication, and type of injury.

Correction notice This article has been corrected since it first published. The provenance and peer review statement has been included.

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