

# A review of elderly injuries seen in a Singapore emergency department

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## ABSTRACT

**Introduction:** The elderly population in Singapore is steadily increasing, thus increasing the stress on healthcare provision and financing. Elderly injuries result in significant mortality and morbidity. This study aimed to identify the injury patterns, specific risk factors involved and needs of the elderly so that the current emergency model of care for the injured elderly can be improved and injury prevention strategies devised.

**Methods:** We conducted a retrospective study of all elderly aged 65 years and older seen for trauma in an emergency department over six months. Data captured in the real-time computer system was studied with regard to patient profile, mechanism of injury and patient disposition.

**Results:** 720 patients aged 65 years and older were seen for trauma in the first six months of 2005, accounting for 10.4 percent of the total attendance for that age group. Home injuries (67.9 percent) were the most common, followed by road-related injuries (21.2 percent). 85.3 percent of the injuries were due to falls. 49.9 percent of the patients were admitted to hospital. We also examined the underlying causes of the injuries and the common injuries sustained.

**Conclusion:** Injuries in the elderly is a significant problem. Most of the injuries occur at home and falling is the commonest cause. Many of the injuries are potentially preventable. Several possible injury prevention strategies and improvements to the current emergency model of care of the injured elderly are discussed. The establishment of a national elderly injury surveillance database is advocated.

**Keywords:** elderly injuries, emergency department, falls, geriatric injuries, trauma

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## INTRODUCTION

Singapore has one of the fastest ageing populations in the world. Elderly persons aged 65 years and older made up 7.2% (234,500) of our population in the year 2000. This proportion is projected to increase to 8% in 2010, 13% in 2020 and 18.4% (800,000) in 2030.<sup>(1)</sup> Medical advances have allowed people to live longer, healthier and more active lives. The combination of increased longevity and our highly-mechanised society puts the older population at greater risk of trauma exposure. Figures from the United States have shown that injuries are the eighth leading cause of death among older adults.<sup>(2)</sup> In 2001, approximately 2.7 million senior adults in the United States were treated for non-fatal injuries in hospital emergency departments;<sup>(3)</sup> the majority of these injuries were the result of falls. There is a lack of such injury surveillance data for the elderly in Singapore.

The emergency department plays a vital role in the management of elderly injuries. Not only does it provide an accessible 24-hour portal of acute care for the injured elderly, it is also involved in the coordination of subsequent healthcare services for the injured elderly. The emergency department also plays an important role in injury prevention. Hence, the aim of this study was to identify injury trends, mechanisms and the types of injury in the elderly, with the purpose of identifying areas for targeting prevention efforts and exploring future models of care for the injured elderly in the emergency care setting.

## METHODS

This is a six-month retrospective study conducted on all elderly aged 65 years and older who presented to the National University Hospital (NUH) emergency department with trauma. The period of study was January 1, 2005 to June 30, 2005. Records of patients who were coded as trauma/emergency were retrieved, a total of 774 cases. There was no history of trauma in 54 of the records as they were wrongly coded. Hence, a total of 720 records were used for analysis. This formed 10.4% of the total number of patients who were aged  $\geq 65$  years and had visited the NUH emergency department for the total duration of the study. Data was captured in a real-time computer system

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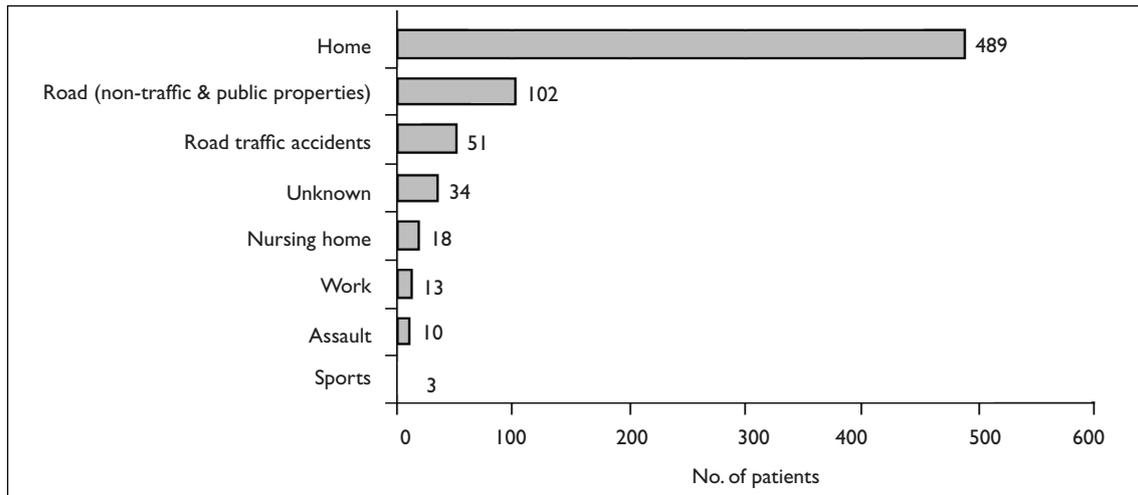
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**Table I. Singapore patient acuity category (PAC) scale.**

Category	Criteria
PAC scale 1	Resuscitation. Cardiovascular collapse or imminent danger of collapse. Required to be attended to without a moment's delay. Includes: multiple major trauma, shock due to trauma, penetrating chest or abdominal injuries, etc.
PAC scale 2	Non-resuscitation. Major emergency. Ill and non-ambulant. Severe symptoms, trolley-based. Includes: major limb fractures, major joint dislocation, spinal cord injury, trunk injury with stable vital signs, etc.
PAC scale 3	Minor. Emergency. Ambulant. Mild to moderate symptoms. Includes: closed, isolated extremity fractures, superficial injuries, foreign bodies of nose, throat, eyes, etc.

**Fig. 1** Bar chart shows the injury types by mechanism.

and analysed with regard to patient age, gender, race, triage priority, mechanism of injury, types of injuries and patient disposition. Clinical summaries were extracted for every patient from the emergency records database (EMDS) and if admitted, from the hospital records database (CPSS). Statistical analysis was performed using the Statistical Package for Social Sciences, version 14.0 (SPSS Inc, Chicago, IL, USA). Chi-square tests were used for the analysis of mechanisms, types of injury and dispositions of patients, as compared between the two genders and between the young and the old elderly. The young elderly was defined as those aged between 65 and 80 years. The old elderly was defined as those who were more than 80 years of age. Mann-Whitney U tests were used to compare the length of stay between the two genders and between the young and old elderly.

## RESULTS

720 patients were studied. The median age was 75.0 years, with an age range of 65–102 years. Females formed the majority of the patients (62.5%, 450). The racial distribution of our study cohort resembled the general population,<sup>(4)</sup> with the proportion of Chinese forming 79.3% (571), Malay 9.2% (66), Indian 7.1% (51) and others 4.4% (32). 50.1% (361) of the patients arrived via ambulance. 58.6% (422)

of the patients were assessed to be patient acuity category (PAC) 3, 37.4% (269) were assessed to be PAC 2 and 4.0% (29) as PAC 1 (Table I).

Home injuries were the most common, accounting for 67.9% of all trauma cases (Fig. 1). Falls are the leading mechanism for elderly patients sustaining trauma, forming 85.3% (614) of all injuries. Of all the falls sustained, the majority occurred at home (74.1%, 455). The majority (55.6%) of the falls at home were due to accidental or environmental causes. From an analysis of emergency and ward records, 33.0% of falls at home may be attributable to underlying medical causes (Fig. 2). Pedestrian injuries formed the highest number of road traffic injuries in this study (39.2%, 20), followed closely by motorcycle accidents (37.2%, 19), then by car accidents (15.7%, 8) and bicycle accidents (7.8%, 4).

Analysis of the types of injuries sustained (Fig. 3) showed that head and face injuries (29.6%) were the most common. This was followed by lower limb (24.2%), upper limb (13.6%) and trunk (9.3%) injuries, and then followed by foreign bodies, burns/scalds, self harm/suicide and animal bites. Fractures of the upper limb (53.2%, 91) were the most common type of upper limb injury, with fracture of the forearm (including wrist and elbow) making up the majority (59.3% or 54 of all upper limb fractures). Other

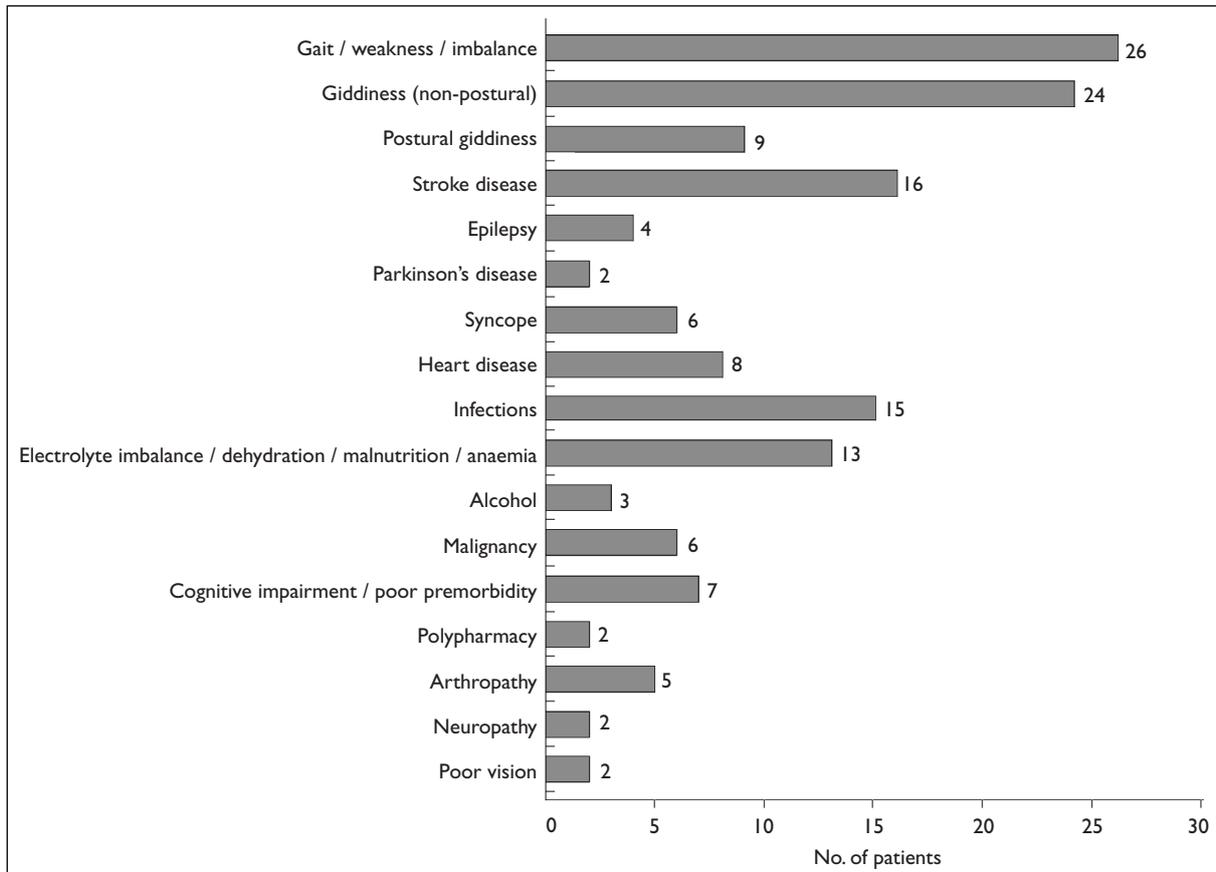


Fig. 2 Bar chart shows the frequency of the underlying medical causes for falls at home.

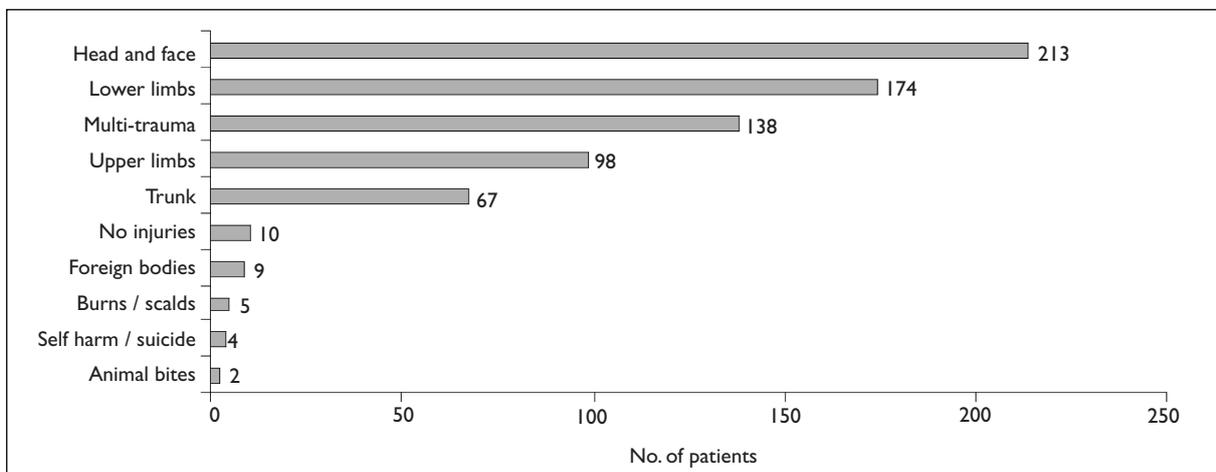
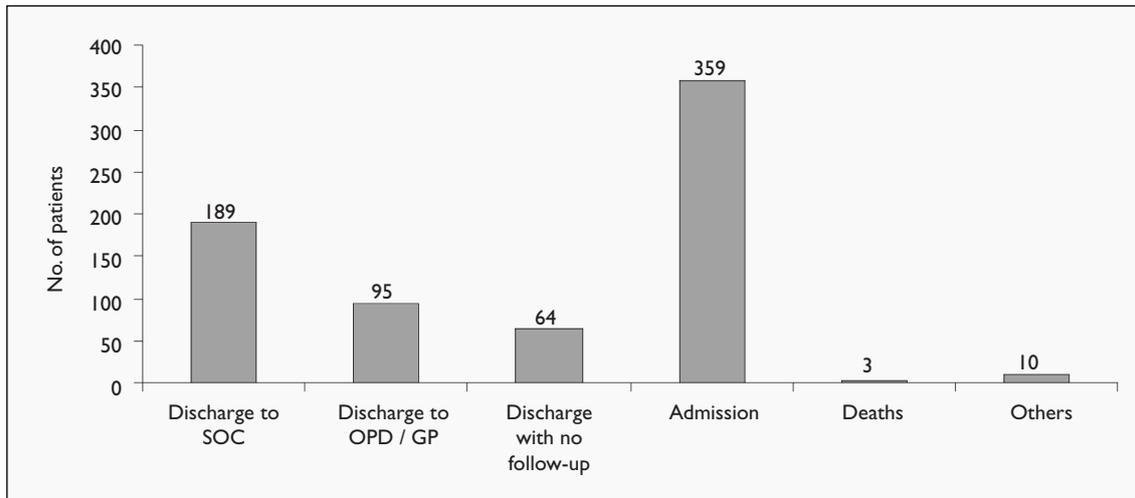


Fig. 3 Bar chart shows the frequency of injury types.

injuries included contusion/abrasion of the upper limb (30.4%, 37), followed by lacerations of upper limbs 6.4% (11) and dislocations 6.4% (11). Sprains, amputations, bite injuries and mallet fingers formed the rest (7). Fractures were also the commonest type of lower limb injury, accounting for 54.8% (142), followed by contusions/abrasions (35.9%, 93), sprains/strains of joints (3.9%, 10), lacerations (3.0%, 8), burns (1.5%, 4), then dislocation (0.4%, 1). Hip fractures were the most common (54.9% or 78 of all the lower limb fractures).

Trunk injuries consist of contusions, vertebral fractures, abrasions and lacerations. Contusions/abrasions of the trunk formed the majority of cases, accounting for 44.1% (46), followed by vertebral fractures 36.9% (40) and rib fractures 11.7% (13). Clavicle fracture, pneumothorax, sprain /strain of the back and sciatica formed the rest (7). There were two cases of central cord syndrome. Of all injuries, the most commonly sustained injury was head injury (32.5%), followed by lower limb fractures (15.9%), then contusion of the lower limbs (8.7%). Analysis by type



**Fig. 4** Bar chart shows analysis by disposition.

SOC: specialist outpatient clinic, GP: general practitioner, OPD: outpatient department (polyclinic). Others include transfers to other hospitals, abscondments and at-own-risk discharges.

and mechanism revealed that head injuries were more common for home injuries (30.7% of home injuries were head injuries), assaults (40% of injuries by assault resulted in head injuries), in nursing homes (38.9% of injuries in nursing homes were head injuries) and during sports (66.7% of sports injuries were head injuries). Limb injuries were more common during work (53.9% of injuries at work were limb injuries), and in non-traffic road injuries (45% of all non-traffic road injuries resulted in limb injuries). Proportionately, more multiple traumas occurred in road traffic accidents; 49% of road traffic accidents resulted in multiple traumas as compared to 14.9% of home injuries, 22.5% of non-traffic road injuries, 27.8% of nursing home injuries, 10% of assault injuries and 23.1% of work injuries.

49.9% of all elderly patients presenting to the emergency department with trauma required admission (Fig. 4). The majority of those discharged from the emergency department required follow-up at the specialist outpatient clinics, accounting for 54.3%, and 27.3% required follow-up with a primary health physician. Only 18.4% were discharged without follow-up. Of the 359 patients who required admission, length of stay ranged from one to 68 days, mean length of stay was 8.71 days and median duration of stay was six days. 2.8% (20) died during admission either as a direct consequence of the trauma sustained (40%, 8) or from indirect causes that contributed to or manifested as a fall leading to trauma, medical causes acquired during hospitalisation (50%, 10) or were unknown (10%, 2). The majority of the patients who were admitted were discharged home, accounting for 81.3% (292), while 8.9% (32) required step-down care at community hospitals and 4.2% (15) were discharged to nursing homes. A small proportion of patients (0.4%, 3) died in the emergency

department. The mechanisms of injury for the deaths were a fall from a height at work, after a suicide attempt at home by jumping, or from a severe head injury after being found unconscious by relatives at home.

Comparing the mechanisms of injury, there was a statistically significant difference between the genders ( $p < 0.0005$ , chi-square test). Females had a higher incidence of home injuries (75.8% in females vs. 54.4% in males), whereas more males were involved in road traffic accidents (12.6% in males vs. 4% in females) and work (4.4% in males vs. 0.2% in females). There is no significant difference in disposition in the emergency department ( $p = 0.297$ , chi-square test), or in length of stay when compared between the genders. There was a statistically significant difference between the genders when compared for the injury types, ( $p = 0.003$ , chi-square test). Males sustained more head and face injuries (39.3% in males vs. 23.8% in females), whereas females sustained more limb injuries (38.5% in females vs. 31.2% in males). From our study, those who committed self-harm or suicide were all females.

A significant difference between the young and old elderly exists when comparing their dispositions ( $p < 0.0005$ ). The old elderly with trauma were more likely to require admission (62.6%), compared with 40.5% of the young elderly. The young elderly tend to be more likely to be discharged home after admission (90.2% vs. 79.8% in the old elderly). Length of stay, however, was not significantly different between the two age groups.

## DISCUSSION

This study gives us a statistical snapshot of trauma in the elderly Singaporean population, as seen in an emergency setting. It has been reported that around 30% of people in

America aged 65 years and older living in a community and more than 50% of those living in residential care or a nursing home fall every year.<sup>(5)</sup> Hence, the proportion of the injured elderly presenting to the emergency department is just the tip of the iceberg. Another study in Singapore has revealed that there is a high hospital admission rate among the elderly presenting to an emergency department; 63.7% of elderly people who presented to the emergency department for various reasons were admitted.<sup>(6)</sup> In our study, there is also an alarming percentage of 49.9% of patients who required hospitalisation, and 13.1% of those who were admitted required either step-down care or nursing home care. Hence, injury in the elderly is an important cause of hospital and step-down care admissions, thus having a significant socioeconomic impact.

Falls were the major cause of trauma in 85.3% of our study population. Also, the majority of injuries occur at home, where the majority (55.6%) of falls are accidental/environmental (slip and fall, trip and fall, dark surroundings). Fall prevention is important in the elderly as it may be preventable most of the time. A nationwide campaign on home safety for the elderly, health promotion activities to promote an active healthy lifestyle and regular eye screening for the elderly can be considered. Our study showed that females tend to fall more than males and this could be due to a more sedentary lifestyle. Also, females tend to incur more injuries at home. This may be due to their predominantly homemaker lifestyle. Health promotion activities could also be targeted towards this group of vulnerable patients. To prevent injuries on the roads, elderly-friendly public amenities, e.g. in public transport, public toilets, roads, good lighting on streets, are encouraged. Currently, motorists aged above 65 years are required to undergo a medical examination to assess their fitness to drive. Since road traffic accidents are an important cause of injury in the elderly, a road safety campaign targeting the elderly should be promoted.

The current emergency model of care for the injured elderly should be examined. In our study, a percentage of the cause of falls (10.3% of all falls at home) was not investigated at all. This may have a greater impact on the health of the patient than the injury itself. From our study, among those elderly who fell at home, 33.0% may have an underlying or attributable medical cause. Hence, besides treating the injuries sustained, identification and risk stratification of the elderly with trauma should be done in the emergency department at the first point of contact. Injury prevention can also be instituted at the emergency department. Firstly, targeted geriatric assessment and evaluation should be taught to the emergency physicians,

as they are working in an unfriendly environment of high patient volume and limited consultation time. This is important as the geriatric population forms an increasing percentage of patients seen at the emergency department. Screening questionnaires<sup>(7)</sup> looking out for risk factors of falls or injuries in the elderly could be given to caregivers or patients while they wait for their medical consultation, followed by a targeted appropriate assessment and evaluation of the injured elderly in the consultation room.

The emergency department should not work in isolation, and a collaborative work flow with the geriatric department or community geriatric support should be established with regard to appropriate referral and subsequent management. Coordination with occupational and physiotherapy departments regarding home safety,<sup>(8,9)</sup> home visits, home modification and gait retraining are some feasible suggestions. Opportunistic education of the public—e.g. handouts to the caregivers regarding home safety—can be done in the emergency department. There can be further research and work done on management of the injured elderly in order to improve their clinical outcome and decrease morbidity. During this study period, no case of elder abuse was encountered. We must bear in mind the possibility of elder abuse whenever we evaluate an injured elderly as it is often unreported. We must heighten our suspicion when there are signs and symptoms suggestive of elder abuse;<sup>(10,11)</sup> e.g. delay in seeking treatment and inappropriate injuries. Besides treating the injuries, appropriate referral to available social services should be made, e.g. medical social worker, elder protection team.

Limitations of the study included incomplete or incorrect data entry, problems with coding and data capture. As the data entry is in real-time, several inconsistencies were noted, thus much time was spent checking entries and checking with the hospitalisation notes. Due to the one-year time lag between data collection and the time of conducting the study, retrieval of history via phone calls was not carried out due to recall problems by the caregiver or patient.

Despite these limitations, we feel that injury surveillance in the elderly is an important venture. Surveillance data can form the basis for targeting prevention efforts to different populations of the elderly. It can be a source to monitor trends and evaluation interventions, e.g. introduction of fall risk assessment in the emergency department and gait or strength retraining.<sup>(9)</sup> Collection of data will require much coordination, effort and resources. However, most emergency departments in Singapore are now computerised; existing emergency department systems can be tailored to collect data on elderly injury in a universal template.

In conclusion, trauma in the elderly affects a significant

proportion of patients attending the emergency department, a high proportion of whom are admitted to the hospital. The elderly trauma patient hence remains a challenge to the emergency physician, especially in such busy settings. Diminished physiological reserve associated with the ageing process makes the evaluation and recognition of an injury more difficult. In addition, a minor trauma mechanism, e.g. falls, causes significant injury in this population more often. Being more vigilant in screening the elderly and identifying those at risk of serious injuries, or any predisposing causes for repeated injuries, are necessary measures to maximise the outcome in this fragile population.

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