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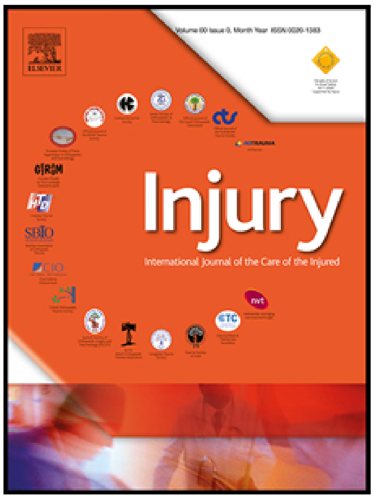

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Highlights:

- 10.6% of mobility scooter incidents on the TARN database resulted in mortality. The mortality rate was 15.4% of those who were over the age of 75 years and 24.2% in those who sustained major trauma.
- Patients over 75 years had similar ISS scores to those younger than 75 years, although had an increased mortality rate and increased length of stay in hospital.
- Limb injury was most common with more than half of patients sustaining an injury to the limb. However, head trauma was most closely associated with major trauma and mortality.
- Vehicle collisions accounted for almost two thirds of injuries and were the most dangerous mechanism of injury.
- The incidence of death following mobility scooter incidents is 1.66 times higher compared to incidents involving all registered vehicles in the UK.

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Abstract

Aims: To establish the incidence and nature of injuries seen in patients following mobility scooter incidents.

Methods: The Trauma Audit and Research Network (TARN) database was used to collect data concerning injuries associated with mobility scooters. The data was taken from incidents that occurred between February 2014 and November 2020. The data analysed included: patient demographics, injury mechanism and patterns and associated mortality rates.

Results: 1,504 patients were identified of which 61.4% were male. The median age was 76.2 years (IQR 63.5-84.9). The median injury severity score (ISS) was 9 (IQR 9-17), with major trauma (ISS ≥16) being observed in 29.4% of patients. Injuries to the limb were most common, although injuries to the head were most severe. Vehicle collisions accounted for 65.4% of injuries and were most closely associated with the most severe incidents. The median length of stay in hospital was 12 days, excluding the patients who died. Overall, mortality following injury was 10.6%, but the mortality rate was 15.4% in those aged 75 years and over, and 24.2% in those sustaining severe trauma.

Conclusion: As the population ages, injury characteristics of those with both major and non-major trauma changes. Mobility scooter use is prevalent amongst older people, and we provided a detailed analysis of injuries sustained with their use across a national database. The length of stay and the inherent resource use, because of admission following mobility scooter trauma, is considerable. These injuries particularly affect the 'most elderly' and carry a considerable mortality burden.

Introduction

The United Kingdom (UK) has an ageing population, with one in five people aged 65 years or over in 2019 compared to one in six in 1999 and a projected one in four by 2029(1). Older patients are more vulnerable to trauma and its complications due to their frailty, limited mobility and reduced physical reserves(2,3). This in turn can lead to longer hospital stays, increased mortality, subsequent re-injury and poorer outcomes(4). According to Kirshenbom et al (2017) traumatic injuries are the fifth leading cause of death in elderly patients(5). Blunt injury resulting from falls and motor vehicle crashes (MVCs) are the most common type of trauma encountered by the elderly(6). In 2019, 30,144 patients were seriously injured, and 1,752 fatalities were reported on the roadway in the UK following MVCs in which older road users were over-represented in premature mortality and morbidity rates(7–9). In the UK, 6,312 patients aged 60 years and over were killed or seriously injured in MVCs in 2019(10).

Mobility scooter use as an alternative method of transport is becoming ubiquitous amongst the older population(2,11). Mobility scooters were introduced in the early 1950s to help those with impaired mobility, and to improve quality of life by allowing participants to partake in daily activities independently(12). To date, there are approximately 350,000 mobility scooters in use in the UK and this increasing number of users is associated with a rise in related injuries(13,14). Carlsson and Lundälv (2019) conducted a study in Sweden investigating incidents and injuries related to powered mobility devices (PMDs), in which they reported a three-fold increase in the number of PMD-related incidents over a ten-year period from 2007 to 2016(15).

In the UK, laws regarding mobility scooter use are set out by the Department for Transport(16). Mobility scooters can be defined as class two or class three vehicles. Class two vehicles can only be used on the pavement and have a maximum speed limit of four miles per hour, whereas class three vehicles can be used on the road and have a maximum speed limit of eight miles per hour. Consequently, they must be equipped with mirrors, lights and a horn. Mobility scooters can thus be used both on roadways and on footpaths depending on the classification of the mobility scooter(16). However, currently no guidance currently exists on the use of seatbelts or helmets as protective measures for users. Cassell and Clapperton (2006)(14) focused on the occurrence of motorised mobility scooter (MMS) injuries in Australia and reported that over a five-year period, there were six fatalities and 151 hospital-treated injuries recorded. Furthermore, they highlighted that three out of the six deaths were caused by head injuries, and 25% of patients treated in hospital sustained injuries to the head, face and neck. While mobility scooters provide definite advantages to the elderly 5opulationn, the lack of regulation calls into question their safe use by this vulnerable population.

Currently no evidence exists assessing mobility scooter associated major trauma in the UK at a national level(17). To effectively explore the rise in mobility scooter injury in the UK we have analysed the Trauma Audit and Research Network (TARN) database to develop key themes. Therefore, this study therefore investigated the demographics and injury patterns of mobility scooter users who have sustained traumatic injury requiring hospital admission.

Methods

The TARN database was used to investigate all patients who presented to hospitals following incidents that involved mobility scooters in England between February 2014 and November 2020. February 2014 was chosen as the start date because this was when the TARN database first included a data field for mobility scooters. TARN is the largest trauma database in Europe, containing information on patients who have suffered from trauma in England, Wales, Ireland and some parts of Europe(18). The inclusion criteria for entry into the database includes trauma patients that have been: admitted to hospital for 72 hours or more, admitted to an intensive care unit, transferred for specialist care or trauma patients who have died in hospital from their injuries. Inclusion criteria was not restricted by a specific Injury Severity Score (ISS) in the TARN database. Patients with isolated injuries such as closed extremity fractures, or those 65 years and over sustaining a hip fracture are excluded from the TARN database.

The TARN data we analysed included information on patients': age, gender, mechanism of injury (blow(s), fall less than 2m, fall more than 2m, vehicle incident or collision), Abbreviated Injury Scale (AIS), total ISS, length of stay in hospital and mortality rate. The Abbreviated Injury Scale (AIS) is an anatomically based, global severity scoring system that classifies an individual injury by body region, this was the metric used to investigate injury by location(19). The AIS ranges from one to six, where a score of one indicates a minor injury, and six indicates maximal injury thought to be 'incompatible with life'. In comparison, the ISS score ranges from one to 75(19). In the TARN database, there were no missing values in any of the variables considered in the analyses

Statistical Analyses

Data was analysed using SPSS v27.0 (IBM, Armonk, New York, USA). Descriptive statistics and inferential tests were used to assess the relationship between: age, mortality and severity of injury with factors which were proposed to be plausibly related.

To determine the relationship between ISS and participant characteristics, ISS values were grouped using a cut-point of 16 to differentiate between those who sustained major trauma and those who did not. This threshold was adopted following an investigation into mortality rates conducted by the North American Major Trauma Outcome study (20). An ISS of 16 or more indicates patients with at least two severe, or one serious injury, and will therefore be defined as major trauma for the remainder of this study. ISS values below 16 were categorised into three groups: 0-8, 9 and 10-15.

Using these groups, we analysed the relationship between ISS and categorical data such as gender, mechanism of injury, location of injury and mortality using the Chi-squared test. We analysed the relationship between ISS and continuous outcomes including age, abbreviated injury scale and length of stay using a Spearman-rank correlation test. When analysing length of hospital stay, only those who survived to discharge were included.

To assess the relationship between age and participant characteristics, we grouped participants into eight age categories. The groups were chosen so that each group had an approximately similar number of patients. Using these groups, we analysed the relationship between age and categorical data including gender, mechanism of injury, location of injury and mortality using the Chi-squared test. The relationship between age and continuous outcomes including ISS, abbreviated injury scale and length of stay was analysed using a Spearman-rank correlation test.

To determine the relationship between mortality rate and participant characteristics, participants were split into three groups. These groups consisted of participants who died within 7 days of trauma, those who died between 8 and 30 days of trauma and those who did not die in hospital. Using these groups, we analysed the relationship between mortality outcomes and categorical data including mechanism of injury, location of injury and gender using the Chi-squared Test. The Kruskall-Wallis test was used to investigate the relationship between mortality outcomes and continuous data including the age, ISS and the abbreviated injury scale.

Results

Overall, 1,504 patients sustained mobility scooter trauma. The characteristics of these individuals and their injuries are presented in ***Table 1***. In total, 923 were male and 581 were female. The youngest individual was 20 years of age, and the oldest 98. Median age was 76.2 years (IQR 63.5-84.9). Vehicle incident or collision was the most common mechanism of injury (65.4%), followed by a fall less than two metres, as the second most common mechanism of injury (34.2%). The third most common mechanism of injury was a blow/crush injury (0.7%), and lastly, a fall which was greater than two metres (0.6%). Falls from greater than 2 metres involved patients driving their mobility scooters down a set of stairs, falling into docks and falling into the sea. Examples of blow injuries were falls from mobility scooters whereby the mobility scooter subsequently fell on the patient or intrinsic parts of the scooter caused a blow injury to the patient. Injuries to the limbs were the most common site of injury with over half of patients sustaining limb injures. Mortality after an incident involving mobility scooters was 10.6%..

<u>*Analysis of Factors associated with ISS*</u>

The association between injuries and the 4 ISS groups defined in the methods section, are presented in ***Table 2.*** As aforementioned, an ISS score of greater than 16 is referred to major trauma.

The data shows that 442 (29.4%) patients sustained major trauma injury. 343 patients had an ISS of between 0-8, 589 with an ISS of 9 and 130 with an ISS between 10-15. The median ISS across all participants of the study was 9 (IQR 9-17). There was no significant association between age of participant and ISS score (p=0.058). However, the data showed that males were more likely to be involved in major trauma (p<0.001). There was also a significant difference between different mechanisms of injury and ISS groups (p<0.001), with the most common injury mechanism in patients that experienced major trauma being vehicle collisions. The length of stay was marginally longer in those with lower ISS scores (p=0.008, r=-0.069). Lastly, the mortality rate in those sustaining major trauma was 24.2% compared to less than 7% in each of the other ISS sub-groups. *(**Table 2**).*

Major trauma sufferers had a greater likelihood of having injuries to the head (p<0.001, r=0.634), face (p<0.001, r=0.248), thorax (p<0.001, r=0.200) and abdomen (p<0.001, r=0.155). They were also more likely to sustain more severe injuries to these areas (p<0.001). Injuries to the head were most associated with major trauma with 72.4% of patients sustaining head injury. Contrastingly, injuries to the limb were more severe (p<0.001, r=-0.109) and more frequent in patients who did not sustain major trauma when compared to injuries to other areas of the body (p<0.001). ***(Table 2)***

Analysis of Factors associated with Age

The association between the age of participant and participant characteristics are presented in ***Table 3***. For the purposes of analysis, patients were split into 8 age categories to create approximately equal-sized groups.

The findings indicated that older individuals had a higher likelihood of death (p<0.001). The mortality rate in each of the four youngest groups, where the age was less than 75, was under 10%. However, it was over 10% in each of the four oldest groups where the age was greater than and including 75 years. The average mortality rate in the four older groups was 15.4%, compared to 5.5% in the four youngest groups. The length of stay at hospital was also statistically longer for more elderly patients (p<0.001, r=0.149). Individuals over the age of 75, on average, stayed for more than 12 days, and those under 75 stayed for 12 or less. There was no statistically significant association between ISS and increasing age (p=0.061) with the median ISS score in all age categories being 9. The mechanism of injury was statistically different between the age categories (p=0.004). In the extremities of age, patients were more likely to be injured from a fall, than a vehicle collision. Lastly, the proportion of males and females did not differ with increasing age (p=0.059). ***(Table 3)***

With increasing age, there was an increase in frequency and severity of injuries to the head (p<0.001,r=0.166), thorax (p<0.001, r=0.091) and pelvis (p<0.001,r=0.110). Conversely, elderly patients sustained injuries to their limbs less frequently and more mildly (p<0.001,r=-0.21). ***(Table 3)***

Analysis of Factors associated with Mortality

The relationship between mortality and injuries is demonstrated in table 4. Individuals were grouped into those who died within 7 days of trauma, within 8-30 days of trauma and those who did not die as a result of trauma.

Overall, the mortality rate was 159 (10.6%). Of those who died, 73% died within 7 days. Older age and higher ISS was more commonly associated with mortality (p<0.001,p<0.001). In the two mortality groups which were associated with death, the median ISS score was above 16, indicating major trauma. Males were more likely to die in mobility scooter incidents than females ($p<0.001$), but mechanism of injury made no statistically significant difference to mortality ($p=0.290$).

Mortality was associated with an increase in frequency and severity in head ($p<0.001$), facial ($p<0.001$), thoracic ($p<0.001$), abdominal ($p<0.001$) and spinal ($p=0.012$) injuries.
Head injury was most associated in mortality within 7 days of trauma, the median AIS for head injury in this cohort was 4. Moreover, patients who died were less likely to sustain a limb injury and on average sustained less severe limb injuries ($p<0.001$). ***(Table 4)***

Discussion

With the elderly population in the UK increasing in size over the last two decades, there is a growing need for mobility aids to encourage independence among the older population (1). However, as mobility scooter usage increases, so does the number of injuries and fatalities associated with mobility scooter incidents(21). The results of this study indicated that mortality following trauma is significant, with an overall mortality of 24.2% from injuries incurred during mobility scooter incidents in patients who have sustained major trauma, a 15.4% mortality in those who were over and including the age of 75 years and a mortality of 10.6% among all participants in incidents involving mobility scooters. Elderly patients were found to be particularly vulnerable to mortality and major trauma and it was found that trauma to the head resulted in the most severe injuries and the highest mortality rate.

Given the estimated 350,000 users of mobility scooters in the UK and the observed 1,504 severe injuries related to mobility scooters in the 6 years that data was collected, the incidence of severe injury over 6 years is 0.43%(13). Moreover, there were 159 deaths recorded, meaning that the incidence of death related to mobility scooters over six years is 0.045%. For comparison, in 2019, there were a reported 25,945 serious MVCs and 1,752 fatalities caused by 38.7 million licensed vehicles in the UK. This equates to an annual incidence of 0.067% of severe injury in motorists, and an annual fatality incidence of 0.0045%.(10,22) Therefore, the incidence of severe injury is ten times greater and the incidence of death is 1.66 times higher in mobility scooters when compared to all registered vehicles in the UK. While a higher injury and fatality rate can be partly attributed to the older age of mobility scooter users, there are also strict safety regulations for cars, motorbikes and buses which do not yet exist for mobility scooters.

Several studies have identified that older users were over-represented in those requiring hospital admission and treatment following a mobility scooter incident(14). The findings from this study found that the mortality rate in those aged 75 years or over was 15.4%, compared to 5.5% of those who were under 75 years. The incidence of these injuries must also not be underestimated, as 79.9% of the patients who died in this study were over the age of 75 years. This finding is reinforced by Kitching et al (2016), who identified that 74.1% of fatalities involving mobility scooters were sustained by the elderly(23). In this study, patients over and including the age of 75 years were more likely to sustain head injuries and were more likely to have a prolonged stay in hospital. A contributing factor to both findings may be that mobility scooters are generally used by an older population who are more prone to frailty and therefore more vulnerable to trauma. Therefore, given the increased risk of injury and mortality with increasing age, it may be wise to counsel patients about the risk versus benefit when assessing their suitability to use a mobility scooter, which may help prevent adverse outcomes in the long-term.

When comparing pattern of injury, several studies have identified injuries to the head or neck, upper and lower extremities as the most common sites of injury(12,21,23). This is supported by the findings of Carlsson and Lundälv (2019), who found that the most commonly injured body regions following a single collision involving a mobility scooter were the head, upper limbs and lower limbs (15). In this study, 74.2% of those who sustained major trauma suffered an injury to the head, with these injuries often being classified as severe or life-threatening. At present, there is no legislation enforcing the use of head protection. Thus, this should be considered in the future in order to prevent head injury and associated mortality(15,24).

Over half of the recorded incidents in the current study involved limb injury. Notably, 61.7% of those who did not sustain major trauma sustained injury to the limb compared to 30.1% of those who did. The average AIS to the limb for those who did not sustain severe trauma was 3, indicating a severe injury. The high frequency of limb injuries in mobility scooter incidents is mirrored in another study which identified that injuries to the lower extremities represented almost half of hospital admissions related to mobility scooter usage(14). Since injuries to the limb are rarely life threatening, an isolated limb injury will rarely be classified as major trauma. However, it has been argued that complicated lower limb injuries that do not score highly with the ISS still have potential to cause significant physical and psychological morbidity and thus must not be under-triaged (25,26)

Collisions with vehicles accounted for 65.4% of mobility incidents, and were most closely associated with the most severe ones. Notwithstanding, almost a third of injuries were caused by a fall of less than 2 metres *(Table 3)*. Contrary to this study, Cassell and Clapperton (2006)(14) reported a higher rate of injuries following falls from mobility scooter incidents in their study. They discovered that all fatalities and 58% of hospital-treated injuries associated with mobility scooters were due to falls from a mobility scooter in Australia. In either case, it is clear that falls are predictors of adverse outcomes in mobility scooter incidents(14,15).

Vehicle incident or collision was identified as causing the most severe trauma in this study. Studies have identified that most collisions happen at intersections or junctions with other motor vehicles such as motorcycles, cars and trucks(14,15,24). Limited visibility, user inexperience, and scooter defects have been identified as possible risk factors for both collisions and falls(15,27).Consequently, it may be helpful for users to be provided with adequate education and training prior to mobility scooter use. In addition to this, if there was legislation mandating the use of seatbelts, adequate footwear and helmets or allowing mobility scooters to use cycle lanes, major trauma may be prevented, especially since the majority of deaths were caused by head injuries and vehicle collisions. Although education may delay the availability of mobility scooters at the point of need, these health regulations are necessary to prevent major trauma and help to save lives.

There were a few limitations to our study. The first one is the paucity of information on patient comorbidities which may impair their ability to use a mobility scooter safely, such as poor vision or immobility. Furthermore, we were unable to analyse whether comorbidities have an impact on injury severity and overall mortality. As Paparone (2013) states, it is patients with mobility issues caused by comorbidities that are most at risk of injury(12).

Another limitation to consider is data collection. While the TARN database provides us with comprehensive information from various centres in the UK and some parts of Europe, it lacks data that would have contributed to further findings. For example, the TARN database excludes patients aged 65 years or over who have suffered from an isolated hip fracture. Several studies, for example Kirby et al (1995), identified hip fractures amongst the most common injuries following a mobility scooter incident(12,28). Therefore, the database may not be fully representative of the trauma population we are investigating which means our analysis may underrepresent the incidence and nature of injuries experienced by this population. Despite this, the TARN database did not have any missing data within any of the variables it had reported on, an evident strength of the database.

We were also unable to distinguish incidents involving class 2 with class 3 scooters. As class 2 scooters exclusively use footpaths and can go up to a speed of four miles per hour it is likely that the injury patterns related to the use of them will be different to class 3 scooters which can go up to eight miles per hour and on roads as well as footpaths.

Lastly, the data analysed did not include incidents that did not result in a hospital admission, which means that our study may underestimate the total of mobility scooter related injuries. In a study that investigated the nature and causes of injuries related to scooters, powered wheelchairs and manual wheelchairs in the US, it was shown that out of 334 patients, 3% did not seek medical attention following an injury(28). Therefore, our analysis may under-estimate the total incidence of mobility scooter related injuries.

Conclusion

An older and more frail population increasingly relies on mobility aids including scooters for transport and activities for daily living. This study investigates the injury patters of mobility scooter injuries using a national database and finds a considerable mortality rate, accentuated by both older age and major trauma. Since there are currently limited measures which contribute to mobility scooter safety, practical and legislative measures should be introduced to make mobility scooters safer and avoid preventable deaths.

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Conflicts of Interest From Authors: None to declare

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Table 1: Demographic characteristics

		Frequency (%) or Median (IQR)
Age		76.2 (63.5-84.9)
	20-59 years	266 (17.7%)
	60-64 years	168 (11.2%)
	65-69 years	130 (8.6%)
	70-74 years	167 (11.1%)
	75-79 years	210 (14.0%)
	80-84 years	221 (14.7%)
	85-89 years	189 (12.6%)
	≥ 99 years	153 (20.2%)
Gender	Male	923 (61.4%)
	Female	581 (38.6%)
Mechanism of Injury	Vehicle Incident/collision	970 (65.4%)
	Fall less than 2m	514 (34.2%)
	Blow/Crush	11 (0.7%)
	Fall more than 2m	9 (0.6%)
Location of Injury	Limb	788 (52.4%)
	Head	412 (27.4%)
	Thorax	333 (22.1%)
	Pelvis	262 (17.4%)
	Spine	211 (14.0%)
	Face	142 (9.4%)
	Abdomen	50 (3.3%)
	Other	61 (4.1%)
ISS Score (median; IQR)		9 (9-17)
Length of stay (days) (median; IQR)		12 (6-21)
Mortality	Yes	159 (10.6%)
	No	1345 (89.4%)

Table 2: Relationship between ISS and participant characteristics

		ISS				
		0-8	**9**	**10-15**	**≥16**	**P-Value (Correlation Coefficient)**
		N=343	**N=589**	**N=130**	**N=442**	
Age (Median; IQR)		77 (68.5-85.4)	69.6 (59.9-81.6)	76.6 (64.7-85.3)	78.45 (68.8-86)	0.058 (0.049)
Gender	Male	216 (63%)	324 (55%)	85 (65.4%)	298 (67.4%)	<0.001
	Female	127 (37%)	265 (45%)	45 (34.6%)	144 (32.6%)	
Mechanism of Injury	Vehicle Incident/collision	223 (65%)	340 (57.7%)	86 (66.2%)	320 (72.4%)	<0.001
	Fall less than 2m	113 (32.9%)	239 (40.6%)	43 (33.1%)	119 (26.9%)	
	Fall more than 2m	5 (1.5%)	1 (0.2%)	1 (0.8%)	3 (0.7%)	
	Blow/ Crush	2 (0.6%)	9 (1.5%)	0	0	
Abbreviated Injury Scale (Median; IQR, Mean; SD)	Head	0 (0-0), 0.04 (0.21)	0 (0-0), 0.07 (0.44)	0 (0-1), 0.79 (1.16)	4 (0-5), 3.09 (1.99)	<0.001 (0.634)
	Face	0 (0-0), 0.08 (0.36)	0 (0-0), 0.01 (0.12)	0 (0-0), 0.27 (0.61)	0 (0-0), 0.35 (0.71)	<0.001 (0.248)
	Thorax	0 (0-0), 0.35 (0.69)	0 (0-0), 0.29 (0.87)	0 (0-3), 1.12 (1.40)	0 (0-3), 1.13 (1.69)	<0.001 (0.200)
	Abdomen	0 (0-0), 0.01 (0.16)	0 (0-0), 0.02 (0.26)	0 (0-0), 0.14 (0.51)	0 (0-0), 0.20 (0.77)	<0.001 (0.155)
	Spine	0 (0-0), 0.48 (0.85)	0 (0-0), 0.14 (0.60)	0 (0-0), 0.48 (0.96)	0 (0-0), 0.38 (0.90)	0.457 (-0.019)
	Pelvis	0 (0-2), 0.94 (1.00)	0 (0-0), 0.05 (0.30)	0 (0-0), 0.09 (0.42)	0 (0-0), 0.61 (1.37)	<0.001 (-0.191)
	Limb	0 (0-0), 0.46 (0.83)	3 (3-3), 2.49 (1.12)	2 (0-3), 1.58 (1.33)	0 (0-2), 66 (1.06)	<0.001 (-0.109)
	Other	0 (0-0), 0.2 (0.16)	0	0 (0-0), 0.12 (0.34)	0 (0-0), 0.11 (0.43)	<0.001 (0.137)
Location of Injury (AIS>0)	Head	12 (3.5%)	20 (3.4%)	52 (40.0%)	328 (74.2%)	<0.001
	Face	20 (5.8%)	2 (0.3%)	25 (18.5%)	96 (21.7%)	<0.001
	Thorax	76 (22.2%)	59 (10.0%)	53 (40.8%)	145 (32.8%)	<0.001
	Abdomen	3 (0.9%)	5 (0.8%)	11 (8.5%)	32 (7.2%)	<0.001
	Spine	82	29	27	73	<0.001

		(23.9%)	(4.9%)	(20.8%)	(16.5%)	
	Pelvis	162 (47.2%)	14 (2.4%)	6 (4.6%)	80 (18.1%)	<0.001
	Limb	82 (23.9%)	492 (83.5%)	81 (62.3%)	133 (30.1%)	<0.001
	Other	9 (2.6%)	0	14 (10.8%)	38 (8.6%)	<0.001
Length of stay (days) (Median; IQR)		12 (7-23)	14 (8-23)	13 (7-27.5)	12 (6-22)	0.008 (-0.069)
Mortality		15 (4.4%)	28 (4.8%)	9 (6.9%)	107 (24.2%)	<0.001

Table 3: Relationship between age and participant characteristics

		Age (years)								**P-Value (Correlation coefficient)**
		20-59	**60-64**	**65-69**	**70-74**	**75-79**	**80-84**	**85-89**	**90-99**	
		N=266	**N=168**	**N=130**	**N=167**	**N=210**	**N=221**	**N=189**	**N=153**	
Gender	Male	166 (62.4%)	104 (61.9%)	78 (60%)	84 (50.3%)	125 (59.5%)	139 (62.9%)	122 (64.6%)	105 (68.6%)	0.059
	Female	100 (37.6%)	64 (38.1%)	52 (40%)	83 (49.7%)	85 (40.5%)	82 (37.1%)	67 (35.4%)	48 (31.4%)	
Mechanism of Injury	Vehicle Incident/collision	164 (61.7%)	102 (60.7%)	84 (64.6%)	108 (64.7%)	140 (66.7%)	145 (65.6%)	131 (69.3%)	95 (62.1%)	0.004
	Fall less than 2m	95 (35.7%)	64 (38.1%)	41 (31.5%)	59 (35.3%)	69 (32.9%)	74 (33.5%)	55 (29.1%)	57 (37.3%)	
	Fall more than 2m	6 (2.3%)	0	5 (3.8%)	0	0	0	1 (0.5%)	1 (0.7%)	
	Blow/Crush	1 (0.4%)	2 (1.2%)	0	0	1 (0.5%)	2 (0.9%)	2 (1.1%)	0	
Abbreviated Injury Scale (Median; IQR, Mean; SD)	Head	0 (0-0), 0.67 (1.50)	0 (0-0), 0.53 (1.42)	0 (0-0), 0.65 (1.48)	0 (0-3), 1.11 (1.82)	0 (0-3), 1.23 (1.92)	0 (0-3), 1.19 (1.90)	0 (0-3.5), 1.34 (1.96)	0 (0-4), 1.39 (1.99)	<0.001 (0.166)
	Face	0 (0-0), 0.16 (0.54)	0 (0-0), 0.11 (0.42)	0 (0-0), 0.12 (0.43)	0 (0-0), 0.16 (0.52)	0 (0-0), 0.16 (0.49)	0 (0-0), 0.16 (0.48)	0 (0-0), 0.13 (0.45)	0 (0-0), 0.16 (0.50)	0.461 (0.019)
	Thorax	0 (0-0), 0.37	0 (0-0), 0.46	0 (0-2), 0.80	0 (0-0), 0.66	0 (0-1), 0.75	0 (0-1), 0.72	0 (0-0), 0.68	0 (0-0), 0.67	<0.001 (0.091)

		(1.04)	(1.10)	(1.35)	(1.28)	(1.36)	(1.29)	(1.32)	(1.29)	
	Abdomen	0 (0-0), 0.10 (0.53)	0 (0-0), 0.10 (0.53)	0 (0-0), 0.08 (0.50)	0 (0-0), 0.05 (0.40)	0 (0-0), 0.12 (0.61)	0 (0-0), 0.06 (0.42)	0 (0-0), 0.24 (0.27)	0 (0-0), 0.10 (0.51)	0.608 (-0.013)
	Spine	0 (0-0), 0.23 (0.70)	0 (0-0), 0.24 (0.68)	0 (0-0), 0.41 (0.91)	0 (0-0), 0.31 (0.76)	0 (0-0), 0.36 (0.90)	0 (0-0), 0.33 (0.84)	0 (0-0), 0.36 (0.83)	0 (0-0), 0.35 (0.84)	0.062 (0.05)
	Pelvis	0 (0-0), 0.29 (0.86)	0 (0-0), 0.15 (0.58)	0 (0-0), 0.51 (1.11)	0 (0-0), 0.40 (0.96)	0 (0-0), 0.49 (1.00)	0 (0-0), 0.49 (1.07)	0 (0-0), 0.53 (1.07)	0 (0-0), 0.55 (1.10)	<0.001 (0.11)
	Limb	3 (0-3), 1.94 (1.37)	3 (0-3), 2.00 (1.35)	0 (0-3), 1.25 (1.37)	0 (0-3), 1.23 (1.37)	0 (0-3), 1.20 (1.35)	0 (0-3), 1.05 (1.35)	0 (0-3), 1.20 (1.36)	0 (0-3), 1.24 (1.34)	<0.001 (-0.21)
	Other	0 (0-0), 0.04 (0.30)	0 (0-0), 0.07 (0.37)	0 (0-0), 0.01 (0.09)	0 (0-0), 0.06 (0.38)	0 (0-0), 0.04 (0.20)	0 (0-0), 0.05 (0.22)	0 (0-0), 0.04 (0.21)	0 (0-0), 0.06 (0.24)	0.038 (0.053)
Location of Injury (AIS>0)	Head	50 (18.8%)	23 (13.7%)	25 (19.2%)	52 (31.1%)	68 (32.4%)	69 (31.2%)	68 (36.0%)	57 (37.3%)	<0.001
	Face	24 (9%)	11 (6.5%)	11 (8.5%)	17 (10.2%)	23 (11.0%)	24 (10.9%)	17 (9.0%)	15 (9.8%)	0.876
	Thorax	33 (12.4%)	28 (16.7%)	37 (28.5%)	39 (23.4%)	54 (25.7%)	59 (26.7%)	46 (24.3%)	37 (24.2%)	<0.001
	Abdomen	10 (3.8%)	7 (4.2%)	4 (3.1%)	4 (2.4%)	10 (4.8%)	5 (2.3%)	5 (2.6%)	6 (3.9%)	0.837
	Spine	28 (10.5%)	19 (11.3%)	23 (17.7%)	24 (14.4%)	31 (14.8%)	31 (14.0%)	31 (16.4%)	24 (15.7%)	0.480
	Pelvis	31 (11.7%)	12 (7.1%)	27 (20.8%)	27 (16.2%)	44 (21.0%)	44 (19.9%)	42 (22.2%)	35 (22.9%)	<0.001
	Limb	181 (68%)	119 (70.8%)	63 (48.5%)	79 (47.3%)	98 (46.7%)	87 (39.4%)	86 (45.5%)	75 (49.0%)	<0.001
	Other	7 (2.6%)	8 (4.8%)	1 (0.8%)	6 (3.6%)	9 (4.3%)	11 (5.0%)	9 (4.8%)	10 (6.5%)	0.293
ISS Score (Median; IQR, Mean; SD)		9 (9-13), 11.5	9 (9-9), 10.9	9 (5-13.25),	9 (5-16), 12.0	9 (9-17), 13.3	9 (8.5-17),	9 (9-17), 13.1	9 (5-18), 13.5	0.019 (0.061)

	(6.87)	(6.73)	11.1 (7.61)	(8.58)	(9.34)	12.5 (8.90)	(9.05)	(9.81)	
Length of stay (days) (Median; IQR, Mean; SD)	11 (6-18), 15.8 (16.1)	10.5 (7-17.75), 16.6 (18.3)	12 (7-22), 17.8 (17.0)	12 (7-22), 18.4 (19.2)	12.5 (7-23), 18.0 (17.6)	14 (8-26), 19.4 (18.3)	16 (9-27.5), 20.7 (17.1)	15 (10-27), 22.8 (22.4)	<0.001 (0.149)
Mortality	10 (3.8 %)	8 (4.8 %)	6 (4.6 %)	16 (9.6 %)	24 (11.4 %)	33 (14.9 %)	29 (15.3 %)	33 (21.6 %)	<0.001

Table 4: Relationship between mortality and participant characteristics

		No Death	Death within 7 days	Death 8-30 days	P-Value
		N=1345	N=116	N=43	
Age (Median; IQR)		74.2 (62.8-83.6)	81.2 (73.3-86.6)	86.8 (78.3-90.4)	<0.001
ISS (Median; IQR, mean; SD)		9 (9-14), 11.1 (7.1)	25 (13-29)	16 (9-25)	<0.001
Gender	Male	804 (59.8%)	85 (73.3%)	34 (79.1%)	<0.001
	Female	541 (40.2%)	31 (26.7%)	9 (20.9%)	
Mechanism of Injury	Vehicle Incident/collision	853 (63.4%)	85 (73.3%)	31 (72.1%)	0.290
	Fall less than 2m	473 (35.2%)	30 (25.9%)	11 (25.6%)	
	Fall more than 2m	8 (0.6%)	1 (0.9%)	1 (2.3%)	
	Blow/ Crush	11 (0.8%)	0	0	
Abbreviated Injury Scale (Median; IQR, Mean; SD)	Head	0 (0-0), 0.82 (1.61)	4 (0-5), 3.03 (2.24)	0 (0-4), 1.58 (2.13)	<0.001
	Face	0 (0-0), 0.12 (0.45)	0(0-0.75), 0.41 (0.77)	0 (0-0), 0.16 (0.53)	<0.001
	Thorax	0 (0-0), 0.56 (1.18)	0 (0-3), 1.25 (1.63)	0 (0-02), 1.02 (1.60)	<0.001
	Abdomen	0 (0-0), 0.06 (0.42)	0 (0-0), 0.31 (0.88)	0 (0-0), 0.19 (0.70)	<0.001
	Spine	0 (0-0), 0.29 (0.78)	0 (0-0), 0.47 (0.96)	0 (0-2), 0.60 (1.09)	0.012
	Pelvis	0 (0-0), 0.40 (0.95)	0 (0-0), 0.55 (1.19)	0 (0-0), 0.56 (1.24)	0.410
	Limb	2 (0-3), 1.47 (1.40)	0 (0-2), 0.90 (1.15)	0 (0-3), 1.00 (1.35)	<0.001
	Other	0 (0-0), 0.04 (0.23)	0 (0-0), 0.17 (0.50)	0 (0-0), 0.07 (0.34)	<0.001
Location of	Head	315 (23.4%)	80 (69.0%)	17 (39.5%)	<0.001

Injury (AIS>0)	Face	109 (8.1%)	29 (25.0%)	4 (9.3%)	<0.001
	Thorax	272 (20.2%)	47 (40.5%)	14 (32.6%)	<0.001
	Abdomen	33 (2.5%)	15 (12.9%)	3 (7.0%)	<0.001
	Spine	176 (13.1%)	24 (20.7%)	11 (25.6%)	0.015
	Pelvis	229 (17.0%)	24 (20.7%)	9 (20.9%)	0.476
	Limb	732 (54.4%)	40 (34.5%)	16 (37.2%)	<0.001
	Other	42 (3.1%)	17 (4.7%)	2 (4.7%)	<0.001