

## A 5-year Profile of Trauma Admissions to the Surgical Intensive Care Unit of a Tertiary Hospital in Singapore

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### Abstract

**Introduction:** This retrospective pilot study provides information on trauma admissions to the Surgical Intensive Care Unit (SICU) of a tertiary hospital in Singapore. The aim was to use the data collected to generate awareness and interest in this area. The authors also wish to use the information to advocate subsequent in-depth collection and analysis of data and the development of a Trauma Registry. As this was a pilot study, the data collected were by no means exhaustive and only descriptive analysis was applied. **Materials and Methods:** Trauma admissions to the SICU for the period between January 2001 and December 2005 were identified from the admissions logbook maintained in the unit. The physical case-notes or electronic-records for the identified cases were retrieved and the relevant data and parameters were entered into the data collection sheet. Descriptive analysis was applied to the data collected. **Results:** A total of 503 cases over the 5-year period fulfilled our criteria. Motor vehicle accidents were the greatest contributor of trauma admissions to the SICU (53%). The length of stay (LOS) in the unit ranged from 1 to 59 days. The anatomical area most frequently injured was the head (68%). Out of the 132 mortalities, male patients accounted for 84%. Two-thirds (67%) of injury-related mortality occurred in young patients aged less than 45 years. Motor vehicle accidents accounted for nearly half (47%) of injury-related mortality. Motorcyclists accounted for almost half (46%) of motor vehicle accident deaths. **Conclusion:** The preponderance of young people involved in motor vehicle accidents with head injuries has a large impact on society and on the hospital workload. The authors hope that this pilot study will generate awareness and interest in the area of trauma injuries. They recommend that a nationwide trauma registry be established to look closer into this “disease”, as other developed countries have done.

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**Key words:** Critical care, Data, Registry

### Introduction

Our tertiary hospital has a 9-bed Surgical Intensive Care Unit (SICU) that caters to all surgical disciplines except Cardio-Thoracic and Vascular Surgery (which has its own dedicated Cardio-Thoracic Intensive Care Unit).

During the 5-year period between January 2001 and December 2005, there were an average of 500 admissions to the SICU per year. Trauma admissions accounted for 20% of these.

Trauma injuries are classified under Accidents, Poisoning and Violence by the International Classification of Diseases Ninth Revision (ICD9) and are assigned codes E800 to E999 depending on the type of injuries sustained. In Singapore, Accidents, Poisoning and Violence was ranked first for hospital discharges for the year 2006, accounting for 9.1%

of all hospital discharges.<sup>1</sup> In that same year, it accounted for 6.3% of all deaths in Singapore and was ranked fifth in the top 10 causes of death in Singapore.<sup>2</sup>

This retrospective pilot study provides information on trauma admissions to the SICU of a tertiary hospital in Singapore. The aim was to generate awareness and interest in this area and advocate for comprehensive data capture of all trauma admissions at the hospital, cluster and the national level with the ultimate objective of creating a Trauma Registry.<sup>3</sup> As this was a pilot study, the data collected were not exhaustive. Descriptive statistics was used on the data collected.

### Materials and Methods

Trauma admissions to the SICU for the period between January 2001 and December 2005 were identified from the

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admissions logbook maintained in the unit.

The physical case-notes or electronic-records for the identified cases were retrieved and the relevant data and parameters were entered into the data collection sheet.

Permission for use of these records was obtained from the Director, SICU and cluster Domain Specific Review Board.

Inclusion criteria are:

1. Traumatic injuries severe enough to warrant intensive care admission.
2. Emergency surgery within 24 hours of admission for trauma injuries requiring postoperative care in the SICU.

Exclusion criteria are:

1. Patients with incomplete data due to irretrievable case-notes or electronic-records.
2. Readmission to the SICU during the same hospital stay after more than 24 hours post-discharge from SICU.
3. Admission to the SICU more than 24 hours post-injury unless classified under Inclusion criteria 2.

The following data were collected: age, gender, day of week admitted, year injured, anatomical area injured, mechanism of injuries, length of stay (LOS) in SICU and outcome in SICU (mortality).

The LOS for patients who were readmitted into the SICU post-discharge was calculated as follows:

- Patients who were readmitted to the SICU less than 24 hours after being discharged from it had the sum of both stays taken as the LOS.
- Patients who were readmitted to the SICU more than 24 hours after being discharged from it had only the initial stay taken into consideration when computing the LOS.

The anatomical area injured was determined with the definitions as outlined in “The Abbreviated Injury Scale 1990 Revision Update 98” dictionary published by the Association for the Advancement of Automotive Medicine.<sup>4</sup>

Descriptive analysis was applied to the data collected.

## Results

A total of 503 cases over the 5-year period fulfilled our criteria. That gives an average of 100 trauma admissions per year into the SICU. The SICU has an average of 500 admissions per year. Therefore, trauma admissions accounted for approximately 20% of all admissions into the SICU.

Male patients accounted for 85% of trauma admissions to the SICU (Table 1). Despite this, mortality rates between genders were similar, with males having a mortality rate of 35% and females 38% (Table 2).

Table 1. Summary of Demographics, Length of Stay and Mortality

Data Category	No. (%)
<b>Gender</b>	
Male	426 (85%)
Female	77 (15%)
<b>Age group (y)</b>	
15-29	199 (40%)
30-44	137 (27%)
45-59	102 (20%)
60-74	46 (9%)
>75	19 (4%)
<b>Length of stay (days)</b>	
1-7	391 (77.7%)
8-14	80 (16.0%)
15-21	21 (4.2%)
22-28	4 (0.8%)
> 28 days	7 (1.4%)
<b>Mortality</b>	
Died	132 (26%)
Survived	371 (74%)

Table 2. Admissions by Gender

		Survived	Died	Total	% Mortality
Gender	Male	315	111	426	35.2
	Female	56	21	77	37.5

Patients less than 45 years of age accounted for 67% of admissions. Mortality rate increased with age. The mortality rate was 27.6% for the 15-29 years age group, 30.5% for the 30-44 years age group, 45.7% for the 45-59 years age group, 58.6% for the 60-74 years age group and 72.7% for the 75 years and above age group (Table 3).

Motor vehicle accidents (MVA) were the most common cause for admission to the SICU and accounted for 53% of trauma admissions; falls came second at 26%. The other causes for trauma admission to the SICU were blunt force trauma, accidents involving bicycles, crush injury, penetrating trauma, explosions, firearms injury, electrical injury, hanging and others. There was no mortality in the group with penetrating trauma and firearms injury. Mortality varied between 23% and 38% in those with MVAs, falls, accidents involving bicycles and crush injuries. The patient with electrical injury and the hanging patient died (Table 4, Fig. 1).

Motorcyclists accounted for almost half (46%) of MVA deaths. Pedestrians accounted for 30% (Fig. 2).

The LOS in the SICU ranged from 1 to 59 days. The LOS

Table 3. Admissions by Age Group

	Survived	Died	Total	% Mortality	
Age group (y)	15-29	156	43	199	27.6
	30-44	105	32	137	30.5
	45-59	70	32	102	45.7
	60-74	29	17	46	58.6
	>=75	11	8	19	72.7

Table 4. Admissions by Injury Mechanism

	Survived	Died	Total	% Mortality
Hanging	0	1	1	100
Electrical	0	1	1	100
Firearms	2	0	2	0
Explosion	5	3	8	37.5
Penetrating	9	0	9	0
Crush injury	8	5	13	38.5
Bicycle	9	5	14	35.7
Blunt force	14	6	20	30
Others	27	11	38	28.9
Falls	93	37	130	28.4
MVA	205	62	267	23.2

MVA: motor vehicle accident

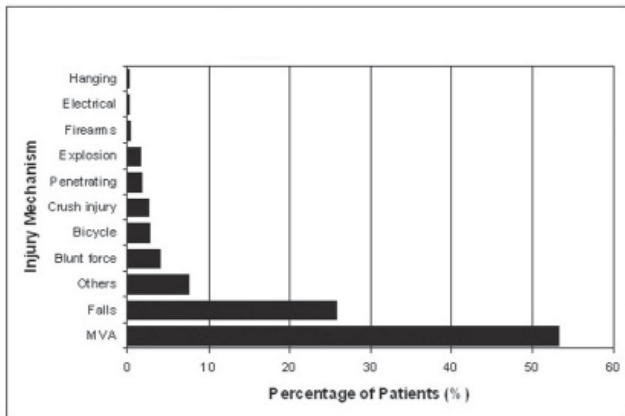


Fig. 1. Admissions by injury mechanism.

for the majority (78%) of patients was 7 days or less. Of the 132 patients who died, 62 (47%) of them died within 48 hours of admission (Fig. 3).

The anatomical area most frequently injured was the head (68%). Limb injuries were the next most frequent (upper limb 31%, lower limb 37%), followed by the torso (thorax 31%, abdomen/pelvis 24%). Injury to the spine was present in 15% of the admissions (Fig. 4).

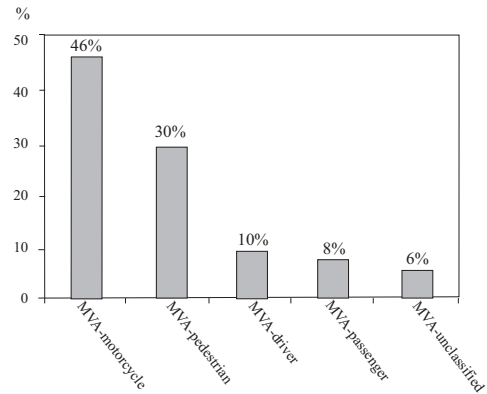


Fig. 2. Distribution of motor vehicle accident (MVA) mortality.

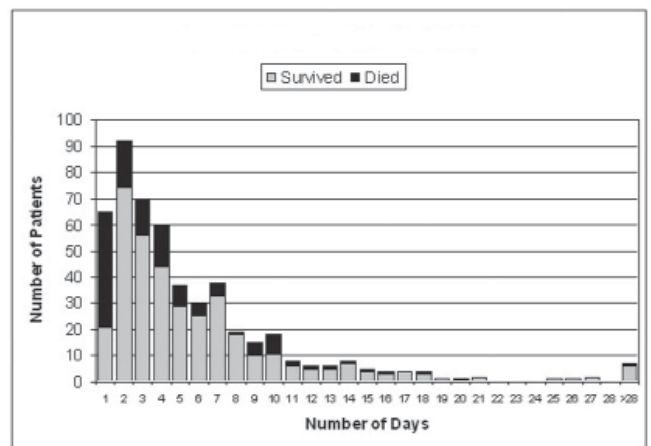


Fig. 3. Length of stay in intensive care unit (ICU). Dark-coloured portion are those who died in ICU and light-coloured portion are those who survived to discharge from ICU.

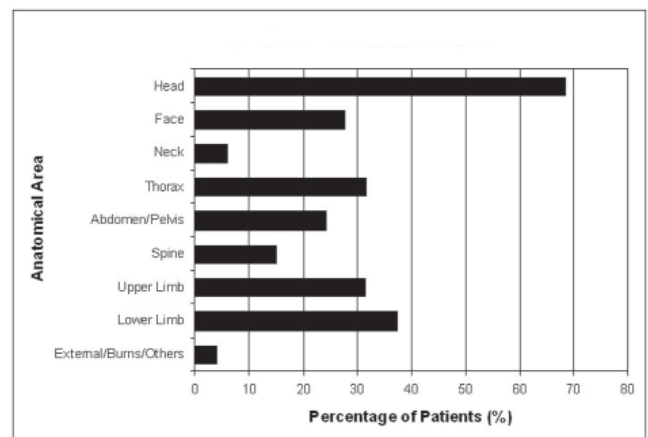


Fig. 4. Admissions by anatomical area injured. Some patients have more than one anatomical area injured.

**Discussion**

Trauma admissions to the SICU represent the most severely injured group of patients. Although the overall death rate for Accidents, Poisoning and Violence was around 6%,<sup>2</sup> mortality for trauma admissions in our SICU

was 26%. This is a 4-fold difference.

In recent decades, there has been a shift in perception that traumatic injuries are preventable and not unavoidable random events. There is also growing acceptance that trauma is a preventable public health problem.<sup>5-8</sup>

In the context of a hospital, trauma admissions to the SICU mean utilisation of a scarce resource (SICU bed) and intensive man-hours (resuscitation, surgery, intensive care and rehabilitation).

In societal context, trauma admissions to the SICU mean loss of an economically productive citizen and socioeconomic burden on other family members.

It is important to realise that for each injury or death, there are many injury survivors who are left with permanent disabling complications. The survivors often consume scarce resources in acute care hospitals as there are limited available community rehabilitation facilities.

The 3 major community hospitals in Singapore with rehabilitation facilities are the Ang Mo Kio-Thye Hua Kwan Hospital, St Andrew's Community Hospital and St Luke's Hospital.<sup>9-11</sup> These hospitals have about 200 beds each. However, these hospitals also cater to the needs of the geriatric population and those who have sustained strokes. Trauma patients who require rehabilitation are therefore competing for scarce resources in the community hospitals as well.

Trauma injuries represent a significant problem for Singapore. We believe that policies need to be formulated at the national level to enhance injury prevention, establish better rehabilitation programmes and facilities optimise the allocation of scarce healthcare resources. In order to formulate sound public policy, policy-makers require access to reliable information.<sup>12</sup>

Some countries, such as Australia, have established trauma registries. The Victorian State Trauma Registry was developed to capture information on all major trauma patients in the state of Victoria, with the aim to monitor the performance of the State's trauma system.

During the 1990s, research into road traffic fatalities in Victoria revealed that 30% to 40% of deaths were preventable or potentially preventable. In response to these findings, a ministerial taskforce was established to examine trauma and emergency medical services in Victoria. The resulting report, the Review of Trauma and Emergency Services (the ROTES report) was published in 1999. The report provided evidence-based advice to the state government on a best practice model for the integration and enhancement of trauma services. Over 100 recommendations, aimed at achieving optimal patient outcomes through coordinated trauma care, were made.<sup>13,14</sup>

The Annual Report of the Victoria State Trauma Registry

2001 to 2002 was the first annual report of the project. The availability of such extensive data on trauma care was seen as a great resource base for the healthcare system, researchers and others with an interest in trauma service. In the fourth annual report,<sup>15</sup> data confirmed that the trauma triage guidelines were being followed. In comparison with data from earlier reports, the following were noted: decrease in in-hospital mortality, LOS trended downwards and more patients were discharged to home than to rehabilitation.

From this example, it is apparent that data from a trauma registry can be used to provide a robust basis upon which to develop evidence-based policies and practices.<sup>16-19</sup> We hope that our pilot study will generate awareness and interest in the area of trauma injuries and serve as a motivation for us to expand data collection.<sup>20,21</sup> Expanded data collection will enable us to perform more in-depth analysis. For example, expanded data collection will allow us to calculate Injury Severity Scores and make comparisons between those who survived and those who died. It will also allow us to compare our data with the international community and review resource utilisation. The data can thus be used to inform of the nature of the problem and help focus on the need for the appropriate allocation of limited resources. Overall, the ultimate aim is improved patient care.

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The data were collected for all readmissions to the surgical ICUs in a tertiary hospital in the year 2003. Results. Of all the 945 ICU discharges, 110 patients (11.6%) were readmitted. They had a longer initial ICU stay ( $8.05 \pm 7.17$  vs  $5.22 \pm 4.95$ ,  $P < 0.001$ ) and were older and in a more severe condition than those not readmitted, but with a longer hospital stay and higher mortality rate (40% vs 3.6%,  $P < 0.001$ ). A total of 26.4% of the readmission patients had an early readmission (<48 h), with a lower mortality rate than those with a late readmission (24.1% vs 45.7%,  $P = 0.049$ ).  
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Daily Intensive Care Unit (maximum 30 days) ICU charges during a Hospital confinement. Hospital Miscellaneous Services 2. Expenses incurred during hospital confinement excluding. accommodation, surgeon's & in-hospital doctor's attendance fee. 3. A Daily Room & Board Benefit shall be paid when, upon recommendation of a Registered Medical Practitioner, an Insured Member is registered as a bed patient in a Hospital. The amount of the said benefit shall be equal to the actual charges made by the Hospital during the Insured Member's confinement, but in no event shall the benefit under this Paragraph exceed for any one day the rate of Daily Room & Board Benefit set forth in the Policy Schedule or exceed the number of days as specified in the same Schedule. 2. 1b.

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