

# Trauma Admissions to the ICU of The University Hospital of the West Indies, Kingston, Jamaica

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## Abstract

We retrospectively reviewed all trauma admissions to the intensive care unit (ICU) of the University Hospital of the West Indies, Kingston, Jamaica, over a 5-year period (10/95–09/00). During the study period, 161 trauma patients were admitted to the ICU, representing 12% of total ICU admissions. The male:female ratio of ICU trauma cases was 4:1 compared with 1:1 for the total ICU admissions. Most ICU trauma admissions were emergencies (98%) and usually came via the operating room/post-anesthesia care unit (67.3%) and Accident & Emergency Department (16.4%). Main causes of trauma were road traffic crashes (45%), gunshots (27.3%), and stabbings (10.5%). The mean patient age was 35 years. The duration of ICU stay was  $6.3 \pm 8.4$  days. Survivors tended to have a longer stay than nonsurvivors. The mortality rate was 26.4%.

Trauma is bodily injury severe enough to pose a threat to life or a part of the body such as a limb or an organ.<sup>1</sup> It remains a national and worldwide public health problem and is a leading cause of morbidity and mortality, especially among previously healthy, productive young people and among males in particular.<sup>2-7</sup> The impact on its victims, their families, and society is considerable. Most injuries are relatively minor and are treated in the Accident & Emergency Department (A&E) and/or the surgical wards. Patients with severe trauma are in the minority but they consume the most resources and impose a substantial burden on health services and society. Major or severe trauma is often life threatening and usually presents as an emergency, requiring immediate surgical intervention and/or intensive care.

The Jamaican government spends more than 400 million Jamaican dollars on trauma annually. This ranks as the second highest patient expenditure of the 3.5 billion dollar health budget. Trauma is the single most common reason for admission to the surgical wards at the 500-bed University Hospital of The West Indies (UHWI) in Kingston, Jamaica. This is a tertiary referral center with an eight-bed ICU and an eight-bed post-

Based on a poster presentation at TraumaCare 2001, the 14th Annual Trauma Anesthesia and Critical Care Symposium, San Diego, California, May 17–19, 2001.

**Table 1. Demographics and Clinical Characteristics of ICU Trauma Admissions**

	Trauma ICU Admissions	Total ICU Admissions
<b>Number</b>	161	1342
<b>Sex M:F</b>	4:1	1:1
<b>Age (yr)</b>		
• Mean (range)	35 (2–70)	42 (0–98)
• Modal group	21–30	31–40
<b>Duration ICU stay (%)</b>		
• < 3 days	32.6	45
• ≥ 3 days	67.4	55
<b>Source of admission (%)</b>		
• OR/PACU	67.3	69.5
• A&E	16.4	6.1
• Wards	6.9	17.6
• Other hospitals	6.9	3.5
• Unspecified	2.5	3.3
<b>Type of admission (%)</b>		
• Emergency	98	61.7
• Elective	2	38.2
<b>Mortality (%)</b>	26.4	24

anesthesia care unit (PACU) that serves the five-room main operating suites.

During the study period, trauma accounted for 30% of all admissions to the surgical wards, an increase from 20% in 1994.<sup>3</sup> The impact of trauma on our ICU in terms of time, resources, staffing, and cost has not been previously documented. This study assesses the pattern, profile, frequency, and outcome of trauma cases admitted to the multidisciplinary eight-bed ICU.

## Methods

Records of all trauma patients admitted to the ICU over a 5-year period (1 October 1995 to 30 September 2000) were reviewed retrospectively. Approval for this study was obtained from the University Hospital Ethics Committee. Data collected included age, sex, diagnosis, cause of trauma, referring specialty(ies), duration of admission, and outcome. The results are presented as mean  $\pm$  standard deviation (SD) or percentages unless otherwise stated. Comparison was performed using the Mann-Whitney U test for unpaired data. A *p* value < 0.05 was considered significant.

**Table 2. Length of ICU Stay (LOS) of Trauma Patients**

	ICU Stay (days)*
All	6.3± 8.4
Nonsurvivors	4.1± 5.7 <sup>†</sup>
Survivors	7.1± 9.1 <sup>†</sup>

\*Mean± SD

<sup>†</sup>*p* = 0.0021 using Mann-Whitney U test

## Results

During the study period, 161 patients with severe trauma were admitted to the ICU. They accounted for 12% and 16% of total and emergency ICU admissions, respectively. The demographics, clinical characteristics, source and type of admissions, duration of ICU stay, and outcome are shown in Table 1. There was a disproportionate preponderance of men (M:F=4:1), and the trauma patients were generally younger than the average ICU patient (mean age, 35 vs. 42 years). Trauma admissions were almost exclusively emergencies (98%) and came mainly from the OR/PACU (67.3%) and A&E (16.4%). The ICU length of stay (LOS) for all trauma patients was 6.3± 8.4 days (median, 3; range, 2–65 days). More than half of the nonsurvivors (55%) died within 24 hours of ICU admission and 84% died by the seventh ICU day. Of the survivors, 23% were discharged to the wards within 48 hours, and a further 27% were discharged by the seventh ICU day. Survivors had a statistically significant longer LOS than nonsurvivors (7.1± 9.1 vs. 4.1± 5.7 days [*p* = 0.002]) (Table 2).

Although the mortality rate of trauma patients was slightly higher than that of all ICU admissions (26.4% vs. 24%), it was lower than that of total ICU emergency admissions (33.3%). Advancing age was a significant risk factor for death, with mortality rates of 44.4% in those over 60 years and 25% in those 60 years and younger. Traumatic brain injuries with or without other associated injuries were the leading cause of death in all age groups, contributing to 45% of deaths. They were also the leading cause of death in all ICU patients.

Mechanisms of trauma are shown in Table 3. Road traffic crashes remain the leading cause of severe trauma, but there is a high prevalence of intentional and interpersonal violence (42%). There were no readmissions to the unit.

## Discussion

Jamaica is a developing country with scarce resources and an under-funded health service. Trauma care utilizes a significant proportion of the health budget.<sup>8,9</sup> Considering our small population, only those countries having a civil war exceed our murder rate. This is most probably due to a high

**Table 3. Mechanisms of Trauma**

<b>Unintentional</b>	
• Road traffic crashes	45%
• Burns	4.3%
• Falls	3.7%
• Near drowning	3.7%
<b>Intentional</b>	
• Gunshot	27.3%
• Stabbing	10.5%
• Assault/domestic violence	4.3%
<b>Unspecified</b>	
	1.2%

level of organized crime, gang warfare, a thriving illegal drug trade, and a constant inflow of guns and deportees. International media coverage of our more dramatic trauma events has had a negative impact on tourism, one of our major sources of income.

Interpersonal violence and traffic crashes are the major causes of trauma morbidity and mortality. Interestingly, intentional injuries, especially stabbings and shootings, were the predominant cause of admission to our general surgical wards, accounting for 52% of trauma admissions; traffic crashes accounted for 20%. In contrast, reports from other centers in both developed and developing countries indicate that roadway crashes are easily the most common cause.<sup>7,10,11</sup> This has implications for strategies to reduce trauma, as the focus and emphasis are different between intentional and nonintentional injuries.

Only patients with severe or life-threatening polytrauma, who usually constitute a minority of all trauma patients, are admitted to the ICU. Severe road traffic crashes are usually associated with significant head injuries and multiple injuries, which explain why they are the leading cause of our ICU admissions (45%), unlike in the wards. Another significant difference between our ICU and others is the LOS. Surveys from many ICUs indicate a positive correlation between LOS and mortality rate, with nonsurvivors staying longer and consuming more resources than survivors.<sup>12,13</sup> Most of our trauma cases had a short LOS, and survival correlated positively with LOS. More than half of our ICU trauma deaths (55%) occurred within 24 hours of admission. We do not know the reasons for these results, but they justify our continued aggressive patient management throughout the hospitalization. We have a low incidence of withdrawal of therapy due to "futility."

Alcohol and illicit drug use is a common finding in trauma victims. Although our study did not specifically seek this association, two recent studies from Jamaica clearly demon-

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strate this. In a study of road crash fatalities, 77.5% of victims tested positive for alcohol, 22.5% were positive for cannabis, 3.2% for cocaine, and 22.5% for both alcohol and cannabis. Pedestrians constituted a high percentage of the fatalities (42%) and, surprisingly, high levels of blood alcohol were common in these patients.<sup>14</sup> The other study indicated that 55% and 27% of victims of interpersonal violence tested positive for cannabis and alcohol, respectively, and the corresponding figures for victims of road traffic accidents were 50% and 43%.<sup>15</sup>

Car seat belts are used infrequently in Jamaica. Only 21.1% of drivers and 13.6% of front-seat passengers were observed using seat belts in the capital city of Kingston in a 1996 study.<sup>16</sup> Jamaica has a fatal accident rate 13 times that of the United States and 15 times that of the United Kingdom.<sup>17</sup>

Widespread availability of (mostly illegal) firearms increases their use for trauma, suicide, and homicide. A very strong and highly significant association between gun availability levels and total homicide rates was demonstrated recently across industrialized countries.<sup>18</sup>

Trauma has been recognized as a national crisis, and several measures have been implemented at the community, national, organizational, academic, and hospital levels. The government has implemented legislative measures such as the introduction of seatbelt and helmet laws, which came into effect in November 1999. There are harsher penalties for dangerous driving and an increased presence of traffic police. Gun amnesties have been offered on several occasions, but the responses have been disappointing. A number of nongovernmental organizations are working with young adolescents to ensure they become productive members of society. The churches have been active toward this cause, and many have implemented feeding, skills training, and counseling programs. Peace initiatives within schools, called *Peace & Love in Schools (PALS)*, is an effort to decrease violence in schools. This has been shown to be a significant problem stemming from children's early exposure to domestic and other interpersonal violence in their homes.<sup>19</sup> Organizations such as the Women's Resource and Outreach Centre and the Women's Crisis Centre also assist victims of trauma. The latter provides shelter for women running from abusive homes and relationships.

Factors within the hospital that have contributed positively to the outcome of trauma patients include the training of specialist Accident & Emergency doctors; the implementation of the Advanced Trauma Life Support (ATLS<sup>®</sup>) course<sup>20</sup>; the ready (or increased) availability of investigative tools such as computed tomography<sup>21</sup>; and the presence of the ICU, even though the facilities are limited.

The constant occupation of scarce ICU beds and drainage of the blood bank by trauma patients frequently causes cancellation of major elective cases (e.g., cardiothoracic, general surgical, and neurosurgical) to the intense frustration of the surgeons and the disappointment, inconvenience, and sometimes worsening morbidity of the patients cancelled. There is also the cost factor for both the patients and the hospital. The ICU increasingly "spills" over into the PACU when its eight beds are occupied. This prevents or slows the ingress of other patients postoperatively, as well as the progress of the surgical lists. A High Dependency Unit may be the solution to alleviate this critical shortage of ICU beds, as shown in other studies.<sup>22</sup> Despite media pleas, blood donors are few, because of the perception that donated blood will be used to save the lives of "gunmen."

Trauma outcome is less favorable in older patients and in those with severe intracranial injuries. Both local and international studies have documented that trauma is more common in young males.<sup>2-11,14,15</sup> Trauma patients admitted to the ICU are generally younger and have a better previous health status than most other ICU patients. They should therefore have a more favorable outcome; however, the mortality rates do not indicate this pattern, which may be a reflection of the severity of their injuries.


Some limitations of our study include the fact that it was a short-term study limited to ICU stay. We realize hospitalization is just a part of the total care of the trauma patient and long-term outcome may be more relevant. Another limitation is the lack of regular use of a standard injury scoring system to allow objective comparisons of outcome. Trauma and its associated grave outcome (such as prolonged hospital stay, permanent disability, death, and loss of the family income) has an economic and social cost to the victims, their families, taxpayers, health care givers, the health budget, and the nation as a whole.

## Conclusions

Trauma is a major cause of hospitalization and intensive care utilization and consumes a significant amount of the health care budget. In most instances it is preventable. Trauma prevention, the most effective management strategy, should include increased public education, improved security, better implementation of legislative measures to ensure safety for all road users, control of firearms, and minimizing domestic and intentional violence. Widespread training of health care personnel in the management of the trauma victim has commenced. Its benefits have been proven internationally as well as on our Caribbean neighbors, Trinidad and Tobago. The need for a High Dependency Unit and expansion of the existing ICU is also underscored. Appropriate, aggressive intensive care in combination with efficient communications, rapid medical evacuation, and an organized emergency multidisciplinary trauma care team will further improve outcome in trauma patients.

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## Trauma Untamed – as yet

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The singular hair-raising and appalling attribute of trauma the world over is its propensity to rob the society of productive youthful lives by striking swiftly at unpredictable time with uncalled fury.

With dedicated focussed and consciously developed strategies and resources, the developed countries of the world have been able to reduce mortality and morbidity caused by trauma. However, the alarming increase in mortality resulting from motor vehicle crashes, crimes, war, and industrial and agricultural incidents and the high cost of long-term rehabilitation, which most patients who survive cannot afford, are still the prime concerns. The good news is that developing countries have started recognising the gravity of the problem and are trying to evolve strategies that can improve the trauma management system with a more “systemized” or organised approach.

There can be contrasting differences between various developing countries, since use of resources for trauma care has to depend on priorities as well as realistic assessment of the magnitude of the problem and its epidemiologic baseline. Differences exist in the nature of frequently encountered trauma in different developing nations.

The ITACCS journal, *TraumaCare*, is dedicated not only to disseminating scientific information to its readers but also to reporting on efforts to improve the care of trauma patients in every locale. Accordingly, a report from our colleagues in Kingston, Jamaica, is published in this issue.<sup>1</sup> Special emphasis has been given to the high incidence of intentional injuries caused by personal warfare in Jamaica. However, this ICU-based study reflects only the severely injured and may not represent the overall true incidence of various causes of unintentional deaths.

In India, 10.1% of total deaths in 1997 were reported to be caused by accidents and injuries, and the most common causes of trauma deaths were traffic crashes and suicides (22.6% and 23.7% respectively).<sup>2</sup> According to another data source,<sup>3</sup> one death by accident was reported every 1.9 minutes and one suicide every 5 minutes during 1999, amounting to 11.2 suicidal deaths per 100,000 population.

A separate case may be made for each developing country, given its geographic distribution of resources, locale, differing socioeconomic strata, and cultural differences. In India, the heterogeneous distribution and co-existence of industrialized and developed metropolitan cities, smaller cities and towns, and entirely rustic and rural villages makes planning and implementation of health programmes an even more arduous task.

All developing countries face a high rate of road crashes due to a multitude of problems, namely, large numbers of