

ORIGINAL RESEARCH

Children and Terror Casualties Receive Preference in ICU Admissions

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ABSTRACT

Objective: Trauma casualties caused by terror-related events and children injured as a result of trauma may be given preference in hospital emergency departments (EDs) due to their perceived importance. We investigated whether there are differences in the treatment and hospitalization of terror-related casualties compared to other types of injury events and between children and adults injured in terror-related events.

Methods: Retrospective study of 121 608 trauma patients from the Israel Trauma Registry during the period of October 2000-December 2005. Of the 10 hospitals included in the registry, 6 were level I trauma centers and 4 were regional trauma centers. Patients who were hospitalized or died in the ED or were transferred between hospitals were included in the registry.

Results: All analyses were controlled for Injury Severity Score (ISS). All patients with ISS 1-24 terror casualties had the highest frequency of intensive care unit (ICU) admissions when compared with patients after road traffic accidents (RTA) and other trauma. Among patients with terror-related casualties, children were admitted to ICU disproportionately to the severity of their injury. Logistic regression adjusted for injury severity and trauma type showed that both terror casualties and children have a higher probability of being admitted to the ICU.

Conclusions: Injured children are admitted to ICU more often than other age groups. Also, terror-related casualties are more frequently admitted to the ICU compared to those from other types of injury events. These differences were not directly related to a higher proportion of severe injuries among the preferred groups.

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Key Words: ICU, medical resources, pediatric injuries, terror survivors

Much has been written about moral and ethical aspects of medical resources utilization.¹⁻⁷ These considerations become even more pronounced in cases of mass casualty events (MCE), such as disasters and terror attacks, when the prioritization of medical resources in trauma centers could directly influence the chances of the patients' immediate survival.^{8,9}

Ethically correct medical decisions have to be strictly professional. These decisions are supposed to be helped by using a variety of treatment-decision protocols and explicit rationing policies, but the "human factor" should not be forgotten. Medical personnel may be influenced by emotions or prejudice based on the patients' gender, age, or race. Such factors may influence, and sometimes overcome, the neutral principles of medical necessity, leading to a preference of some groups over others.

In some medical emergencies, such as terror-related attacks, this influencing component could become especially prevalent, depending on the amount of attention the media gives to these events. The amount of attention can be gauged, for example, by the length of broadcast time, the amount of page space, and even changes in broadcast schedules to provide immediate coverage. However, in terms of casualties, the scope of some events

(so-called limited MCE) is relatively small, and the overall injury burden on the population is much smaller than more common types of injury events, such as a road traffic accidents (RTA).⁹⁻¹¹ Regardless of the political context of terror-related events, it is possible to suggest that their greater coverage by media is partially due to identification and empathy of viewers toward the casualties.

The age of trauma casualties, especially minors, may also be a source of bias in allocating resources and treatment priorities. It has been previously reported that children tend to be given priority in medical treatment, compared to other age groups, such as senior citizens.^{1,2} Even though rational arguments, such as "potential effective life-years salvaged" could be presented in favor of such preference, it may be assumed that, in reality, other less clinical factors are present as well. Their effect could even become cumulative when the patients are children who are injured in terror-related attacks.

The goal of this study was to investigate whether the quality of medical treatment trauma patients received was affected by their age and the circumstances of their injuries. The indicator chosen to assess the quality of treatment was admission to the intensive care unit (ICU) during their hospitalization. The ICU is known to be both a scarce and life-saving resource.⁵

HYPOTHESIS

1. Patients injured in terror-related attacks are more often admitted to the ICU when compared with patients injured in RTAs and other trauma-related events.

2. Children injured in terror-related attacks receive preference in ICU admissions when compared with patients of other age groups injured in terror-related attacks.

3. The preference given to these two groups with regard to ICU admissions is not a direct result of these two groups having higher percentages of severe injuries.

METHODS

Study Design

To verify the hypotheses, the volume of ICU utilization for each group studied (ie, terror-related casualties vs other trauma casualties; children vs adults) was analyzed while controlling for severity of injury.

Study Setting and Population

This retrospective study is based on data from 10 trauma centers (6 level I trauma centers and 4 regional centers) that provided data to the Israeli National Trauma Registry between October 1, 2000, and December 31, 2005. The registry receives information on all injured individuals who are hospitalized up to 72 hours after the occurrence of the injury, including those who died in the hospital (including deaths in the emergency department [ED]) and patients who are transferred and admitted to another hospital. The registry does not include patients whose injuries result from poisoning, drowning, or suffocation; patients discharged from the hospital after treatment in the ED, or injured individuals who arrive to the ED 72 hours or more after injury. Data are collected by specialized staff in all hospitals.

Measurement and Data Analysis

Based on registry data, two selective subsets of injuries were created for the study: the primary subset included all patients admitted to the ED during the study period (N = 121 608); the second subset consisted only of casualties from terror-related attacks drawn from the primary subset (N = 2425). *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* was used to code injury types and diagnoses. Codes for external cause of injury (E990-E999) served as inclusion criteria for the secondary subset.

Statistical analyses were performed using SAS (Cary, NC) software. Statistical significance was set at $P < .05$ for all analyses (χ^2 test). Analyses performed included frequency comparisons between different groups, divided by type of injury event (terror-related, RTA, and other), severity of injury (Injury Severity Score [ISS]), and the age of the patient. The main outcome measure was admission to the ICU (no admission/1+). The ISS and type of trauma were used as primary measures for the injury severity, because the use of physiologic parameters such as Glasgow Coma Scale (GCS) and systolic blood pressure are known to be deficient in the case of young children.¹²

Patients were divided into five age groups: 0-12 years (children), 13-17 years (teenagers), 18-22 years (soldiers), 23-59 years (adults), and 60 years and older (elderly patients).

Three multivariate logistic regression models were performed to examine the probability of being admitted to the ICU as a result of injury: (1) within primary subset and controlled for type of injury event and severity; (2) within primary subset and controlled for patient's age, type of injury event and (3) within secondary subset and controlled for age and injury severity. Odds ratios (OR) with confidence intervals (CIs) to 95% were calculated (95% CI).

RESULTS

Study Population: Subset Description

Table 1 shows the characteristics of the study population by subset. Terror-related injuries comprised only 1.99% of all inju-

TABLE 1

Characteristics of Population Subsets (%) ^a		
Characteristics	Primary Subset All Trauma (N = 121 608)	Secondary Subset Terror-Related Trauma (N = 2425)
Type of event		
Terror	1.99	-
RTA	25.09	-
Other	72.91	-
Gender		
Male	63.19	77.17
Female	36.81	22.83
Age, y		
0-12	27.04	5.28
13-17	6.67	7.96
18-22	8.72	32.78
23-59	34.13	48.58
60+	23.45	0.47
Injury Severity Score (ISS)		
ISS 1-8	65.46	48.84
ISS 9-14	24.27	21.70
ISS 16-24	6.10	11.18
ISS 25+	4.16	18.28
GCS		
15	93.51	82.23
9-14	2.49	3.71
4-8	1.37	4.67
3	2.63	9.39
Systolic pressure in ED		
90+	97.3	93.10
<90	2.7	6.9
Trauma type		
Penetrating	12.9	72.8
Blunt	81.78	25.24
Burn	5.32	1.96
Operated	38.36	57.62
ICU admissions	6.97	26.41
Mortality	1.87	6.41

Abbreviations: GCS, Glasgow Coma Scale; ED, emergency department; and ICU, intensive care unit.

^aAll differences are significant at $P < .05$.

Preference in ICU admissions

ries, while 25.09% of injuries were due to RTA. The secondary subset was predominantly male (77.17%) and included only 5.28% of children under the age of 13 years compared to 27.04% in the primary subset. Elderly patients (>60 years) in the secondary subset comprised 0.47% compared to 23.45% in the primary subset.

Terror-related injuries were much more severe and caused greater mortality. Of patients in the secondary subset, 26.41% were admitted to the ICU (compared to 6.97% in primary subset), and

57.62% were operated on (compared to 38.36% in primary subset). More than one-half of the patients who were sent to the operating room in the secondary subset were operated on less than four hours after being admitted to the ED. The differences in severity of injury were in accordance with differences found in the trauma type: 72.8% of terror-related casualties suffered penetrating trauma compared to only 12.9% in the primary subset.

Primary Subset: Differences in Treatment by Type of Injury Event and Severity

Differences were found between different types of injuries and ICU utilization (Figure 1). The main medical consideration influencing the use of resources during treatment tended to be injury severity. Given the fact that terror-related injuries were found to be more severe than other types of injuries in the registry, it was important to view all differences adjusting for this factor.

Among all patients with ISS 1-24, terror-related casualties had the highest frequency of ICU admissions, followed by RTA, and other trauma events. Only among patients with an ISS greater than 25 was the volume of ICU utilization for terror-related and RTA casualties similar, but it was nevertheless greater than for other types of trauma events.

Secondary Subset: Difference in Injury Severity and ICU Utilization Among Age Groups

Due to the fact that terror-related casualties received more treatment than other trauma patients, the analysis focuses on the secondary subset of patients exclusively. We have hypothesized that the age of the patient would be the primary independent variable in explaining admissions to the ICU. Figure 2 shows the differences in severity of injury and ICU utilization among age groups.

Teenagers (aged 13-17) had the highest severity of injuries, while soldiers (aged 18-22) had the lowest severity. Minimal differences in severity of injury were found among children (aged 0-12), adults (aged 23-59), and elderly patients (aged 60 years and older). As expected, the highest percentage of ICU admissions was in teenagers (40.53%) and the lowest was in soldiers (22.32%). The ICU utilization of children was similar to that of teenagers (36.22%), but much higher than the levels of adult and elderly patients (25.87% and 28.24%, respectively).

All Subsets: Logistic Regression Analysis for Probability of Entering the ICU

To examine the actual influence of age, type of event, and injury severity on probability of being admitted to the ICU, three logistic regression analysis models were created: two for the primary subset and one for the secondary subset (Table 2). To account for differences between the subsets and to provide an additional measure of injury severity, all models were adjusted for trauma type.

FIGURE 1

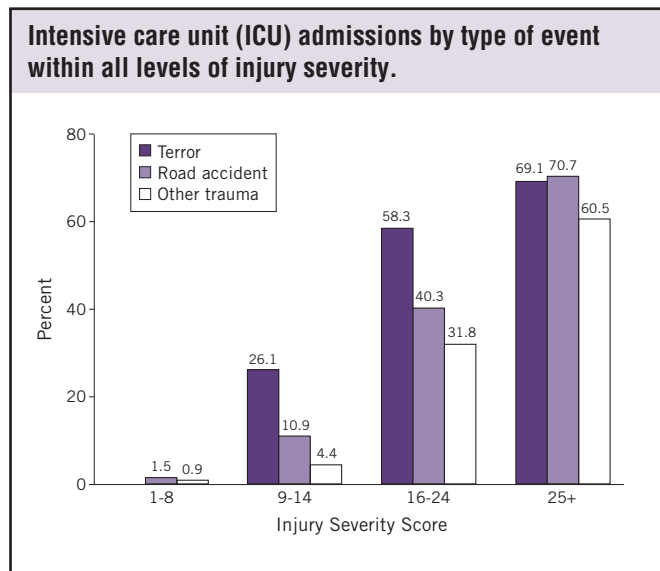
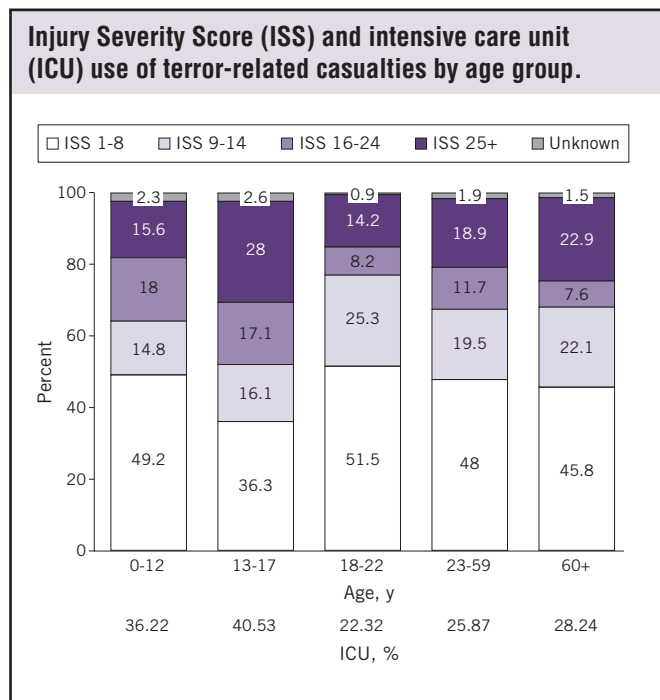


FIGURE 2



Model 1 was adjusted for trauma type, injury severity, and type of event. Higher injury severity was found to be a significant factor in predicting admission to the ICU (OR 1.18, 95% CI 1.18-1.19); however, the type of trauma event appears to be of greater importance. The probability of being admitted to the ICU due to a terror-related event was 2.82 times higher than as a result of "other" types of trauma event; the probability of ICU admission due to RTA was 1.66 times higher than for "other" trauma events. Patients with burns had the highest odds of being admitted to the ICU. Patients with blunt injuries had a lower likelihood of being admitted to the ICU compared to patients with penetrating trauma.

Model 2 analyzed the factors included in model 1, in addition to the age of the patients (children aged 0-12 vs all other patients). The impact of injury severity remained the same, while the importance of the event type increased. However, the influence of trauma type decreased. Age was noted to have a profound effect: children had a 1.75 times higher probability of being admitted to the ICU compared to patients age 13 and older.

Model 3 was performed only on terror-related casualties; therefore, it considered only trauma type, patient's age, and injury severity. The importance of injury severity decreased (OR 1.10, 95% CI 1.09-1.11), while the differences between both blunt and penetrating trauma and burn and penetrating trauma increased. The impact of age also increased: children had a higher probability (1.83 times) of being admitted to the ICU than patients in the other age groups.

COMMENT

The results of this study show that, based on the volume of admissions to the ICU, terror-related casualties receive more medical resources than patients injured in other types of events, particularly RTA. This finding is understandable owing to the fact that the injuries sustained by patients in terror-related incidents are found to be much more severe than those of other patients in the registry, and therefore by definition require more medical resources. For this reason, all analyses performed in this study have been adjusted for ISS. In all severity groups except those who were critically wounded (ISS 25+), terror-related casualties were found to have a greater advantage over survivors of RTA and other trauma events with regard to the likelihood of being admitted to the ICU. The ICU is expected to give priority to the admission of severely injured patients. As the ICU usually has very high occupancy rates and is used to its full capacity, the admission of a substantial volume of lightly and moderately injured patients can be a symptom of preference for this group over others. This finding could not be explained by the activation of MCE protocols during terror-related events. Even though more trauma teams are present when an MCE is called and all available surgeons are summoned to the hospital, the number of ICU beds tends to remain unchanged. During MCE, hospitalized patients could be transferred to rehabilitation beds with capabilities similar to those of the ICU, but they would not be registered as being hospitalized in the ICU.¹³

TABLE 2

Logistic Regression Analysis of Intensive Care Unit Utilization Adjusted for Age, Type of Event, Trauma Type, and Severity of Injury

Variable	Analysis OR, 95% CI		
	Model 1 All Trauma	Model 2 All Trauma	Model 3 Terror Related
Injury severity			
ISS 16+	1.18, 1.18-1.19	1.19, 1.18-1.19	1.10, 1.09-1.11
ISS 1-14	1	1	1
Trauma type			
Blunt	0.79, 0.72-0.87	0.73, 0.67-0.81	0.66, 0.50-0.86
Burn	2.75, 2.39-3.17	2.22, 1.92-2.57	2.41, 1.18-4.75
Penetrating	1	1	1
Type of event			
Terror-related attack	2.82, 2.44-3.52	2.95, 2.55-3.42	-
RTA	1.66, 1.57-1.76	1.70, 1.60-1.80	-
Other trauma	1	1	-
Age, y			
0-12	-	1.75, 1.65-1.86	1.83, 1.25-2.64
13+	-	1	1

Abbreviations: OR, odds ratio; CI, confidence interval; ISS, Injury Severity Score; and RTA, road traffic accident.

When resource utilization was analyzed exclusively among terror-related casualties, another difference was found: children aged 1-12 were admitted to the ICU disproportionately in relation to the severity of their injuries. Teenagers were the most severely injured age group, and as such would be expected to have the highest volume of ICU admissions. However, the younger aged group had almost the same percentage of ICU admissions as the teenagers, even though their ISS was much lower. The distribution of injury severity in children was similar to both adults and elderly patients, and yet they had a significantly higher percentage of ICU admissions.

To adjust for these differences, a logistic regression analysis predicting the chance of being hospitalized in the ICU controlling for age, type of event, severity of injury, and type of trauma was performed. The results underlined the priority given to children and terror-related casualties in ICU utilization. Several ethically-related issues arise from this finding.

There has been a covenant between society and the medical profession since ancient times, as traditionally manifested by the Hippocratic Oath, as well as by various laws and regulations. This covenant has usually been based on the assumption that physicians, when allowed, would give the best treatment available to any person in need. This assumption has led to the usual practice whereby society has not interfered with decisions made by physicians.

Preference in ICU admissions

The situation is quite different for physicians who are required to make medical decisions in extreme scenarios, such as an MCE. In that type of situation, medical facilities may become overwhelmed by high numbers of casualties, many of whom might be seriously injured. The scenario thus turns into a situation of scarcity, with regard to either workforce or equipment, or both. As scarcity is “the mother of allocation,” physicians are obliged to make some hard choices.⁴

Professional clinical choices require prioritization of patients for treatment. Naturally, these choices are based on clinical criteria: in trauma, these choices have been long based on physiological parameters together with indices of injury severity.^{14,15} These criteria have demonstrated a strong capacity to predict resource utilization in the modern battlefield environment.¹⁶

One of the scarce resources has been, and still is, the ICU. Admission to the ICU is reserved for patients who require intensive therapy not available elsewhere in the hospital, have a reasonable chance of recovery if admitted to the ICU, and would otherwise likely die without this intervention.⁸ This situation would imply that the priority for an admission to an ICU should correlate with the likelihood that ICU care will benefit that patient substantially more than non-ICU care.¹⁷

Recent experience has shown situations in which clinical criteria are not sufficient or are not enough, for example, when several patients present with the same problem and the same severity. In such situations, other criteria for prioritization are required. Here, physicians are required to deal with nonmedical issues, such as justice. While not usually a component of the process of decision-making in clinical medicine, prioritization becomes important in situations of scarcity, as problems in distributive justice might arise.^{4,17}

Justice consists of balancing rights and obligations and in fulfilling them.¹⁸ According to what is called *formal justice*, all people should be treated equally, in spite of differences with others, unless some differences between them are relevant to the treatment itself.¹⁷ An injustice, therefore, involves a wrongful act or omission that denies people benefits to which they have a right or fails to distribute burdens fairly.¹⁷ Thus, theoretically at least, issues of gender, race, economic and social status, or age are irrelevant to the choices.¹⁷

When there is no necessity for allocation, the only criteria for prioritization should be clinical. Yet, our results demonstrate quite clearly that is not the case: when trauma occurs, children are receiving preferential treatment compared to other age groups, especially when injuries have been caused by terror-related events. Although it has been noticed that, in general, children’s injuries were found to be more severe, this alone would not appear to explain the general attitude of prioritization of children in admittance to the ICU.¹⁸

It appears that additional reasons exist for treating children first, even though age alone has not been found previously to be a prognostic predictor for survival or quality of life after intensive care.¹⁹ Among the main reasons is the belief that the public prefers the allocation of resources to the young and expects that professionals will act accordingly.^{4,20-24}

It is interesting to note that the literature dealing with the ethical aspects of allocation of scarce resources does not look at prioritization of the young as an unjust policy, as long as each person is treated the same way throughout the course of a life time. It has been stated that such policy is consistent with fair equality of opportunity, and no basis exists for a claim of unequal treatment. This philosophical attitude may also be considered as part of a general attitude, which encourages society to invest more resources into decreasing early death than into extending the lives of the elderly.²¹ The utilitarian explanation for this attitude is that the younger population has more productive years of life ahead and, therefore, has more opportunities to contribute to society.²³ Other attempts have been made to quantify the value of a patient’s life-years to improve resource allocation, but their use has been questioned by some researchers.²⁵

All these explanations do not account for the prioritization of children in situations in which no scarcity of resources exists, as has been found in this study. Even though provider uncertainty owing to clinical factors such as unclear physiological readings and inability of children to properly verbalize their concerns can contribute to excessive treatment, it does not explain the cumulative effect of age and type of event.¹² Children injured in terror-related events were found to be the most preferred group in terms of admission to the ICU.

It was unclear why patients of terror-related events were treated better than patients of RTA who had similarly severe injuries and were in the same age group. The usual over-triage during MCE could not be the only reason, as not all terror-related events result in an MCE, and triage during a limited MCE is not much different from the usual.¹³ It appears then that, in Israeli society, a hierarchy of trauma casualties exists and that those of terror-related events have a higher place in this hierarchy than those of RTA.

Limitations

The main limitation of our study applies to the extent of explanation that could be given to the observed differences. As we chose to narrow our scope by analyzing specific factors, other possible confounders such as physiologic parameters of the patients and types of interventions provided to them were not considered. Those parameters should be included in further research of the subject.

The other limitation of this study is our reliance on ISS to compare the study groups (casualties of terror-related events vs other trauma and children vs adults). The meaning of ISS for these

groups could be inherently biased, as terror casualties have a unique injury profile, while children may require more medical care than adults with similar ISS scores.^{12,18} To alleviate this limitation by controlling for type of trauma, the influence of ISS remained stable. Considering the measurement of severity of injuries in children, the literature indicates that ISS is preferable to the use of physiologic parameters, such as GCS and systolic blood pressure.¹²

There remains, however, an additional limitation of ISS: its diminished capability to adequately measure and account for the cumulative effect of coexisting injuries in one body system or part. We hope that controlling for trauma type has somewhat helped us to deal with this limitation.

CONCLUSIONS

This study has shown that children and terror-related casualties are given priority in ICU admissions compared with other trauma casualties, regardless of the severity of their injuries. This finding may be interpreted as a preference of these two groups over the others. While this should not necessarily be considered inappropriate behavior, medical practitioners should be aware of its possibility.

Future research of this phenomenon should prospectively target the decision-making process in the ED by surveying decision-makers about their age-related considerations, while making the decision, and matching it with a survey of the ICU staff about their assessment of the patient's actual need of ICU care.

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