Defining the need for blood and blood products transfusion following suicide bombing attacks on a civilian population: A level I single-centre experience

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Abstract

Introduction: Knowledge of patterns of blood use in the care of mass casualty settings is important for preparedness of medical centre resources and for maximising survival when blood supplies are limited. Our objectives were to review our experience with the use of blood products and define the utilisation of blood transfusion following suicide bombing attacks.

Patients and methods: We conducted a retrospective analysis of blood and blood product transfusion following civilian bombing attacks at a level I trauma centre in Jerusalem, Israel from 2000 to 2005. The study group consisted of 137 patients who were admitted following 17 suicide bombing attacks which were carried out in Jerusalem during the 5-year period. Demographic data, number of units of blood and blood products transfused and the need for massive transfusions were recorded and analyzed.

Results: Fifty-three patients received blood transfusions (38.7%). There were 33 males (62.2%) with a median ISS of 13 (range 4–25). These 53 patients received 524 PRBC, 42 WB, and 449 FFP. The mean number of PRBC transfused/admitted patient was 3.82 units (range 0–59). Thirty patients (21.9%) received 236 PRBC (45% of total PRBC) at the first 2 h. The ratio of ordered to transfused blood was 946:524. The FFP:PRBC ratio for all transfused patients was 1:1.17. The number of PRBC transfused per attack correlated with the number of patients admitted per attack. The most commonly transfused blood type was A (52.3%). Only 18 units of uncrossed-matched blood were transfused (3.3% of total). 14 patients (10.2%) received massive transfusions. These patients received 399 PRBC (76.1% of total units transfused) and the average number of PRBC transfused was 28.5/patient (10–59).

Conclusions: More than 1/3 of casualties admitted following civilian bombing attacks received transfusions, most in the first 2 h. Large-scale attacks will require more blood and blood products than small-scale attacks. Twice the number of PRBC ordered than transfused reflects a known trend for over-triage during the initial assessment following bombing attacks. One tenth of patients received massive transfusion.

Introduction

Massive bleeding is a major cause of death in civilian and military casualties. In the United States 10–15 percent of all RBC units are used to treat injured patients.1 Massive transfusion, defined as transfusion of 10 or more units of packed red blood cells (PRBC) over the initial 24 h, has been the focus of much recent research.2,3 Trauma centres have integrated massive transfusion protocols that include activation of additional personnel, employment of rapid infusion systems, automatic thawing of plasma and changes in cross matching policy. Recent analysis of combat events from Iraq and Afghanistan demonstrates that approximately 20% of casualties will require blood transfusion and 7% will require massive transfusions.4,5

Few articles have been written, however, directly addressing the management and resource utilisation, specifically blood requirement, following mass casualty incidents (MCI). The term PPI, or PRBC transfused per admitted patient, was introduced by Soffer at al. in order to estimate the number of PRBC required based on the initial number of patients admitted from the emergency department (ED).6 Soffer et al. analyzed 18 consecutive terrorist attacks and found that the number of PRBC units transfused per patient was related to incident size, with smaller incidents

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(<25 evacuated casualties) having a number of PRBC transfused to patient per incident (PPI) of 0.7 and larger incidents having a PPI of 1.5. Half of the units of PRBC’s were transfused in the first 2 h after the incident and a similar number was type O blood.6

The workload on blood banks (BB) during MCI can be overwhelming. Knowledge of the patterns of blood use in the care of mass casualty settings is also important for medical centre resource planning, for designing protocols to test the efficacy of blood transfusion policy, and for maximising survival when blood supplies are limited. For all of these reasons, we undertook to review our experience in blood products utilisation during the 2000–2005 terrorist bombing attacks on the civilian population in Jerusalem. Our primary goal was to define blood and blood product usage following these incidents. Our secondary goals were to evaluate massive transfusions and the timing of blood and blood products transfusion.

Materials and methods

Data collection

We retrospectively analyzed the data of all victims of suicide bombing attacks (SBA) who were admitted to the level I trauma unit of the Hadassah University Hospital, Jerusalem, Israel from October 2000 to December 2005. Data was prospectively collected by the trauma registry. The records of all patients admitted with the diagnosis of trauma secondary to terrorist attacks were reviewed and scanned for demographic data, injury characteristics, invasive procedures and outcome.

The amount of blood and blood products transfused to the study population was obtained by reviewing the Hadassah University Hospital BB database. Data was retrieved regarding blood and blood products, and time of release from the BB. The database was scanned for type and cross-matching, PRBC preparation and release. The number of unused blood products which were returned to the BB was also recorded. The number of PRBC’s units transfused was calculated by subtracting the number of return units from the number of released units. Based on previous reports and clinical relevance, we divided the time periods into the initial 2 h, 2–6 h, 6–24 h and over 24 h.

Israel National Blood Program

In Israel, the Emergency Medical System (EMS) and the National Blood Program are operated by Magen David Adom (MDA), the national equivalent of the Red Cross. MDA blood services were established as the sole provider of blood and blood components in Israel. Demand for blood during wars and ongoing terrorist attacks on civilians have challenged its ability. Nationwide, 90% of the whole blood units are collected in daily mobile drives. An additional 10% are collected in fixed donation sites at MDA first aid stations and BB hospitals. Civilians donate 75% of the total blood products supply, the remaining donations given by enlisted personnel.7

Hadassah blood bank protocol during an MCI

The Hadassah BB protocol and contingency plans were created for the management of blood requirements following MCI. The protocol defines certain activation steps which are necessary to ensure adequate blood supply to the emergency department (ED), trauma unit, operating room and intensive care units. Information regarding an MCI can reach BB personnel either directly from hospital administration, central MDA command, or as has happened on several occasions, through the media or Internet.

Once the BB has been alerted, it is the responsibility of the BB representative to evaluate the magnitude of the event, i.e. the number of wounded, attack setting and expected time to arrival. Small to medium sized events are defined when up to 50 patients are expected in the ED. A terrorist attack generating more than 50 patients would be considered a large-scale event. The BB representative takes several steps including notification of BB supervisor on-call and BB director, recruitment of additional personnel, preparation of additional sites in the BB for handling of blood samples, verification of BB inventory, and recruitment of additional units of blood from MDA. According to our protocol three units of blood are expected for a severely injured patient and 2 units for a moderately injured patient. Blood handling is switched from automated to manual methods. Initial ABO and D blood typing is carried out by forward test, followed by complete typing test. Segments from PRBC are prepared for cross-match for 10 units of type A and O, and 14 units of fresh frozen plasma (FFP) are thawed (10 AB, 2 A and 2 B). According to demand, 2 units of non cross-matched type O — are delivered to the trauma unit, ICU or operating room. A BB representative and a Transfusion Medicine physician are stationed in the ED and trauma unit to coordinate blood transfusion, detect mislabelling and ensure proper handling of blood samples. Recipients whose ABO group has been determined, but compatibility testing has not been completed, will receive ABO-compatible PRBC. Compatibility testing is then completed as soon as possible.

Many patients, especially those in critical condition, will require blood before final identification. To prevent mishandling of blood samples, each patient is temporarily assigned an identification number and another separate random number. Identification number is corrected as soon as the patient is confidently identified. The random number is kept and stored to ensure continuity of records.

Transfusion definitions

One unit of PRBC was defined as a 250-mL bag. Similarly one unit of FFP was defined as a 300-mL bag. Platelet administration took place in 6-pack increments where one 6-pack equalled to a 200–300 mL bag. Massive transfusion was defined when a patient received 10 or more units of PRBC within the initial 24 h.

Calculation of blood typed, prepared and transfused and limitations

For the purpose of oxygen transfer PRBC were preferred. Only when whole blood (WB) was available and according to BB considerations, mainly availability, WB was transfused in addition to PRBC. WB was released during MCI, when fractionation process was delayed and shortage of blood was expected.

Whenever possible, type and cross-matched blood was transfused. Blood released from the bank as uncrossed-matched was transferred to the trauma unit on demand from the trauma unit but without patient identification. Thus, it was impossible to assess the exact number of patients who received uncrossed-matched O — blood. Transfusions received within 30 min of arrival in the ED were non cross-matched (i.e. emergency release), while those received after 30 min were ABO/Rh cross-matched units. Since the data in this manuscript is based on individual patient characteristics, and only 18 units of O — PRBC were transfused without cross-matching (3.3% of all PRBC transfused), we decided not to include those units in the analysis of PRBC’s and reported O — uncrossed-matched blood separately per attack. All products transfused were stored in the BB and product availability or shelf life was not a limiting factor during the attacks.

Per admitted patient index (PPI) was defined as units of product transfused per casualty.6 Because of the degree of contamination of
wounds and the pace of operating blood reutilisation devices (i.e. cell savers) were not used.

**Statistical analysis**

Data is presented as median and interquartile range (IQR). The chi-squared and Fisher’s exact test was used to compare variables between patient groups as appropriate. The Mann–Whitney u test was used to compare continuous variables between the groups. A p value of 0.05 or less was considered statistically significant. Statistical analysis was performed using SPSS version 11.5 (Statistical Package for Social Science, Chicago, IL).

**Results**

**Patient population**

From October 2000 to December 2005 we admitted 157 patients to the Department of Surgery and Trauma Unit, Hadassah University Hospital, Jerusalem, Israel following an MCI. These were the result of 17 suicide terrorist bombing attacks which were carried out in Jerusalem during the above period. Three patients were transferred from other medical centres and there was incomplete data for 17 patients and these patients were therefore excluded from the final analysis. Sixty-eight victims (49.6%) were injured inside a bus, 36 (26.3%) in a semi-confined space such as a restaurant, and 33 (24.1%) in an open space.

Fifty-three patients (38.7%) received transfusions of blood and blood products (Table 1). Patients who received blood were more severely injured, mostly as a result of penetrating wounds (Table 2).

**Transfusions**

Type and screen was sent for 112 patients (81.8%). 946 units of PRBC were ordered for 79 patients (57.6%). The average number of PRBC ordered per patient was 12. A total of 524 units of PRBC (55.4% of PRBC ordered) were transfused to 53 patients. The mean number of PRBC’s transfused for an admitted patient was 3.82 units (range 0–59). The mean PRBC’s transfused per patient for the 53 patients who received blood was 9.9 units (range 1–59). The FFP:PRBC ratio for all transfused patients was 1:1.17 (449:524). The distribution of blood transfusion was not symmetrical: 416 PRBC (79.4%) were transfused to 14 patients (26.4%) (Fig. 1).

**Timing of blood products transfusion**

The timing of PRBC and blood components transfusion is presented in Fig. 2. In the initial 2 h 28 patients (20.4%) received 236 units PRBC (45% of total PRBC) and 19 units WB (45.3% of total
WB). Forty-three of 53 patients (81.1%) received 409 units PRBC (78.1% of total PRBC) and 37 units of WB (88.1% of total WB) in the first 24 h. Platelet consumption was largely a function of PRBC transfusion. Platelet use increased from 0 percent for patients who received up to three units of PRBC's, to 62% of all patients receiving 4 or more units of PRBC's.

**Effect of attack characteristics**

The mean number of PRBC units transfused per attack was 30.8 (range 4–145 units). The mean number of PRBC transfused per attack during the initial 2 h was 13.9 (range 0–61). The number of PRBC's transfused per attack correlated with the number of patients admitted from the emergency department ($R^2 = 0.647$) (Fig. 3). An average of 66.8 PRBC's (PPI = 4.02) was transfused during the 5 attacks with 10 or more admitted victims while the average for the remaining 12 attacks was 15.8 PRBC/attack (PPI = 3.8). However, there was much variability and in 2 attacks 36 and 56 PRBC were transfused when only 6 and 3 patients, respectively, were admitted from the ER.

**Transfusion of type O non cross-matched blood**

As mentioned above, uncrossed-matched type O PRBC are released from the BB by demand from the trauma unit and are not assigned to specific patients. Eighteen units of type O PRBC were transfused without type or cross-matching. These consisted of 6 units O− and 12 units O+. These 18 units of uncrossed-matched blood were transfused following 4 SBA (23.5% of attacks). 3 of these 4 attacks (75%) occurred aboard a bus. Uncrossed-matched PRBC were not patient-assigned and thus the number of patients who received uncrossed-matched blood is unknown.

**Blood types transfused**

The distribution of the blood types transfused to the 53 patients is shown in Table 3. The number of patients who received blood transfusion and the number of units transfused was not proportional to the distribution in the Israeli population. Blood type A+ was transfused almost twice its proportion in the Israeli population (50.9% compared with 34%). This larger blood utilisation is explained by the significantly higher number of patients who received massive transfusions in the A+ group. Eight patients in the A+ group (53.3%) received massive transfusions, compared with 4 patients in the B+ group (23.5%) and 2 patients in the 0+ group (13.3%).

**Massive transfusions**

Fourteen patients (10.2% of victims) received massive transfusions. Median age of patients in the massive transfusion group was 22 years (range 14–73) and median ISS for the group was 34 (range 13–50). Median number of body regions injured was 3 (range 2–6). These 14 patients were the consequence of 8 suicide bombing attacks (47.1% of attacks). Six patients (42.8%) were injured aboard a bus, 4 (28.6%) in OS and 4 (28.6%) in SCS.

These 14 patients received a total of 399 PRBC units (76.1% of all PRBC transfused). The average number of units transfused was 28.5 per patient (range 10–59). These patients also received 361 units of FFP (80.4% of total transfused), 72 bags of platelets (84.7%) and 58 units cryoprecipitate (84.1%). In the initial 2 h this group of patients received 197 PRBC and 19 WB (83.5% and 100%, respectively, of all blood units transfused during this period). In addition, in the first 2 h 10 patients received 100 units of FFP, 8 patients received 22 bags of platelets and 7 patients received 12 units of cryoprecipitate.

The FFP:PRBC ratio was 1:2.1 in the first 2 h (in the 10 patients who received FFP). The ratio increased to 1:0.8 in the next 4 h, and increased further to 1:0.7 by the first 24 h. After the initial 24-h period, massively transfused patients received almost equal amounts of PRBC and FFP.

All 14 patients (100%) were injured by penetrating missiles (debris and bomb fragments) and all suffered from multiple injuries to more than one body region. An analysis of injuries by

![Figure 2](image1.png)  
**Fig. 2.** Number of units of blood and blood products transfused over the time. PRBC, packed red blood cells; WB, whole blood; FFP, fresh frozen plasma; PLA, platelets; Cryo, cryoprecipitate. Platelets and cryoprecipitate are shown in number of bags.

![Figure 3](image2.png)  
**Fig. 3.** The number of PRBC transfused per attack as a function of the number of admitted patients per attack. Pearson coefficient $r = 0.804$, 95% confidence interval 0.527–0.927, $p < 0.0001$, $R^2 = 0.647$.

**Table 3** Distribution of blood types transfused by the number of patients and number of units.

<table>
<thead>
<tr>
<th>Blood type</th>
<th>Number of patients</th>
<th>Number of units transfused</th>
<th>Distribution in Israeli donor population (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>15 (28.3)</td>
<td>267 (50.9)</td>
<td>34</td>
</tr>
<tr>
<td>A−</td>
<td>1 (1.9)</td>
<td>8 (1.5)</td>
<td>4</td>
</tr>
<tr>
<td>B+</td>
<td>17 (32.1)</td>
<td>165 (31.5)</td>
<td>17</td>
</tr>
<tr>
<td>B−</td>
<td>2 (3.8)</td>
<td>2 (0.4)</td>
<td>2</td>
</tr>
<tr>
<td>AB+</td>
<td>2 (3.8)</td>
<td>4 (0.7)</td>
<td>7</td>
</tr>
<tr>
<td>AB−</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1</td>
</tr>
<tr>
<td>O+</td>
<td>15 (28.3)</td>
<td>74 (14.1)</td>
<td>32</td>
</tr>
<tr>
<td>O−</td>
<td>1 (1.9)</td>
<td>4 (0.7)</td>
<td>3</td>
</tr>
</tbody>
</table>

* Data is shown in number of patients (and percent) and number of blood units (and percent).
body region showed that 75.5% (n = 12) had injuries of the extremities, 64.3% (n = 9) had injuries to the abdomen or pelvic contents, 57.1% (n = 8) had chest injuries, and 35.7% (n = 5) had head or neck injuries. Nine patients (64.3%) underwent peripheral vascular surgery and 7 (50%) suffered from open extremity fractures. Patients in the massively transfused group were significantly more likely to suffer from peripheral vascular injuries and significantly less likely to suffer from penetrating head injuries compared with patients who did not receive massive transfusions (Table 4).

Mortality

Overall 9 patients (6.6%) died of their wounds. Median time to death was 1 day (range 1–12 days). These patients received 197 PRBC (37.8% of total PRBC) and 224 units of FFP (49.9% of total FFP), and the FFP:PRBC ratio was 1.14:1. Five of these patients died on the day of admission from uncontrollable haemorrhage. Five of the 14 patients (35.7%) who received massive transfusions died of their wounds, 3 on the day of admission and on days 4 (n = 1) and 6 (n = 1).

Discussion

SBA’s are considered a sub-group of MCI’s and the mechanism of injury, and therefore expected injuries can be better predicted.9–10 Attack setting, the number of victims, and the type of explosive device may differ, but overall recent worldwide experience has shown that these events are similar in many ways. Our current data and previously published reports have shown that blood utilisation following SBA’s can be significant and blood bank preparedness and contingency planning are essential in order to better manage these events.

Soffer et al. reported the experience of several hospitals in and around Tel Aviv with 18 MCI caused by terrorist attacks and calculated a PPI of 1.32.4 Our PPI was 3.82, considerably higher than that reported by Soffer and similar to more recent data reported by Propper et al. from the experience of a single United States military unit in Operation Iraqi Freedom (PPI 3.5).11 Twenty-four of 50 patients (48%) in the American series received blood transfusions compared with 39% in our experience.11 Their patients were more severely injured compared with our patients as reflected in a higher ISS (19 vs. 16, respectively). All their patients were evacuated by helicopters. That could possibly explain the difference in blood transfusion and ISS. Our data show that 38.7% of admitted patients received blood. Based on our experience and the experience of others, we can assume that blood will be transfused to 35–50% of admitted patients.

Of all blood products, almost 80% were transfused in the first 24 h. Nearly half (45%) of PRBC were transfused in the initial 2 h. This reflects the need for blood during the initial resuscitation in the setting of civilian SBA’s. BB should be alerted as soon as the initial information about the type and magnitude of MCI is reported. Use of blood and blood products during the following time periods (2–6 and 6–24 h) was more moderate and was related to the surgical procedures.

The lower FFP:PRBC ratio in the first 2 h compared to later time periods, correlated with treatment strategy. Initially, restoration of blood volume in the severely injured patient was performed predominantly with PRBC. After initiation of a massive transfusion protocol, the transfusion strategy shifted towards coagulopathy reversal. Physiologic misbalance should drive the strategy of the initial transfusion, not only the concept of a balanced FFP:PRBC ratio. Also, during the study period no advanced monitoring of coagulopathy was used (e.g. visco-elastic assays) directing proper coagulation factor administration. A recent large (n = 806) prospective report from a major US trauma centre found no survival advantage for civilian trauma victims using a balanced transfusing strategy even in patients who received massive transfusions.12

Our data show that up to 10% of patients will receive massive transfusions. This is similar to data from Iraq (8%) where most of the casualties were injured by a combination of blast and penetrating injury.11,13,14 But again, it was appreciably higher than a previously published report from Israel (4.7%).6 Our database is based on a single institution experience whereas previous reports from Israel were based on data from several medical centres. Our centre consistently admitted patients from every single terror attack in the Jerusalem vicinity, and our results reflect only on patients initially admitted to our centre.

Soffer et al. reported that half of all PRBC transfused were type O.6 More importantly, they reported that a quarter of all blood transfused was untested type O (25.6%). The frequency of type O blood in the Israeli population is approximately 35%. According to our data 30.2% of patients (16 of 53) who received blood had type O blood and 14.8% of units (78 of 524) of cross-matched transfused PRBC were either O+ or O−. A total of 18 units were uncrossed-matched O+ and O−. The addition of these 18 units to the sum of PRBC transfused does not change the general picture, i.e. that type O blood was not transfused at a higher rate than its presentation in the general population (96 of 542, 17.7%). A plausible explanation for this dramatic difference between our results and previous reports is the different approach to the utilisation of type O uncrossed-matched blood. Since following SBA many victims with diverse injuries are treated almost simultaneously in the ED, it would probably be more prudent for the blood bank to release blood by type, before completing cross-match, in order to avoid running out of type O blood. Furthermore, the presence of a BB representative at the Trauma Unit, working in concert with the treating teams, facilitates communication and limits possible errors in identification.

Soffer et al. demonstrated that the PPI was 1.5 for incidents with >25 evacuated casualties compared with 0.7 for incidents with <25 casualties (p = 0.04).6 Our data show that the number of PRBC transfused/attack is correlated with the number of admitted casualties/attack. PPI was not different between attacks. This is probably logical since it has not been shown that following MCI’s the severity of injury depends on the number of casualties. The differences between our data and previously published reports can be explained by the unpredictable severity of injuries following a SBA. Even in relatively small SBA’s (<10 casualties) there were patients who were severely injured and received massive

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Table 4

<table>
<thead>
<tr>
<th>Massive transfusion group (n = 14)</th>
<th>Blood group (n = 39)</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS</td>
<td>34 (20–40)</td>
<td>25 (16.5–35.5)</td>
</tr>
<tr>
<td>Injury to 4 or more regions</td>
<td>3 (3–5)</td>
<td>4 (3–4)</td>
</tr>
<tr>
<td>Abdominal injury</td>
<td>4 (28.6)</td>
<td>6 (15.4)</td>
</tr>
<tr>
<td>BLI</td>
<td>2 (14.3)</td>
<td>11 (28.2)</td>
</tr>
<tr>
<td>Ear drum perforation</td>
<td>6 (42.9)</td>
<td>10 (25.6)</td>
</tr>
<tr>
<td>Open extremity fractures</td>
<td>7 (50)</td>
<td>11 (28.2)</td>
</tr>
<tr>
<td>Peripheral vascular injury</td>
<td>9 (64.3)</td>
<td>4 (10.3)</td>
</tr>
<tr>
<td>Skull fractures</td>
<td>2 (14.3)</td>
<td>12 (30.8)</td>
</tr>
<tr>
<td>Penetrating extremity injury</td>
<td>11 (78.6)</td>
<td>22 (56.4)</td>
</tr>
<tr>
<td>Penetrating torso injury</td>
<td>11 (78.6)</td>
<td>23 (59)</td>
</tr>
<tr>
<td>Penetrating head injury</td>
<td>6 (42.9)</td>
<td>32 (82.1)</td>
</tr>
</tbody>
</table>

Data shown as median (and IQR) or number (and percentage).

* Mann–Whitney u test.

b Fisher’s exact test.
transfusions. In fact, our data show that as many as 56 PRBC were transfused when only 3 patients were admitted. Thus, caution must be taken to avoid underestimation of blood requirements simply based on the number of evacuated or admitted patients.

Following the 9/11 attacks it was reported that blood donations increased un-proportionally and that the greater part of this blood was discarded.\textsuperscript{1,5} Our data show that burden on the BB for type and screen and for ordering PRBC was in many cases unjustified and increased the workload. Type and screen was sent for 112 patients, but less than half actually received blood. Similarly, 948 PRBC were ordered and prepared for 79 patients, so that in only 67.1\% of cases was this practice necessary. Only 55.3\% of PRBC ordered were transfused. An implementation of an MCI protocol for BB preparedness could lead to better coordination between primary surgical staff and BB representatives, decrease the workload on the BB and facilitate optimal delivery of blood to patients.

Our study has several limitations, not only associated with its retrospective nature. Although it is a 5-year review of transfusion practices during an MCI within a single institution by one group of trauma surgeons, there was no consistent transfusion protocol throughout that period. BB database contains several areas of incomplete data, as described previously. The number of units transfused was calculated by subtracting the number of units returned to the BB from the number of units released by the BB. Blood units which were discarded in the operating room, ED or elsewhere could not be accounted for. This study focused only on blood product utilisation and did not examine indications for transfusion or transfusion-related complications.

Conclusions

According to our experience based on a wide range of noncombat, MCI’s, 1/3 of all admitted patients received blood transfusions. PPI following SBA was 3.8 units of PRBC. A small number of patients received most of the blood products, similar to the general trauma population in a Level 1 trauma centre. The number of casualties triaged may provide an initial baseline prediction of blood product needs and percentages of patients who will require blood transfusion. 10\% of all admitted patients received massive transfusions regardless of attack setting and the number of injured per attack. Most blood products were given in the first 24 h and particularly in the first 2 h from admission. Non cross-matched type O– PRBC’s were given to a limited number of casualties in extreme situations. Initiation of an MCI BB protocol is of utmost importance.

Conflict of interest statement

None of the authors have any conflicts of interest.

References