"Evita Una Muerte, Está en Tus Manos" Program

Bystander First Aid Training for Terrorist Attacks

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ABSTRACT

Background: The latest terrorist attacks in Europe and in the rest of the world, and the military experience in the most recent conflicts leave us with several lessons learned. The most important is that the fate of the wounded rests in the hands of the one who applies the first dressing, because the victims usually die within the first 10 minutes, before professional care providers or police personnel arrive at the scene. A second lesson is that the primary cause of preventable death in these types of incidents involving explosives and firearms is massive hemorrhage. Objective: There is a need to develop a training oriented to citizens so they can identify and use available resources to avoid preventable deaths that occur in this kind of incidents, especially massive hemorrhage. Methods: A 7-hour training intervention program was developed and conducted between January and May 2017. Data were collected from participants’ answers on a multiple-choice test before and after undertaking the training. Improved mean score for at least 75% of a group’s members on the posttraining test was considered indicative of adequate knowledge. Results: A total of 173 participants (n = 74 men [42.8%]; n = 99 women [57.2%]) attended the training. They were classified into three groups: a group of citizens/first responders with no prior health training, a group of health professionals, and a group of nursing students. Significant differences (p < .05) between mean pre- and post-training test scores occurred in each of the three groups. Conclusion: There was a clear improvement in the knowledge of the students after the training when pre- and post-training test scores were compared within the three groups. The greatest improvement was seen in the citizens/first responders group.

Keywords: tourniquet; hemostatic; compression bandage; terrorism; mass casualty incident

Introduction

The latest terrorist attacks in the United States, Europe, and in the rest of the world, added to military experience in the most recent conflicts, leave us several lessons learned. The most important is that “the fate of the wounded . . . rests in the hands of the one who applies the first dressing” (Nicholas Senn) at the scene of the incident, because the wounded usually die within the first 10 minutes of their injury, before health professionals or police personnel arrive at the scene. Analysis of terrorist incidents indicates massive bleeding, as in combat, is the first cause of preventable death and that these incidents are a growing and global phenomenon. According to a study by Eastridge et al., 90.9% of potentially preventable deaths in combat are due to bleeding, with 13.5% being located in limbs and, therefore, appropriate for tourniquet application; 7.9% are due to airway problems and another 1.1% are due to tension pneumothorax.

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Civil society is facing attacks with explosives, by active shooters, or by small groups of terrorists in which the same injury mechanisms occur. As a study of terrorist attacks that occurred between 1970 and 2013 found that no continent, except Antarctica, has been free of incidents in which terrorist elements have not been implicated. A recent example is the Paris attacks, from which a series of lessons was drawn by the Emergency Medical Assistance Service, such as the need for more tourniquets in the prehospital environment.

These threats have led the different nations to consider developing policies to deal with these situations at the operational and healthcare levels. An example of these policies is the Stop the Bleed campaign carried out by the US Department of Homeland Security and the Office of the President in 2015, in which the early control of exsanguinating bleeding in victims is enhanced. In addition, various meetings held by the Hartford Consensus, chaired by the American College of Surgeons, to increase survival in mass casualties and active shooters events have resulted in recommendations. These policies, in addition to influencing training, confer great importance to easy access to tourniquets and hemostatic agents by all citizens, not only by medical or police personnel, emphasizing the philosophy of “chain of survival,” until then known for cardiorespiratory resuscitation.

In addition, the use of the tourniquet and hemostatic bandages was already contemplated in different civil protocols and in recommendations such as the European Resuscitation Council of 2015 Guidelines.

To achieve bleeding control effectively by applying a tourniquet and to avoid the onset of hypovolemic shock or death, training is needed that emphasizes quick and correct tourniquet placement. Reducing the placement time will minimize the risk of exsanguination that can lead to hypovolemic shock or death. As findings of a Maryland study of individuals without medical training or previous military experience show, simply providing written information with the placement instructions of a Combat Application Tourniquet (CAT Resources Inc., http://combatourniquet.com/) made its application effective 44.14% of the time, compared with 20.41% among participants who did not receive any information. Another study on tourniquets and hemostatic gauze use in the prehospital environment concluded that to achieve and maximize adequate effectiveness in the management of these tools, training is vital. That study consisted of training through a computer program and then hands-on practical training, started 1 month before implementation in June 2009. In the following 6 months, tests on the maintenance of the skills showed 98.5% of participants (326 of 331) retained their proficiency. Therefore, if a simple instruction sheet achieves almost double the application effectiveness, with adequate training, the results should be even better.

For this to happen, it is necessary to train the citizen as first responder or “immediate responder” (note: the first responder legal term does not exist in Spain; therefore, in this article, we have used the latter term to refer to all persons without regulated health training who may be involved in the initial moments of an incident). Therefore, the main objective of the training in wound management in terrorist and active shooters attacks has been to train the student as the immediate responder in self-protection measures and in the evaluation and management of the most common causes of preventable deaths in this kind of incidents, namely, extremity and junctional massive hemorrhage (treated with a tourniquet and/or hemostatic bandage), airway problems, and penetrating chest wounds (treated with a vented chest seal), to emphasize the importance of hypothermia prevention in the traumatic patient.

Another goal has been the training of prehospital and hospital personnel in casualty management in this type of incident, seeking to speak a common language among all echelons of care.

Methods

A web page (http://www.mactac.org.es/) was created, incorporating, in addition to the Moodle platform (Moodle Project, https://moodle.org/), free teaching materials such as videos and “Guía para el Manejo de Heridos en Incidentes Intencionados con Múltiples Víctimas y Tiradores Activos” [Guide for the Handling of Wounded in Intentional Incidents With Multiple Victims and Active Shooters]. In addition, we facilitated the download of an Android smartphone application through Google Play (Google, https://play.google.com) with the same name, designed by Medical Simulator (http://www.medical-simulator.com/), which allows continuous education and, with the correct training, could facilitate decision-making.

Subsequently, a 7-hour training intervention called “Evita una muerte, está en tus manos” [Avoid a Death; It’s in Your Hands] (Figure 1) was carried out between January and May 2017 at the University Hospital 12 de Octubre and at the University Hospital Fundación Jiménez Díaz in Madrid, Spain.

![Figure 1 Program logo.](image-url)

The program consisted of lectures and workshops conducted by experts in the fight against terrorism and by health professionals, all trained in National Association of Emergency Medical Technicians Tactical Combat Casualty Care. The instructor-to-student ratio was 1:6. The program was led by a coordinator, medical director, and instructors.

The initial part of the classroom phase comprised 90-minute expository (theoretical) sessions, separated into two blocks: introduction and assessment and management. To evaluate the students’ progress, feedback was sought from them through questions about their previous experiences and their knowledge of the topic.

The second part of the classroom phase, which had the greatest teaching load, comprised four practical workshops (45 minutes for each rotation) held simultaneously, and during which techniques were demonstrated. The instructor explained the technique over 5 to 10 minutes and then the students did perform the technique one by one until they could do it correctly.
In practical workshops, in addition to using a technical skills learning technique, role playing was performed by simulated patients with simulated wounds to reinforce the learning. Table 1 lists the personnel and tools used during the classes.

Table 1  Program Resources

<table>
<thead>
<tr>
<th>Resource</th>
<th>Title or Product (no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>Medical director (1)</td>
</tr>
<tr>
<td></td>
<td>Coordinator/instructor (1)</td>
</tr>
<tr>
<td></td>
<td>Instructors (2)</td>
</tr>
<tr>
<td></td>
<td>Simulated patients (2)</td>
</tr>
<tr>
<td>Equipment</td>
<td>C-A-T® tourniquets (8)</td>
</tr>
<tr>
<td></td>
<td>H&amp;H Bolin Chest Seals® (H and H Medical Corp., <a href="https://buyhandh.com">https://buyhandh.com</a>) (6)</td>
</tr>
<tr>
<td></td>
<td>Simulaids® Simulated Wounds (Simulaids Inc., <a href="https://www.simulaids.com">https://www.simulaids.com</a>)</td>
</tr>
<tr>
<td></td>
<td>NAR Tactical Extrication Device TED® (North American Rescue)</td>
</tr>
<tr>
<td></td>
<td>Blankets, bed sheets, gloves</td>
</tr>
<tr>
<td></td>
<td>Audiovisual projector</td>
</tr>
<tr>
<td></td>
<td>Pretraining test, post-training test, satisfaction survey</td>
</tr>
<tr>
<td>Facility</td>
<td>Classrooms (3)</td>
</tr>
</tbody>
</table>

The workshops included aspects such as security, self-protection, and quickly calling 112 (911 in the United States); drag and carry maneuvers; massive hemorrhage control with tourniquets, hemostatic bandages and direct pressure, and compressive bandages; basic opening airways maneuvers and recovery position; assessment and management of penetrating chest wounds with vented chest seals; and right communication and casualty transfer throughout the chain of survival and proper management of the same.

Evaluation

To evaluate the students’ cognitive abilities, a multiple-choice test of 12 questions with four answer options each was used as a data collection tool. Students completed the test in an online phase through the Moodle platform before performing the training and again at the end of training. Adequate knowledge (AK) was considered achieved when at least 75% of students scored higher on the post-training test than on the pretraining test. Subjects were divided into three groups: health professionals, nursing students, and non-health professional personnel (i.e., citizens/immediate responders).

The knowledge variable (i.e., knowledge score) was obtained from the summation of the correct answers on the multiple-choice test. A score ranging from 0 to 12 was obtained, with the higher score indicating greater knowledge. Each participant thus had a pre- and post-training knowledge score (quantitative variables). Therefore, another result variable was calculated, as follows:

\[
AK = 1 \text{ yes, } 2 \text{ no (qualitative dichotomous)}
\]

Or 1 = yes, if the condition AK post-training was
\[
>75% \text{ of the total possible is met}
\]

Or 2 = no, if the condition AK post-training was
\[
\leq 75% \text{ of the total possible is met}
\]

The questionnaires and data collection tools were numerically coded using SPSS statistical software version 20 (IBM Corp., https://www.ibm.com). For the quality of the database, all the variables were searched for missing and out-of-range values.

The distribution of the quantitative variables was determined by the Kolmogorov-Smirnov test, where the null hypothesis was that the quantitative variables would follow a Gaussian distribution. The means were compared to evaluate the results of the training program. A \( t \) test was performed because of the characteristics of the sample.

Normally distributed data are reported as mean (standard deviation [SD]); non-normally distributed data are reported as median (interquartile range [IQR]). The data or quantitative variables are reported as frequency and percentage.

To determine the effectiveness of the program, the \( t \) test for related samples (or its nonparametric Wilcoxon counterpart) was used to compare the before and after knowledge (i.e., test) scores (comparison of means) and the McNemar test for comparison of qualitative variables (e.g., vs. group vs. proper knowledge). The individualized analysis of each of the questions and the improvement (or not) of the responses after the intervention was also performed with the McNemar statistical test for related tests.

The frequency and percentage of the AK variable have been calculated in the total sample of participants and in the separate groups. The variable determined the success of the program, so the program was successful when 75% of the participants reached the status of suitable AK. In all hypothesis contrasts, the null hypothesis was rejected with a type I error less than .05.

All data were protected and students were guaranteed anonymity according to Ley Orgánica 15/1999, de 13 diciembre, de Protección de Datos de carácter personal.

Results

At the time of the completion of this study, seven trainings had been conducted with a total of 173 students (Table 2).

Table 2  Participant Groups

<table>
<thead>
<tr>
<th>Sex</th>
<th>First Responders, no. (%)</th>
<th>Health Professionals, no. (%)</th>
<th>Nursing Students, no. (%)</th>
<th>Total, no. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>40 (83.3)</td>
<td>26 (41.3)</td>
<td>8 (12.9)</td>
<td>74 (42.8)</td>
</tr>
<tr>
<td>Female</td>
<td>8 (16.7)</td>
<td>37 (58.7)</td>
<td>54 (87.1)</td>
<td>99 (57.2)</td>
</tr>
<tr>
<td>Total</td>
<td>48 (100.0)</td>
<td>63 (100.0)</td>
<td>62 (100.0)</td>
<td>173 (100.0)</td>
</tr>
</tbody>
</table>

Table 3 lists the mean scores (±SD) for each group. In the citizen/immediate responder group, a significant difference was found between the mean pre- and post-training test scores (10.08 ±1.952 versus 11.13 ±1.361), respectively; \( p < .05 \). Similarly, the mean pre- and post-training scores differed significantly in the healthcare professionals group (10.25 ±1.808 versus 11.40 ±0.935; \( p < .05 \)) and in the nursing students group (8.57 ±1.93) versus 11.45 ±0.80; \( p < .05 \).

Table 4 presents pre- and post-training knowledge data. In the health professionals group, 47 (81%) of the students reached the pretraining score compared with 55 students (98.2%) who reached the post-training score (\( p < .05 \)). The magnitude of effect of the intervention, however, was 0.978 (IQR,
0.936–1.022), very close to the value 1. In the nursing students group, 33 (53.2%) of the students reached the pretraining score compared with 55 (98.2%) of students who reached it after training (p < .05). The magnitude of effect of the intervention was 1.043 (IQR, 0.96–1.134). Finally, in citizen/immediate responder group, 30 (76.9%) of the students reached the pretraining score compared with 40 (93%) of the students who reached it after training (p < .05). The magnitude of effect of the intervention was 3.625 (IQR, 0.203–64.59).

Table 3 Effectiveness of the Intervention

<table>
<thead>
<tr>
<th>Group</th>
<th>No. (%)</th>
<th>Pretraining</th>
<th>Mean Test Score ±SD</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizens/immediate responders</td>
<td></td>
<td></td>
<td>39</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pretraining</td>
<td>10.08 ±1.952</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-training</td>
<td>11.13 ±1.361</td>
<td></td>
</tr>
<tr>
<td>Health professionals</td>
<td></td>
<td></td>
<td>55</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pretraining</td>
<td>10.25 ±1.808</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-training</td>
<td>11.40 ±0.935</td>
<td></td>
</tr>
<tr>
<td>Nursing students</td>
<td></td>
<td></td>
<td>56</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pretraining</td>
<td>8.57 ±1.925</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-training</td>
<td>11.45 ±.807</td>
<td></td>
</tr>
<tr>
<td>Total sample</td>
<td></td>
<td></td>
<td>150</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pretraining</td>
<td>9.58 ±2.034</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-training</td>
<td>11.35 ±1.023</td>
<td></td>
</tr>
</tbody>
</table>

SD, standard deviation.

A clear improvement between pre- and post-training test scores was observed, with a mean of 11.35 points on the post-training test compared with 9.58 on the pretraining test (p < .001). Therefore, we conclude that the training clearly improved the results and the students finished the training with more knowledge about the skills taught.

Discussion

The evaluation of the effect of the training on the students reflects the quality of the performed training. The three groups experienced a statistically significant improvement between pre- and post-training test scores. The impact of the measure was greater in citizen/immediate responder group (relative risk, 3.6); this is logical, because this group did not have previous health training. It is exactly for this group that the training program makes sense.

Data for between 18% and 20% of students are not presented; many of these students did not explain their absence from the program, and this is an aspect to be reviewed for subsequent trainings.

We analyzed the level of acceptance of the Moodle platform where the teaching materials, pre- and post-training test, and satisfaction survey were located. It seems to be an unattractive platform for both students and instructors, because it seems to involve spending some time they considered “extra” or unnecessary.

To save time on administrative issues in the training courses, it is proposed that the pretraining test be taken online to allow more time for the hands-on workshops. Many students did not complete the pretraining test online, except in the nursing students group; a more exhaustive follow-up has been carried out of this group. Students who did not complete the pretraining test online had to take the test via the traditional paper format on the same day as the training, which took time away from the workshops.

It also seems to be clear, given the time and resources invested in the management of the platform and the training, that there must be someone at the administrative level in charge of the management of the subscriptions and the platform as well, as to be in contact with the students.

Limitations

Although there were checklists for the evaluation of technical skills, there was no possibility of using them, because there was no availability of personnel and the time of the workshops would have had to be adjusted. As an improvement measure, we propose including the technical skills checklist, which would guide the training strategy more effectively to improve the final results. We also strongly recommend implementing a “final integrative practice/scenario” in which students can put into practice all concepts assimilated in a multiple casualty incident with simulated wounded and the subsequent debriefing.

Conclusion

There was clear improvement in the knowledge of the students in each group after the training. The most improvement was seen in the citizen/immediate responder group, then in the nursing students group, and then in the health professionals group; the finding in the latter group may be because of their higher basic health training, thus there was less change between pre- and post-training scores. Therefore, we conclude that the quality of the training performed is significant enough to maintain the educational strategy as initially proposed.

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Disclaimer

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of Grupo de Acción Rápida of the Spanish Guardia Civil, University Hospital 12 de Octubre, University Hospital Fundación Jiménez Díaz, or Pozuelo de Alarcón Local Police Department.
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The authors have nothing to disclose.

Author Contributions
All the authors contributed to and gave final approval to the submitted manuscript.

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