The profile of wounding in civilian public mass shooting fatalities

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BACKGROUND: The incidence and severity of civilian public mass shootings (CPMS) continue to rise. Initiatives predicated on lessons learned from military woundings have placed strong emphasis on hemorrhage control, especially via use of tourniquets, as means to improve survival. We hypothesize that both the overall wounding pattern and the specific fatal wounds in CPMS events are different from those in military combat fatalities and thus may require a new management strategy.

METHODS: A retrospective study of autopsy reports for all victims involved in 12 CPMS events was performed. Civilian public mass shootings was defined using the FBI and the Congressional Research Service definition. The site of injury, probable site of fatal injury, and presence of potentially survivable injury (defined as survival if prehospital care is provided within 10 minutes and trauma center care within 60 minutes of injury) was determined independently by each author.

RESULTS: A total 139 fatalities consisting of 371 wounds from 12 CPMS events were reviewed. All wounds were due to gunshots. Victims had an average of 2.7 gunshots. Relative to military reports, the case fatality rate was significantly higher, and incidence of potentially survivable injuries was significantly lower. Overall, 58% of victims had gunshots to the head and chest, and only 20% had extremity wounds. The probable site of fatal wounding was the head or chest in 77% of cases. Only 7% of victims had potentially survivable wounds. The most common site of potentially survivable injury was the chest (89%). No head injury was potentially survivable. There were no deaths due to exsanguination from an extremity.

CONCLUSION: The overall and fatal wounding patterns following CPMS are different from those resulting from combat operations. Given that no deaths were due to extremity hemorrhage, a treatment strategy that goes beyond use of tourniquets is needed to rescue the few victims with potentially survivable injuries. (*J Trauma Acute Care Surg.* 2016; 81: 86–92. Copyright © 2016 Wolters Kluwer Health, Inc. All rights reserved.)

LEVEL OF EVIDENCE: Prognostic/epidemiologic study, level IV; therapeutic/care management study, level V.

KEY WORDS: Active shooter; mass casualty; TECC.

The incidence and severity of civilian public mass shootings (CPMS) and mass killing events in the United States of America and worldwide continue to rise.[1] Since the almost back-to-back, large, and well-publicized mass shootings in the latter half of 2012, there has been increased focus on improving survival for the wounded in active shooter events. Recently, several large public initiatives have placed much of the effort to address the loss of life through strong, unidirectional messaging on external hemorrhage control, with a special emphasis on the use of extremity tourniquets. For example, the Hartford Consensus Joint Committee to Create a National Policy to Enhance Survival in Mass Casualty Shooting Events views hemorrhage control as "second only to engaging and defeating the shooter and as key to improving the survival of victims of active shooter incidents," describing external hemorrhage control as "the critical step" in eliminating preventable prehospital death.[2,3] This guidance is driven by the combat wounding pattern and Tactical Combat Casualty Care (TCCC) medical lessons learned from past military action and reconfirmed over the past 14 years of the wars in Afghanistan and Iraq.[4] However, to have an informed basis to develop appropriate civilian medical response algorithms for CPMS incidents, there must be evidence that supports the premise that military and civilian wounding patterns and injuries are similar.

Systematic autopsy reviews of fatalities in the Vietnam war as well as in Operation Iraqi Freedom have revealed a consistent pattern of fatal injury in combat (Fig. 1), including specific injuries where the fatality could potentially have been prevented with simple timely medical intervention.[5] These "potentially survivable injuries" historically make up 15% of all combat deaths and consist of exsanguinating extremity hemorrhage, tension/open pneumothorax, and airway obstruction.[6] Of the three, exsanguinating extremity hemorrhage is consistently the most prevalent at 9% and is arguably the least complicated to address, even by minimally trained personnel. Owing to the prevalence of improvised explosive devices and the resulting dismounted blast injury pattern in Operation Iraqi Freedom and Operation Enduring Freedom, exsanguinating extremity and junctional hemorrhage have become significant focus of care on the battlefield under the TCCC guidelines.[7,8]

Given the past 14 years of conflict, military trauma knowledge and experience are now being directly applied to the civilian setting. Trauma management training paradigms founded directly upon this military evidence are being taught to civilians as a solution for the gap in medical operations and medical knowledge in civilian response to high threat events. Unfortunately, despite high threat events being a recent significant

Submitted: December 1, 2015, Revised: February 15, 2016, Accepted: February 16, 2016, Published online: March 8, 2016.
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This study was presented at the 29th annual meeting of the Eastern Association for the Surgery of Trauma, January 9–12, 2016, in San Antonio, Texas.
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DOI: 10.1097/TA.0000000000001031

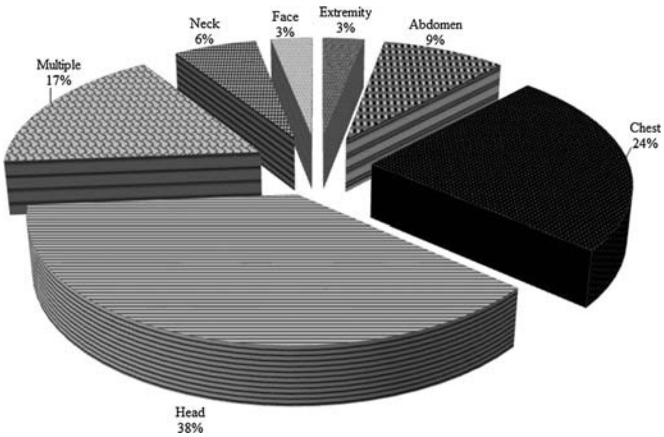

Figure 1. Site of fatal injury in combat personnel.

focus of medical discussion, there has been no analysis of the pattern of wounding and fatal injury in CPMS events. We hypothesize that both the overall wounding pattern and the specific fatal wounds in these civilian events are different from those in military combat fatalities. The purpose of this paper was to define the overall anatomic wounding pattern, the fatal wounding pattern, and the incidence of potentially survivable wounds in CPMS fatalities.

MATERIALS AND METHODS

Both the Federal Bureau of Investigation and the Congressional Research Service define public mass shootings as (1) incidents occurring in relatively public places involving four or more deaths, not including the shooter(s); (2) gunmen who select victims indiscriminately; and (3) the violence in these cases is not meant to be a means to an end, such as robbery.[1,9] Adopting this standard definition, we used autopsy reports from CPMS events to examine both the overall anatomic distribution of wounds, the anatomic region of the identified fatal wound, and the percentage of fatal wounds that may have been potentially survivable with rapid medical intervention and expedient transport to definitive care.

The New York Police Department 2012 Active Shooter Summary Report provides detailed descriptions and data for every active shooter event in the United States since 1966.[10] Using this compilation report along with the FBI report, A Study of Active Shooter Incidents Between 2000–2013,[1] we identified 56 events that both met the definition of CPMS and had an identifiable medical examiner or coroner whom we could contact through an Internet-based search of the region/county/city of the shooting event. As a whole, we found that such details and contacts from events before the 1999 Columbine High School shooting were not well recorded online and therefore not accessible. Thus, any event where the medical examiner/coroner could not be identified or directly contacted was eliminated from the study. As such, most of the incidents that met our criteria were from the period of 2000 through 2013.

Once identified, the responsible medical examiner or coroner's office was contacted and a Freedom of Information Act (FOIA) request was made for the autopsy/medical examiner report for each of the publically listed victims of the selected event. In cases where state law precluded the direct distribution of autopsy reports, a deidentified listing of autopsy findings and causes of death was requested. Three requests were sent by e-mail for each selected event. A negative response at any point or no response after three requests for information removed that event from the study database.

Once requested data were received, each author independently reviewed the reports to determine the anatomic region of every wound, probable site of fatal injury, and whether the wounds were potentially survivable assuming prehospital care was within 10 minutes and definitive trauma center care within 60 minutes. These time-to-care data points were chosen to be consistent with current Pre-Hospital Trauma Life Support recommendations regarding the platinum 10 minutes and the golden hour.[11] Where there was not unanimous agreement, majority opinion ruled.

Wounds were analyzed and compiled by body region and type of injury. The particular body regions were separated according to the following criteria: the head region included all wounds of the head; the face region included all wounds of the face; the neck region included all wounds of the cervical spine and neck superior to the clavicles; the chest/upper back region included all chest injuries and thoracic spine wounds; the abdomen/lower back region included the lumbar spine, abdomen, pelvis, and external genitalia; and the extremities region included any injury below the shoulder region on the upper extremity and below the pelvis on the lower extremity. Wounds were considered fatal if they involved penetration of the heart; injury to any nonextremity major vasculature structure; transcranial, mid-brain, or brainstem injury; or multiple solid organ injuries.

We sent FOIA requests for autopsies to medical examiners from a sample of 25 of the 56 events that met study criteria. Two medical examiners denied the request, even for deidentified data, based on either state or local law, one denied the request owing to lack of resources to compile the requested data, and 10 of the requests were unanswered despite 3 attempts.

In two incidents, for a total of 46 fatalities, the medical examiner was only able to provide limited data. In one of these incidents, state reporting restrictions prohibited the release of the actual autopsies, even deidentified; in the other case, no actual autopsies were done. However, for each victim in both of these incidents, we were able to obtain reported cause of death and detailed external wound data (including location and number of wounds). Without the actual autopsy report, however, identifying the potentially survivable injury was unreliable. Thus, for these two events, we considered a victim to have a nonsurvivable wound if there was at least one direct penetrating transcranial wound. Of these 46 fatalities, 32 met this criterion. As wounds to the torso alone cannot be adequately assessed for potential survivability without knowledge of underlying pathology, the remaining 14 of the 46 patients were excluded from the analysis for survivable injury. Additionally, in this data set, 22 of the 46 fatalities were included in the analysis of probable fatal anatomic wound, as all wounds to each of these victims were to only one anatomic region. However, the other 24 of the 46 fatalities had wounds to more than one anatomic region; thus, we were unable to determine the exact anatomic region of the probable fatal

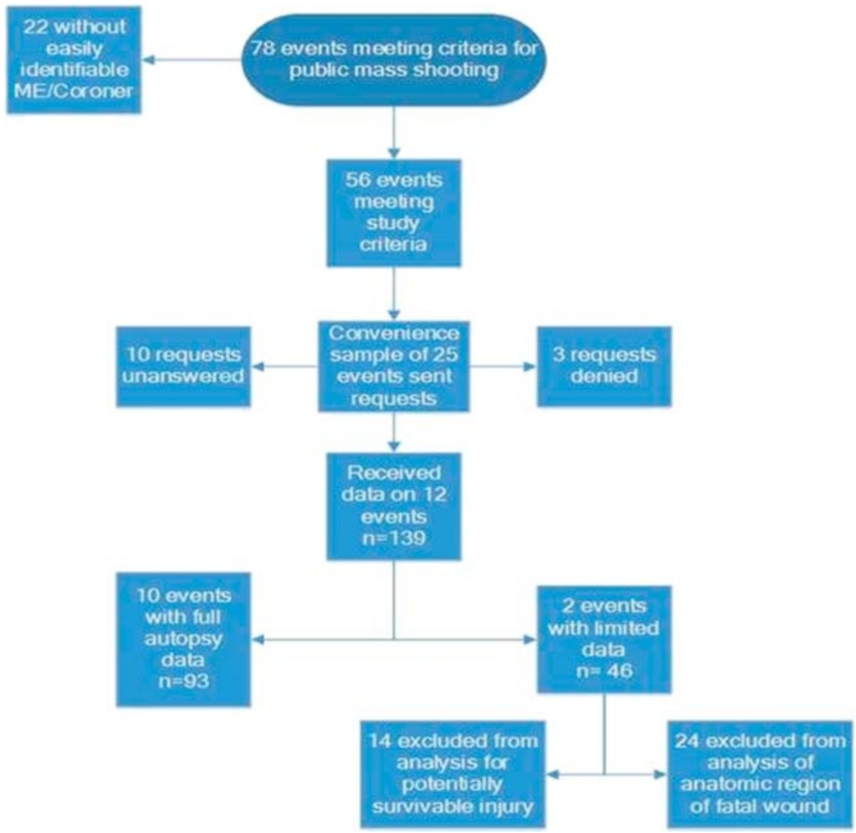

Figure 2. Selection of CPMSs for inclusion.

wound in these victims. We excluded these 24 from the analysis of anatomic distribution of probable fatal wounds (Fig. 2).

RESULTS

We received autopsy reports and/or deidentified wounding data from 12 separate CPMS events totaling 139 fatalities, with 371 total wounds reported (including potential entry and exit wounds) (Table 1). The number of wounds on each fatality ranged from 1 to 10, with an overall average of 2.7 per victim. The overall anatomic wounding pattern, including both fatal and nonfatal wounds (Fig. 3), showed that the head and the chest/upper back were the anatomic regions most frequently involved, as 58% of the victims had at least one wound to the head and/or chest/upper back. Only 20% of overall wounds were to the extremity region, and only 13.5% were to the abdomen/lower back region, suggesting that the shooters were accurate in their aim given that their intention was to kill. Fifty-six percent of the victims had concurrent wounds to more than one anatomic region (not limited to head and chest/upper back).

TABLE 1. Active Shooter Events Included

Location	Year	Number of Persons Killed/ Wounded
San Ysidro McDonalds, San Diego, CA	1984	19/21
Edmond Post Office, Edmond, OK	1986	15/6
Columbine High School, CO	1999	13/21
Living Church of God, Brookfield, WI	2005	7/4
Post Office, Goleta, CA	2006	6/0
Trolley Square Mall, Omaha, NE	2007	5/4
Virginia Tech University, Blacksburg, VA	2007	32/17
Northern Illinois University	2008	5/21
Safeway Parking Lot, Tucson, AZ	2011	5/13
Sikh Temple, Oak Creek, WI	2012	7/4
Century 16 Theater, Aurora, CO	2012	12/58
Washington Navy Yard, DC	2013	13/7

In evaluating the anatomic distribution of the probable fatal wound(s), most (77%) were also to the head or chest/upper back (Fig. 4). Furthermore, 90% of these victims had nonsurvivable injuries in a single anatomic region, suggesting that only 10% died of multisystem nonsurvivable injury. We did not find any extremity wounds that would have resulted in exsanguination and death.

With 100% agreement between reviewers, only 9 of the analyzed 125 fatalities (excluding the 14 without detailed autopsy data) were found to be potentially survivable, yielding a potentially survivable wound rate of 7% (Table 2). There was near-equal distribution between shotgun and handgun wounds in this group and no wounds caused by high-velocity rifles. The most common potentially survivable injury was a gunshot/shotgun to the chest (89%), with autopsy reports showing no significant vascular or cardiac injury and only small hemothorax. Lack of significant pathology in these cases leads us to deduce that the patient died from respiratory impairment

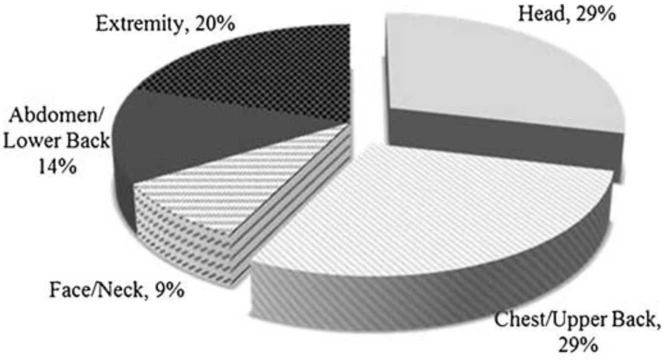

Figure 3. Distribution of all wounds by anatomic location (n = 297).

or tension pneumothorax. There were no penetrating head wounds identified as potentially survivable, as none of the reported head wounds were unilateral. Three cases had concurrent facial injury that may have contributed to the fatality, and one case had an isolated facial injury. No exsanguinating extremity hemorrhage was identified, leaving the chest and airway as the only anatomic regions that could have been temporized with relatively simple interventions at or near the point-of-wounding to allow the patient the potential to survive. Of the 14 cases excluded from this analysis for potentially survivable injury, all had wounds to the head with or without wounds to the torso; there were no wounds to the extremities in the excluded group.

DISCUSSION

There seems to be ready acceptance in the prehospital and trauma medical community of the assumption that, despite obvious operational differences, the wounding patterns, fatal injury, and required prehospital medical interventions are similar between combat and CPMSs. Although the tissue physiology of ballistic wounding and the resulting systemic physiologic response is the same, almost everything else between combat and civilian events is different. Thus, directed medical interventions following CPMS require a different overall strategy and therapeutic emphasis to decrease the number of potentially preventable deaths.

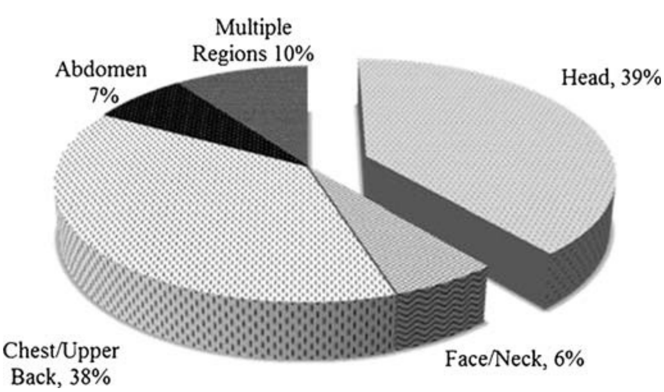

Figure 4. Distribution of fatal wounds by anatomic location (n = 115).

TABLE 2. Wounding Pattern in Patients Deemed to Have Had Potentially Survivable Injuries

Anatomic Region	Number of Wounds	Weapon
Face/Neck/Chest	2	Shotgun
Neck/Chest	3	Shotgun
Face/Neck/Chest	2	Shotgun
Chest/Upper back	2	Handgun
Face/Chest	5	Shotgun
Chest/Back/Abdomen	5	Handgun
Chest	3	Handgun
Chest	1	Handgun
Face	1	Handgun

This is the first study that specifically examines the overall wounding, the fatal wounding, and the incidence of potentially survivable wounds following CPMSs. This data set represents 25% of all fatalities and 15% of all CPMS events in the United States and US territories over the 30 years between 1983 and 2013.[9] Our goal was to gain perspective on civilian fatalities in the same manner that Eastridge et al.[12] did for the modern battlefield in 2010. Through analysis of postmortem autopsy reports of US combat fatalities, the authors in that study defined the patterns of fatal wounds in Operation Iraqi Freedom and Operation Enduring Freedom, with a special focus on the incidence and nature of potentially survivable injuries. Comparing the results, we found that fatalities following CPMSs differ from combat fatalities in the mechanism of injury, overall wounding pattern, the fatal wounding pattern, and the percentage of potentially survivable injuries.

There are multiple reasons why these differences exist. To begin with, in addition to more prevalent use of high-velocity weapons (i.e., rifles), explosives are more common in the military setting. According to Eastridge et al., the causes of lethal injuries in Iraq and Afghanistan combat operations were 74% blast/fragmentation, 22% gunshot wounds, and 4% other (vehicle crash, industrial, crush, etc).[12] Champion et al. reported similar etiologies in combat injuries with 62% fragmentation injury, 23% gunshot wounds, 3% blast, 6% burns, and 6% other.[6] None of the 12 events we studied involved injuries from blast, burns, or fragmentation; instead, 100% of the injuries in our database were due to gunshot wounds, including lower-velocity handguns, multiple projectile shotguns, and high-velocity rifles. This is consistent with other studies of CPMSs. For example, none of the events listed in the online Mother Jones magazine review of active shooter incidents from 1982 through 2015 involved injuries from any other type of weapon.[13] Blast injury alone causes a much wider array of trauma and, intuitively, is associated with a higher potential for exsanguinating hemorrhage.

The difference in the anatomic regions of wounds overall between combat and CPMSs is quite significant. The percentage of extremity injuries in combat has been reported to be between 52% and 64%.[6] In contrast, only 28 (20%) of our 139 total civilians had extremity wounds of any kind. Instead, civilians have a much higher percentage of head and torso injuries (72% vs 48% in combat). The likely reason for this is two-fold: first, the civilians killed in CPMS are not wearing ballistic protection for their head and/or torso, leading to a higher incidence of injury to these anatomic regions. This effect can be seen in the distribution of overall injury in the torso alone. The ballistic armor worn by military personnel in combat protects the upper more than the lower torso, leading to a reported wound distribution of 36% penetrating chest wounds versus 64% abdominopelvic injury.[12] In civilians without ballistic armor, however, these numbers are almost exactly reversed. Of a total of 125 reported torso wounds in our study, 85 (68%) were to the chest/upper back and 40 (32%) were abdominopelvic injuries. Second, the average distance of the shooter in civilian mass casualty is, for the most part, much closer to the victim than the enemy combatant is from the soldier. In after action reviews from combat, reported engagement distances ranged on average from 20 to 30 m.[14] Civilian public mass shootings most often occur at a much closer range and most often indoors.[10] The closer distance in civilian settings greatly improves the accuracy and ability for the shooter to hit center mass, thus creating a higher incidence of head and torso injuries. This scenario unfolded both in the 2007 Virginia Tech shooting and the Sandy Hook Elementary School shooting, where the shooter quickly shot multiple times at close range without significant resistance from the victims resulting in numerous close range lethal head wounds.[15,16]

Given these operational differences, the anatomic site of the fatal injury differs as well. For civilians, wounds to the head and chest were the most common identified sites of fatal injury, together accounting for 77% of deaths. In combat, this number is lower at 61%.[12] However, combatants have a higher percentage of concurrent fatal injuries in multiple anatomic sites (17% vs 10%).[6] The increased prevalence of blast trauma with resulting multiple wounding mechanisms likely accounts for this higher incidence of multiple fatal wounds in the same patient, as opposed to the singular wounding pattern of a bullet or the tight pattern of shot from a close-range shotgun creating fatal injury in a single anatomic region 90% of the time in civilians.

Civilian public mass shootings overall are more lethal events with a significantly higher case fatality rate than combat. The case fatality rate (CFR) for our 12 events, defined as the percentage of fatalities among all wounded,[17] was 44.6%. Overall, from 2000 to 2013, the CFR for active shooting events as reported by the FBI was 46.5%.[1] In contrast, during Operation Iraqi Freedom and Operation Enduring Freedom, the CFR has been reported in certain military groups to be 10.04% and 9.11%, respectively.[18]

The data derived from combat on potentially survivable wounds has been the focus of, and impetus for, the military medical recommendations that have been driving the recent initiatives to improve survivability in civilian active shooter events. The main focus of the military TCCC guidelines is to rapidly address potentially survivable and easily manageable wounds at or near the point of wounding. However, we found that not only do CPMS events seem to be more lethal, there is also a much lower incidence of potentially survivable injuries as compared to woundings incurred during military combat operations. As reported by Eastridge et al., 24.3% of battlefield deaths were potentially survivable from a purely medical perspective.[12] In our study, only 9 (7%) of 125 cases were found to be potentially survivable. Moreover, we found a significant difference in the specific injuries associated with potentially survivable wounds. As opposed to the 60% incidence of exsanguinating extremity hemorrhage and 33% incidence of tension pneumothorax in combat studies,[6] chest injury with potential tension pneumohemothorax represented most (89%) of potentially survivable civilian fatalities. Additionally, in four of the nine cases, nonlethal injury to the face was reported. Resulting airway obstruction may have contributed to the fatality, which represents an incidence of 44% versus the reported 7% in combat.[6] Surprisingly, compared to 60% of preventable battlefield fatalities,[6] none of the 139 autopsies showed exsanguinating extremity hemorrhage as a cause of death. Thus, although tourniquets and an emphasis on controlling external hemorrhage clearly save lives on the battlefield, these interventions may not have the same effect in improving survival after CPMS events.

Does this mean external hemorrhage control for civilians is unimportant? Emphatically no! Tourniquets and simple hemorrhage control measures most definitely have a role in improving survival but should no longer be a myopic focus of first responder and public education. According to our results, where chest injury by far predominates as the most common potentially survivable wound, a systematic approach that promotes not just hemorrhage control but the entire spectrum of civilian Tactical Emergency Casualty Care (TECC) adjusted to the scope of the provider may improve survival. Built on civilian-specific application of military combat medical lessons learned, TECC consists of an evidence and consensus best-practice–based set of civilian-focused medical recommendations for use of geographically involved citizen first care providers with application of simple interventions to stabilize a trauma patient at or near the point of wounding and coordinated first responder rapid access to and evacuation of the injured.[19,20] Per TECC, in addition to immediate patient access and external hemorrhage control (direct pressure, tourniquets, and hemostatic agents), immediate medical care in the wake of a CPMS must include strategies to prevent further injury to the wounded, simple airway management, recognition and management of declining respiratory function as a result of penetrating trauma to the chest, proper positioning of the casualty, efficient movement of the casualty, and prevention of hypothermia.[21] Simple training with that breadth of knowledge, along with improved operational procedures to facilitate both rapid access to the wounded for medical first responders and rapid extrication to definitive care, will likely have the most mortality benefit for the few casualties with potentially survivable but severe injuries following the next CPMS event. As such, we strongly recommend studies evaluating outcomes following implementation of broader education and training in civilian TECC point-of-wounding care as a complete treatment paradigm across the chain of survival, from the uninjured but geographically present first care provider to the initial nonmedical first responders to the prehospital medical providers to the first receivers in the trauma center.

Despite being the first study to evaluate causes of death following CPMS events, this study has several limitations that we acknowledge. First, it is a retrospective review with all of the shortcomings inherent in this study design. Second, we lacked detailed autopsy results in some cases, and it is possible that we erroneously categorized some cases as nonsurvivable, but we think that the possibility of this is slim considering that, even in the cases where we had limited data, most wounds were to the head and chest, and the significant operational barriers inherent in a CPMS severely limited rapid access to emergency health care. It is also possible that we incorrectly classified some injuries as potentially survivable, but this would only bolster our concern that current TCCC-based recommendations will not affect outcome in civilian active shooter events. Next, we acknowledge the possibility of sampling bias from the recent emphasis and operationalization of hemorrhage control strategies among first response agencies. As tourniquet and hemostatic gauze use has increased among medical first response agencies over the past five years, it is possible that these strategies were used during the response to the later events in our database, thus allowing patients with exsanguinating extremity hemorrhage to survive. If this were so, these patients would not be included in our fatality reports, falsely lowering our incidence and distribution of potentially survivable injuries. Studying public information on the medical response to the more recent events in our database, only the 2012 shooting in Tucson has the potential for this bias. Finally, although we attempted to review as many of the autopsy reports as possible, local laws, limited public information, and/or lack of response to FOIA requests prevented us from receiving reports from many events, thereby creating additional possibility of sampling bias. This may be compounded by the fact that we limited analysis to events with four or greater fatalities. Although we attempted to contact as many coroners/medical examiners as possible, it took more than two years to collect the information in this study. We did not feel that delaying the publication of these results in an attempt to contact the remaining coroners/examiners was justified given our findings. We strongly recommend that medical societies lobby lawmakers to allow better access to and more complete reviews of outcomes following shooting events.

CONCLUSION

We found that the overall wounding pattern and the fatal wounding pattern following civilian active shooter events differ from combat injuries. There were no deaths from exsanguinating extremity wounds. As such, we discourage the current myopic focus on hemorrhage control for civilians. Instead, we urge that the tenets of civilian-based TECC be implemented across the entire prehospital trauma spectrum, and we further recommend studying this strategy to affirm its benefit.

AUTHORSHIP

E.R.S. designed this study. E.R.S. and G.S. performed the literature search. E.R.S., G.S., and B.S. performed data analysis and drafted the mansucript.

ACKNOWLEDGMENT

The authors thank Ms. Elana Pinkasovic for research assistance in completing this study.

DISCLOSURES

Dr. Smith and Mr. Shapiro voluntarily serve on the Executive Board of the Committee for Tactical Emergency Casualty Care. Dr. Sarani voluntarily serves on the Board of Directors of the Committee for Tactical Emergency Casualty Care.

REFERENCES

1. Blair JP, Schweit KW. A study of active shooter incidents, 2000–2013. Texas State University and the Federal Bureau of Investigation, US Department of Justice, 2014. Available at: https://hazdoc.colorado.edu/bitstream/handle/10590/2712/C022901.pdf?sequence=1. Accessed June 22, 2015.
2. Brinsfield KH, Mitchell E Jr. The Department of Homeland Security's role in enhancing and implementing the response to active shooter and intentional mass casualty events. *Bull Am Coll Surg*. 2015;100:24–26.
3. Fabbri WP. The continuing threat of intentional mass casualty events in the U.S.: observations of federal law enforcement. *Bull Am Coll Surg*. 2015;100:47–50.
4. Jacobs LM, Eastman A, McSwain N, Butler FK, Rotondo M, Sinclair J, Wade DS, Fabbri WR. Improving survival from active shooter events: The Hartford Consensus. *Bull Am Coll Surg*. 2015;100:32–34.
5. Bellamy RF. Combat trauma overview. In: Zajtchuk R, Grande C, eds. *Textbook of Military Medicine, Anesthesia, and Perioperative Care of the Combat Casualty*. Falls Church, VA: Office of the Surgeon General of the Army; 1995:1–42.
6. Champion HR, Bellamy RF, Roberts CP, Leppaniemi A. A profile of combat injury. *J Trauma*. 2003;54:S13–S19.
7. Kotwal RS, Montgomery HR, Kotwal BM, Champion HR, Butler FK Jr, Mabry RL, Cain JS, Blackbourne LH, Mechler KK, Holcomb JB. Eliminating preventable death on the battlefield. *Arch Surg*. 2011;146:1350–1358.
8. Butler FK. Military history of increasing survival: the U.S. military experience with tourniquets and hemostatic dressings in the Afghanistan and Iraq conflicts. *Bull Am Coll Surg*. 2015;100:60–64.
9. Bjelopera J, Bagalman E, Caldwell S, Finklea K, McCallion G. Public mass shootings in the United States: Selected implications for federal public health and safety policy (Congressional Research Service Report R43004). Available at: http://journalistsresource.org/wp-content/uploads/2013/03/MassShootings_CongResServ.pdf. Accessed October 1, 2015.
10. Kelly RW. Active Shooter: Recommendations and analysis for risk mitigation. NYPD Printing Section. Available at: http://www.nyc.gov/html/nypd/downloads/pdf/counterterrorism/ActiveShooter2012Edition.pdf. Accessed October 1, 2015.
11. National Association of EMTs and the American College of Surgeons Committee on Trauma. *Prehospital Trauma Life Support*. 8 ed: Jones and Bartlett Learning; 2013.
12. Eastridge BJ, Mabry RL, Seguin P, Cantrell J, Tops T, Uribe P, Mallett O, Zubko T, Oetjen-Gerdes L, Rasmussen TE, et al. Death on the battlefield (2001–2011): implications for the future of combat casualty care. *J Trauma Acute Care Surg*. 2012;73:S431–S437.
13. Follman M, Aronsen G, Pan D, Caldwell M. US mass shootings, 1982–2012: Data from Mother Jones' investigation. Available at: http://www.motherjones.com/politics/2012/12/mass-shootings-mother-jones-full-data. Accessed November 20, 2015.
14. Sensing D. Infantry rifle combat distances. Available at: http://donaldmsensing.blogspot.com/2003/06/infantry-rifle-combat-distances.html. Accessed June 22, 2015.
15. Jacobs LM, Burns KJ, McSwain N, Carver W. Initial management of mass-casualty incidents due to firearms: improving survival. *Bull Am Coll Surg*. 2013;98:10–13.
16. Massengill G, Martin M, Davis G, Depue R, Ellis C, Ridge T, Sood A, Strickland D. Mass Shootings at Virginia Tech: Report of the Review Panel. Available at: http://governor.virginia.gov/media/3772/fullreport.pdf. Accessed November 1, 2015.
17. Holcomb JB, Stansbury LG, Champion HR, Wade C, Bellamy RF. Understanding combat casualty care statistics. *J Trauma*. 2006;60:397–401.
18. Belmont PJ Jr, McCriskin BJ, Sieg RN, Burks R, Schoenfeld AJ. Combat wounds in Iraq and Afghanistan from 2005 to 2009. *J Trauma Acute Care Surg*. 2012;73:3–12.
19. Smith ER, Sarani B, Bobko J, Shapiro G, McKay S, Anderson K, Callaway D. Building community resilience to dynamic mass casualty incidents: a multi-agency white paper in support of the first care provider. *J Trauma Acute Care Surg*. 2016. epub 2016 Jan 21.
20. Callaway DW, Smith ER, Cain J, Shapiro G, Burnett WT, McKay SD, Mabry R. Tactical emergency casualty care (TECC): guidelines for the provision of prehospital trauma care in high threat environments. *J Spec Oper Med*. 2011;11:104–122.
21. Committee for Tactical Emergency Casualty Care, FirstCareProvider.org, The Koshka Foundation for Safe Schools. Building Community Resilience to Dynamic Mass Casualty Incidents: A MultiAgency White Paper in Support of The First Care Provider. Available at: http://www.c-tecc.org/images/content/Joint_FCP_White_Paper.pdf. Accessed October 1, 2015.

EDITORIAL CRITIQUE

"Our thoughts and prayers are NOT enough" –President Obama on Roseburg, Oregon mass killing

Columbine, Fort Hood, Lafayette, Roseburg, Tucson, Newtown. These names that would previously have sounded like a simple travelogue now instantly provoke images of senseless gun violence with multiple fatalities, or the unfortunately familiar new term of "active shooter" events. As of October, 2015, the United States was averaging more than 1 multiple shooting incident per day for the year, and exponentially more firearm deaths that didn't meet the strict definitions for a mass shooting event.

In this edition of the journal, Dr. Smith and colleagues have contributed an incredibly important and highly unique analysis of the injury patterns and causes of deaths among fatalities from active shooter events. In contrast to similar military studies, they found that these deaths were not due to extremity or junctional hemorrhage, and thus not amenable to interventions like tourniquets or hemostatic dressings. They conclude that civilian preparation and training should also focus on alternative aspects of care, such as airway and breathing management, as outlined by the Tactical Emergency Casualty Care (TECC) program (www.c-tecc.org). This is a particularly important area of discussion, as these findings seem to directly contradict the emphasis on hemorrhage control being promulgated by the Hartford Consensus Conference (HCC) group.

Some of the study limitations are critically important to consider. The analysis included only 15% of public mass shootings during the study period, and should shine a bright light on the problem of inadequate access to this type of critical data. The study only examined fatalities, so little can be concluded without the true denominator of all wounded victims. The fact that deaths were not due to hemorrhage could alternatively indicate the success of early hemorrhage control interventions at preventing deaths, rather than their inapplicability to these scenarios. Finally, it is important to recognize that although these events generate massive media coverage, they represent only a tiny fraction of deaths due to intentional violence and should not be used to implement wide-ranging policy decisions. In my opinion, TECC and HCC are both critical initiatives that complement rather than contradict each other. As with any public health crisis, and despite the politicization of the issues around guns and gun control, this IS a public health crisis and the medical community must be on the front lines of responding. The only way to do this effectively is with informed policy, evidence-based preparation and training, and high-quality effective treatments.

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