

REVIEW OF MASS SHOOTING EVENTS SUPPORTS CURRENT TRAUMA MANAGEMENT GUIDELINES

By Kevin B. Gerold and Mark E. Gibbons

In March 2016, the *Journal of Trauma and Acute Care Surgery* published the results of a research effort that is of particular interest to TEMS providers. The authors of the article reported the findings of their review of autopsy results and/or de-identified wounding data from 139 fatalities associated with 12 civilian public mass shooting (CPMS) events.¹ This review represented 25 percent of all fatalities arising from 15 percent of all CPMS events occurring in the United States between 1983 and 2013.

The authors identified 371 total wounds from handguns, rifles and shotguns. No patients in this study were subjected to explosive blast trauma. Wounds occurred most frequently to the head, chest and back (58 percent). Twenty percent of wounds involved the extremities and 13.5 percent involved

the abdomen. Most fatalities sustained wounds involving more than one anatomic region (56 percent), and the average number of wounds per fatality was 2.7 (range 1-10). Ninety percent of mortal wounds involved the head or chest and 10 percent resulted from multisystem wounds.

The authors were unable to identify any fatal wounds arising from exsanguinating extremity hemorrhage. During their review, the investigators identified only nine of the 125 fatalities (7 percent) that they believed might have sustained potentially survivable wounds inflicted by handguns or shotguns. Eighty-nine percent of these wounds involved a chest wound. None of the rifle-inflicted wounds was deemed as potentially survivable. In their analysis, the authors hypothesized that these casualties may have succumbed to

reversible airway obstruction, ventilator failure or tension pneumothorax, but they do not provide specific findings to support their conclusion.

This research challenges an assumption that wounding patterns during CPMS events would be similar to patterns seen in combat-associated wounding, where extremity hemorrhage is more common. Based on this review, they discount this belief and conclude that exsanguinating extremity hemorrhage was uncommon in civilian wounding.

From their conclusion, the authors suggest that civilian-based medical training for active shooter events should place less emphasis on exsanguinating extremity hemorrhage control in favor of other causes of potentially preventable death, such as correcting acute

airway obstruction and correcting acute respiratory insufficiency.

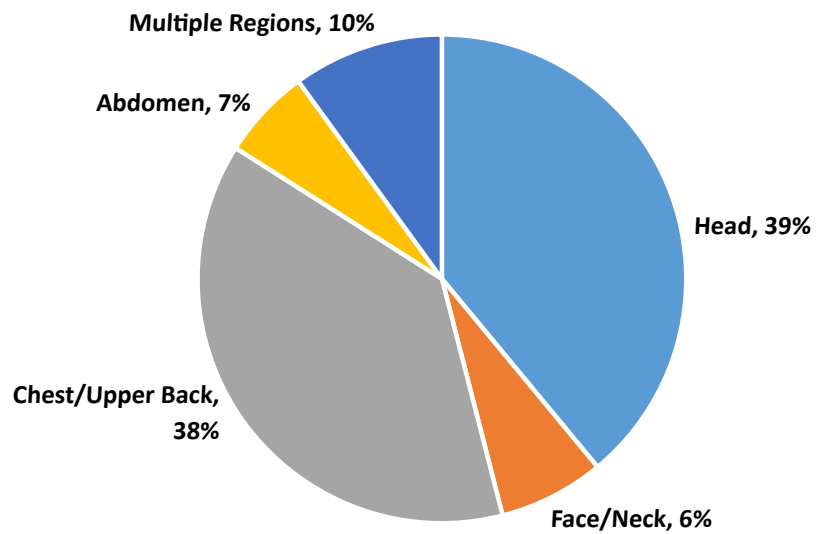
While the authors acknowledge that autopsy data and the absence of wounding patterns among survivors limit what conclusions can be made about the incidence of potentially survivable wounds and the effectiveness of immediate medical interventions, there are several important issues raised by this research.

First, the authors should be commended for their important contribution to our understanding of the wounding patterns associated with CPMS incidents. Their findings highlight the lethality of guns when used inappropriately in the hands of someone intent on mass murder and justify the need for additional methods to reduce the mortality currently associated with active shooter events and similar acts of terrorism.

The difficulties the authors experienced when attempting to review casualty data also identifies the need for a national medical database that collects information regarding the wounds inflicted and care provided to casualties of these incidents. Such a database would enable medical and law enforcement disciplines to make informed determinations on how best to prepare for and treat the wounds associated with these tragic events in an effort to save the lives of those who sustain potentially survivable wounds. The value of such a database has already been demonstrated by the military's Joint Theater Trauma System, which follows the care provided to our combat wounded from the battlefield through the echelons of care and recovery.

Second, this research demonstrates clearly that the wounding patterns associated with CPMS incidents differ from those associated with combat. The military's Committee of Tactical Combat Casualty Care (Co-TCCC) continues

Figure 1: Distribution of fatal wounds by anatomic location (n=115)



to develop best practices intended for treating combat-associated casualties and remains a valuable source of information on how best to advance civilian trauma systems. However, there remains an ongoing need for translating that experience for use by civilian medical practitioners.

The National Tactical Officers Association's TEMS Section, the Committee for Tactical Emergency Casualty Care (C-TECC), the Special Operations Medical Association (SOMA) TEMS Section, the American College of Surgeons' Hartford Consensus and others continue their translational work to determine the best strategies to develop an effective civilian trauma care system that is capable of responding to mass shooting incidents.

Third, while the authors were unable to identify any fatalities sustaining exsanguinating extremity wounds, it is beyond the scope of the data to conclude that these types of wounds should be de-emphasized in training for civilian mass shooting events. The incidence of these types of wounds does not change their cause of early mortality due to hy-

povolemic shock; immediate control of exsanguinating hemorrhage must remain the first priority of first care responders.

Finally, the absence of findings identifying fatalities who would have survived their injuries had first responders acted differently, or if medical care were rendered in a timelier manner, suggests that our current medical response is effectively saving casualties with life-threatening wounds. This is not to suggest that we should abandon opportunities for improvement through experience, research, improved training and the implementation of more effective medical interventions.

Providing the proper medical training and equipment to our initial first responders and implementing medical response models that can rapidly provide care should remain a high priority to save casualties who would otherwise die or become permanently disabled from potentially survivable wounds. The evolution of our current responses to CPMS events should be evidence-based on research, and capitalize on the lessons learned from treating combat and civilian casualties.

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ENDNOTE

1. Smith, Edward Reed, Geoff Shapiro, and Babak Sarani. "The Profile of Wounding in Civilian Public Mass Shooting Fatalities." *Journal of Trauma and Acute Care Surgery* 81, no. 1 (2016): 86-92.

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