MedicalXpress

Philadelphia hospitals responded to equivalent of 54 mass shooting-type events in 11 years

April 11 2019

High-profile mass shootings involving three, four or more victims killed in a single incident receive extensive attention from media, policy makers and the general public. However, these traditionally defined mass shootings make up a small fraction of gun deaths in the United States. More commonly, firearm-injured patients (FIPs) present to trauma centers as a single victim or in clusters of multiple casualties, which do not achieve the definition of a mass shooting or a mass casualty incident (MCI). An MCI involves a high number of injured patients and overwhelms the resources of the local trauma center and/or regional trauma system. The impact of clusters of patients from multiple shooting incidents arriving to the same hospital can be significant, even though they are not regarded as "mass shooting" events.

A research team led by Jessica H. Beard, MD, MPH, Assistant Professor of Surgery in the Division of Trauma & Surgical Critical Care at the Lewis Katz School of Medicine at Temple University (LKSOM), set out to calculate the number and analyze trends in the rates of FIPs transported at clustered time intervals to Philadelphia-area hospitals over an 11-year period. They also examined FIP demographics and mortality, time of day of FIP transport and level of treating trauma center over the same study period, comparing these characteristics between FIP clusters and the overall FIP population. The results of their research were published online April 10 by the *Journal of the American College of Surgeons*.

"This is the first study that has examined the rate at which firearm-injured patients present in clusters in an urban trauma system," said Dr. Beard, who is also corresponding and first author on the study. "From a trauma system perspective, it is important to document and monitor the frequency and magnitude of clustered arrivals of FIPs. With a better understanding of the burden FIP clusters have on our hospitals and trauma systems, improved resource allocation and management plans for multiple patient scenarios can be developed to avoid MCIs."

The research team used data from the Philadelphia Police Department, the most comprehensive source of city-level firearm injury data available in Philadelphia. All FIPs transported to 18 Philadelphia-area Level I trauma, Level II trauma or non-trauma center hospitals from January 1, 2005 to December 31, 2015 were included in the study. FIPs with missing data on shooting time and/or hospital destination were excluded. The team defined a FIP cluster as the arrival of more than one firearm-injured patient within 15 minutes of another to the same hospital. For purposes of this study, the group used rolling temporal windows, meaning the time window began again with each case. So, if one FIP arrived at 7:01 pm, another at 7:08pm and another at 7:17 pm, it was counted as one cluster.

Among the team's findings for FIPs arriving in clusters within 15 minutes of each other to the same hospital:

- There were 14,217 FIPs included in the study over the 11-year period.
- Clustered FIPs were more likely to be female and present at night than the overall FIP population.
- FIPs presenting in clusters were less likely to die and less likely to present at Level II or non-trauma centers than the general FIP population.
- Patient age and race were similar between FIPs arriving in

clusters of 2 or more within 15 minutes and the overall FIP population.

- Overall, 22.1% of FIPs arrived in 1,416 clusters of 2 or more patients.
- The majority of cluster events occurred when 2 FIPs arrived within 15 minutes of each other.
- There were 244 clusters of 3 or more FIPs, 54 clusters of 4 or more FIPs, 3 clusters of 6 or more FIPs and 1 cluster of 7 FIPs.
- 3 Philadelphia Level I trauma centers treated 77.8% of the entire FIP population and these same three centers saw the highest number of clustered FIPs as well, treating 83.3 of clusters of 2 or more and 85.2% of clusters of 4 or more.
- All high volume clusters of 6 or more FIPs were treated at a single Level I Trauma Center.

"We found that there were 54 events when 4 or more FIPs presented to the same hospital within 15 minutes. Over an 11-year period, this amounts to a mass shooting-type event (involving 4 or more victims) occurring every two to three months in the Philadelphia area alone," added Dr. Beard. "FIP clusters can cause trauma systems stress with still unclear effects on patient outcomes, but they are not widely recognized within the traditional framework of 'mass shootings' by media or policy makers. However, for hospitals that treat the injured, it is likely that the number of FIPs, the time between arrivals and the injury severity determine the level of system burden regardless of whether the event in which they occurred was a single event that meets the traditional definition of 'mass shooting.'"

The team's findings further highlight that a significant portion of firearm injury disease burden, even for high casualty incidents, lies in urban centers with high rates of neighborhood gun violence. "Prevention efforts should be focused on these populations and places going forward," said Dr. Beard. "Timely transport to the nearest trauma center

is necessary to optimize survival. Going forward, trauma centers should make an effort to collect data on FIP cluster rates and monitor outcomes on a local and national level."

More information: Jessica H. Beard et al, Clustered Arrivals of Firearm-Injured Patients in an Urban Trauma System: A Silent Epidemic, *Journal of the American College of Surgeons* (2019). DOI: 10.1016/j.jamcollsurg.2019.03.020

Provided by Temple University