Physicians on the Frontlines: Understanding the Lived Experience of Physicians Working in Communities That Experienced a Mass Casualty Shooting

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I. Introduction

A subset of the firearm violence epidemic in the United States are public mass casualty shootings.[1] The number of public mass casualty shootings — generally defined as "incidents occurring in relatively public places, involving four or more deaths ... and gunmen who select victims somewhat indiscriminately"[2] — has increased every year for the last five years.[3]

In response, the medical community has published an increasing number of studies analyzing the epidemic.[4] In November 2018, the National Rifle Association (NRA) tweeted that "someone should tell self-important anti-gun doctors to stay in their lane."[5] More than 21,000 twitter users, consisting largely of members of the medical community, responded, sharing their experiences treating victims of firearm injury and dealing with the grief and despair of those victims' family members.[6]

This online movement highlighted an important consequence of mass shootings that had previously received minimal attention. Multiple studies demonstrate that there are long-term consequences of mass casualty events on communities, victims and first responders.[7] Studies around firearm injury also highlight the unique and devastating effect that it can have on communities and victims.[8] However, few studies have looked at the specific phenomenon of mass casualty shootings (versus other types of shootings such as interpersonal violence or unintentional) and these events' effect on communities.[9] Even less is known about the lived experience of physicians tasked with treating the victims of mass casualty shootings. Filling this knowledge gap will allow institutions and policymakers to better identify and proactively support psychological sequelae commonly experienced by physicians providing care during these events.

II. Methods

A. Study Design

We performed a qualitative study that sought to understand the lived experiences of physicians who worked at hospitals that had a public mass casualty shooting. Our study protocol was approved by the Yale University Institutional Review Board.

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B. Sample Selection and Recruitment

Eligible participants were physicians who worked at hospitals located in communities that experienced a public mass casualty shooting, as defined by the Congressional Research Service.[10] All major public mass casualty shootings with significant media attention that occurred between 2012 and 2018 were included. Initial study participants were recruited via emails sent to professional listservs as well as advertised on the social media platform, Twitter. Eligible participants contacted the investigators to set up an interview. After the first few interviews, we used the snowball sampling technique to recruit additional participants by referrals from previously enrolled participants.[11] Our team concluded that we had thematic saturation (the point at which no new codes are being generated) after twelve interviews; we then completed five more interviews to confirm saturation.

C. Data Collection

We conducted semi-structured one-on-one interviews of eligible participants by telephone. The interview guide was created by the authors and circulated for edits among content experts. The guide was intentionally broad to accommodate the grounded theory approach. Verbal consent was obtained. Each participant was informed that their interviews would be audio recorded and transcribed with the removal of any identifying information. Participants were not compensated for their involvement.

Figure 1

Interview Guide

Interview guide

Basic information

- Ask a quick verbal survey
  - How old are you?
  - What is your sex?
  - What type of training have you had? (ie: nurse, doctor, specialty training)
  - How many years have you been in practice?

Experiences with a mass casualty shooting

- Tell me about your experience the day the mass casualty shooting occurred
- Were you on service when it happened? If you weren't on service, where were you when you found out?
- How did the hospital react? What preparations were made/systems in place to deal with that event?
- How did your colleagues react?
- What did you do?

Response to a mass casualty shooting

- How did your community react to the mass casualty shooting?
  - How did the hospital react?
  - How did the nation react?
  - How did the media react?
- How has the experience of a mass casualty shooting affected your colleagues or the people you work with?
- How has your experience with a mass casualty shooting affected your work?
- How has your experience with a mass casualty shooting affected you personally?
- What structures/supports were in place to help providers deal with trauma of that experience?
  - What did you find helpful, if anything?
  - What, if anything, made the aftermath more difficult for you?
- What would you like to see put in place to help providers on the frontlines deal with the trauma of a mass casualty shootings?

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Four authors conducted interviews from January to May 2020. The interviews consisted of broad, open-ended questions using a grounded theory approach. *See* Figure 1, *infra*. All interviews were audio recorded. Interviews began with basic demographic questions including age, sex, type of training, and years of practice. Questions then addressed the participant's experience during the event. The final set of questions involved the response to the event. These questions addressed the participant's personal reactions and how the reactions of the hospital, community, and nation at large affected their experiences.

D. Data Analysis

Audio recordings were professionally transcribed. The transcriptions underwent review by the investigators with the audio recording to ensure accuracy of the data. The coding team consisted of an emergency medicine physician and a general surgery resident as the primary coders. Two medical students also participated in the development of the code book and themes as a part of the coding team. We used the constant comparative method of qualitative analysis to develop codes and themes.[12] The primary coders first read through transcripts and catalogued the transcript data by assigning conceptual codes to different sections. The entire coding committee reviewed these codes at multiple coding meetings, discussing the meaning of the codes and how they relate to each other. We then created a hierarchy of codes, grouping them into themes. These themes, with the subgroups of codes became the codebook for the study. This process was organized on Dedoose Version 8.0.35, a web-based qualitative research software.[13]

Table 1

Sample Characteristics

Variable	Mean (range) or Frequency
Age, years	48 (29-68)
Number of years in practice	14 (0-34)
Years since mass casualty shooting	3.9 (2-8)
Gender, Female	53% (9/17)
Type of training	
Emergency Medicine	35% (6/17)
Pediatrics	6% (1/17)
Psychiatry	24% (4/17)
Trauma Surgery	35% (6/17)

III. Results

A. Sample

A total of 17 participants with training in emergency medicine, trauma surgery, pediatrics and psychiatry were interviewed. Participant demographics including age, sex, gender, and years of practice are displayed in Table 1, *infra*. The mean age of participants was 48 years old, and over half were female (53%; 9/17). The mean number of years of practice was 14. Trauma surgery and emergency medicine were the most represented specialties at 35% (6/17) each. The participants came from eight different communities that experienced a mass casualty shooting. Each community was represented by 2-3 participants on average with three incidents being represented by one

Table 2

Description of Mass Casualty Shooting Incidents

Location	Date	Number Killed	Number Injured	Type of weapon
Pittsburgh, PA	March 8, 2012	2	7	Semi-automatic handgun
Aurora, CO	July 20, 2012	12	70	Semi-automatic rifle
Sandy Hook, CT	December 14, 2012	26	0	Semi-automatic rifle
Charleston, NC	June 17, 2015	9	0	Handgun
San Bernardino, CA	December 2, 2015	14	22	Semi-automatic rifle
Orlando, FL	June 12, 2016	49	53	Semi-automatic rifle
Las Vegas, NV	October 1st, 2017	58	413	Semi-automatic rifle (modified to shoot like an automatic weapon with a bump fire stock)
Pittsburgh, PA	October 27, 2018	11	6	Semi-automatic rifle and handguns

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participant. Some participants had experienced more than one mass casualty shooting. Each incident in these communities involved significant media attention. The deadliest event occurred in Las Vegas, NV on October 1, 2017, which injured 413 people and killed 58 people. In the majority of events, the shooter used a semi-automatic rifle. Additional descriptions and details of all incidents included in this study can be found in Table 2, *infra*.

B. Themes

In discussing the experiences of physicians working in a community that experienced a mass casualty shooting, four major themes emerged: (1) The psychological toll on physicians: "I wonder if I'm broken"; (2) the importance of and need for mass casualty shooting preparedness: "[We need to] recognize this as a public health concern and train physicians to manage it"; (3) massive media attention: "The media onslaught was unbelievable"; and (4) commitment to advocacy for a public health approach to firearm violence: "I want to do whatever I can to prevent some of these terrible events."

1. THE EMOTIONAL AND PSYCHOLOGICAL IMPACT ON PHYSICIANS

The day of the shooting:

Participants described a variety of strong emotions in both their personal experiences and observations. Reactions to the sheer volume, type of wounds, selfless behavior of the victims, and the pressure on providers to succeed all emerged as themes. One participant described his experience of that day stating:

> I just remember being on the phone with my [spouse] and sobbing and thinking to myself — not saying this to her — but thinking to myself, "Wow, I wonder if I'm broken. [Participant #7]

Many participants described feeling overwhelmed by the sheer volume of patients who were injured by firearms. *See* Figure 2, *infra*. One emotion commonly discussed was horror at the event itself, with a distinct feeling that this type of event was different from anything else they had seen in the past:

> The impact of seeing this number of people — It's not just that they were shot. It goes beyond that … It's the fact that they were victimized in a very insidious, insidiously planned event … I think that's one of the hardest things. [Participant #2]

Participants also noticed a difference in the patients' wounds when compared to their typical practice due to the types of weapons used in the attacks. The nature of the mass casualty shootings and lack of readily available information also led several providers to feel afraid for their own safety. *See* Figure 2, *infra*.

The participants also described a heightened sense of pressure to ensure a good outcome for the victims of the shootings. One participant whose hospital only received one patient from a mass shooting described this feeling:

> I think this situation was really different in the fact that I wanted him so badly to survive. I wanted the one person that got to us to have the chance to live because none of the rest of them did. [Participant #12]

While not every participant described each of these emotions or responses, every single participant described at least one of these reactions to the mass casualty shooting.

Dealing with the aftermath:

Almost all participants described long term psychological consequences in either themselves or colleagues that persisted for many months:

> I know we have colleagues, especially ones who were directly impacted at the shooting, who continue, to this day, to struggle tremendously with the psychological impact of that event. [Participant #9]

The impact of these events was particularly difficult for participants for a variety of reasons. First, participants described how their roles as perceived leaders within the healthcare system hindered processing their emotions in the immediate aftermath:

> As physicians, we are so socialized to be the captains of the ship — to be the leaders — to never let them see you sweat, never let them see you cry. We would not let our guards down in front of the team at all. [Participant #2]

This reaction was compounded by the fact that many physicians continued to care for the victims of the mass shooting for days, weeks and months after the event:

> Grieving a traumatic event, while also caring for others who've been traumatized is actually really, really difficult because it is effectively

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> forced re-traumatization … Being healthcare professionals, we may find ourselves in a position where we are forced to relive the trauma even if we don't want to. [Participant #14]

This forced re-traumatization and compartmentalization, led several physicians to feel the weight of that day even more forcefully than they otherwise would have. *See* Figure 2, *infra*.

Despite these difficulties, participants also described several positive feelings. For many, the outpouring of support locally, as well as from around the country, brought their communities together. *See* Figure 2, *infra*. Several participants discussed the satisfaction they gained from taking care of patients that had been so horrifically injured, especially when they were able to achieve a good outcome:

Figure 2

Theme: Psychological/Emotional Responses (with exemplar quotes)

Theme	Exemplar quote
The day of the shooting	
Intense emotional response	*I just remember being on the phone with my wife and sobbing and thinking to myself — not saying this to her — but thinking to myself, "Wow, I wonder if I'm broken."*
Horror	*The impact of seeing this number of people – It's not just that they were shot. It goes beyond that … It's the fact that they were victimized in a very insidious, insidiously planned event … I think that's one of the hardest things.* *The type of bullets they used are horrific … These are bullet wounds that are just tearing at your flesh. To be seeing those, it was like going into a war zone — very different than the wounds we normally see.*
Disrupted sense of safety	*There was an immediate like, "Are we safe? Is this shooter in one of our hospitals?"*
Overwhelmed	*I mean, we're a busy trauma center. So, you get multiple gunshot wounds in a short period of time. We usually don't see 100 people in a matter of a few hours. The sheer volume was different.*
Pressure for a good outcome	*I think this situation was really different in the fact that I wanted him so badly to survive. I wanted the one person that got to us to have the chance to live because none of the rest of them did.*
Dealing with the Aftermath	
Long-term psychological consequences	*I know we have colleagues, especially ones who were directly impacted at the shooting, who continue, to this day, to struggle tremendously with the psychological impact of that event.*
Compartmentalization	*As physicians, we are so socialized to be the captains of the ship — to be the leaders — to never let them see you sweat, never let them see you cry. We would not let our guards down in front of the team at all.*
Forced re-traumatization	*Grieving a traumatic event, while also caring for others who've been traumatized is actually really, really difficult because it is effectively forced re-traumatization … Being healthcare professionals, we may find ourselves in a position where we are forced to relive the trauma even if we don't want to. I think we have to have a very good plan and find a way to take care of ourselves while we're doing this — whether it is engaging in our own therapy or giving the people who work for us the chance to do that when they need it.*
Pride	*I had worked really hard. I was really happy with the work I did. I was proud. Nobody who had arrived alive, died. I was proud of that.*
Sense of community	*It's always going to be different in every community with every event … But there's a widely distributed, closely connected community of survivors across the country from these events. The people who were carried away or who walked away, who lost loved ones in school shootings, concert shootings, religious place shootings and they connect with each other. God, what a terrible club for anyone to have to join. But, how inspiring to see what they have to teach and how willing they are to engage.*

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> I had worked really hard. I was really happy with the work I did. I was proud. Nobody who had arrived alive, died. I was proud of that. [Participant #5]

2. MASS CASUALTY SHOOTING PREPAREDNESS

Participants expressed the importance of being better prepared for a mass casualty shooting to meet the immediate needs of patients, physicians, and for the aftermath:

> The chances of that happening to you on your shift where you work is pretty small. The chances of it happening to somebody on their shift is almost 100%.... With the increasing frequency, increasing amplitude, I think it would be wise for us to... recognize this as a public health concern and train physicians to manage it. [Participant #3]

Meeting the immediate needs:

Several participants noted that technology in their hospitals was not set up to serve them appropriately during the mass casualty event. *See* Figure 3, *infra*. There were failures in several systems including the electronic medical record, communications and notifications within the hospital, and inadequate and/or inaccurate communications from pre-hospital emergency services. This led providers to devise workarounds that did not always conform to what was normally accepted at their institutions:

> Our internal communication system, our intranet crashed...what still worked was texting each other on our cell phones. We actually had to resort to that, rather than our usual method of communication because it wasn't prepared. [Participant #2]

The volume of injuries caused supply shortages in some instances. Physicians needed to change their clinical management practices to meet the demand, further compounding the stress placed upon physicians. *See* Figure 3, *infra*.

> So, we ran out of chest tubes. So, what do you do? So, we used endotracheal tubes. Is that okay? Is that not okay? ... People I think were reticent, worried, self-paced... You know the right thing to do, but you can't do it. That creates a great deal of post-traumatic stress injury and I think that could be in part alleviated by establishing some crisis standards of care. [Participant #3]

While no physicians expressed about potential liability or malpractice in the moment, a few noted that liability concerns from hospital administration hindered them in speaking openly about the decisions they had to make during the crisis.

This stress was further compounded by a lack of information and abundance of misinformation about the mass casualty shooting from both pre-hospital emergency services as well as the media. This lack of information led some participants to suspect there was an active shooter in the hospital or surrounding area, triggering fear for their own safety. *See* Figure 3, *infra*.

> We just had no idea what was happening and there was a lot of fear for our own safety. The lack of information was really a problem. [Participant #10]

Barriers that normally exist between siloed specialties or professions — such as between the emergency department and inpatient surgery team — broke down as everyone came together to take care of the patients. Without that effort, participants felt that many more lives would have been lost. *See* Figure 3, *infra*.

Addressing the aftermath of a mass casualty shooting:

All participants in this study described at least some long-term psychological effects for either themselves or colleagues, including anxiety, flashbacks, and hypervigilance. The majority expressed concern about the development of post-traumatic stress disorder (PTSD) in the weeks to months following the mass casualty shooting — some continuing to describe symptoms years afterwards. Participants identified a wide array of direct support services available from their institution following the mass casualty shooting, including direct provision of therapy and counseling sessions. But participants from three of the eight incidents reported a complete lack of response or recognition. *See* Figure 3, *infra*. The importance of having organized, readily-available support systems for providers was repeatedly emphasized:

> There has to be a more coordinated, institutional response to go to the people that have been involved in the care... and offer them services. Also, just to explain to them that this is hard... People are going to have some post-acute stress disorder, maybe even some PTSD down the road and to explain that dealing with these things or that after you experience something like this, it is not abnormal to have those feelings. [Participant #12]

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Figure 3

Theme: Mass Casualty Shooting Preparedness (with exemplar quotes)

Theme	Exemplar quote
Meeting the Immediate Needs	
Need for institutional preparation for a mass casualty shooting	*The chances of that happening to you on your shift where you work is pretty small. The chances of it happening to somebody on their shift is almost 100% … With the increasing frequency, increasing amplitude, I think it would be wise for us to … recognize this as a public health concern and train physicians to manage it.*
Failure of technology	*Our internal communication system, our intranet crashed … what still worked was texting each other on our cell phones. We actually had to resort to that, rather than our usual method of communication because it wasn't prepared.* *We couldn't register patients [in the electronic medical record] fast enough … We couldn't then, on the computer, link each patient for orders or imaging.*
Lack of information	*We just had no idea what was happening and there was a lot of fear for our own safety. The lack of information was really a problem.*
Crisis standard of care	*So, we ran out of chest tubes. So, what do you do? So, we used endotracheal tubes. Is that okay? Is that not okay? … People I think were reticent, worried, self-paced … You know the right thing to do, but you can't do it. That creates a great deal of post-traumatic stress injury and I think that could be in part alleviated by establishing some crisis standards of care.* *In a mass casualty situation … the needs exceed the resources and therefore the priority becomes doing the most for the greatest number of people. So, you need to decide who will potentially benefit from your time and your efforts. The people who are [not going to make it], you still evaluate them, you still treat their pain, but you are not going to spend individual significant time with them. There are other people who could be dying in that time that you could really save.*
Teamwork	*I'm going to tell you that night, there was no pushback from anyone. Everyone came to the hospital, everyone worked together, and everyone was on the same page. It was actually phenomenal, and I've never seen something like that before.*
Addressing the aftermath of a mass casualty shooting	
The need for a coordinated, institutional response to address mental health	*There has to be a more coordinated, institutional response to go to the people that have been involved in the care …and offer them services. Also, just to explain to them that this is hard … People are going to have some post-acute stress disorder, maybe even some PTSD down the road and to explain that dealing with these things or that after you experience something like this, it is not abnormal to have those feelings*
Wide variation in the institutional responses to mass casualty shootings	*No one really reached out at all. There wasn't any true, focused intervention, support or anything like that for the actual providers that took care of the patients and were there that night.* *They did opt-out sessions. They scheduled counseling sessions for every provider … and they had the option of opting out of them. But, at least it was scheduled for you. I think that's important because when you're going through the event, you're not going to necessarily take the initiative to make that appointment*
Forgotten trainees	*Since I was a trainee, a resident, we go on about our lives. We work really long hours. Then you are working the next day, then the next day. There isn't a lot of time to really go home and reflect. It's really important for hospital systems and residency programs to truly recognize the importance of including residents and trainees … Residents should not be forgotten because they are on the frontlines, you know? They're the one that don't get much a break afterwards to really reflect and heal.*
Recognition	*The hospital recognized the providers, which I actually thought was really useful in retrospect. Prospectively, I thought that that was dumb– I was just doing my job. But, in retrospect, it changed a little bit about how I view the event. It's something positive that came out of an overall, really hard event… It's a positive outcome of something that's otherwise pretty negative.* *The unsung heroes of the response was actually the medicine service … I think my medicine colleagues felt, at least for some time, that all of the glory was showered upon those on the guts and gore side … The actual making the system work side, they were not recognized at least externally to the hospital … Their contribution was underappreciated by the larger community. But, those of us that understand how the hospital functions could not have done what we did unless they did what they did.*

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Individuals who were trainees at the time of the mass casualty shooting were identified as particularly in need of organizational support. In the words of one participant who was a resident at the time of the event:

> Since I was a trainee, a resident, we go on about our lives. We work really long hours. Then you are working the next day, then the next day. There isn't a lot of time to really go home and reflect. It's really important for hospital systems and residency programs to truly recognize the importance of including residents and trainees … Residents should not be forgotten because they are on the frontlines, you know? They're the ones that don't get much a break afterwards to really reflect and heal. [Participant #12]

Community and hospital recognition of providers' work was identified by some as an important source of healing. *See* Figure 3, *infra*. However, the unequal distribution of that recognition also caused some stress:

> "The unsung heroes of the response were actually the medicine service … I think my medicine colleagues felt, at least for some time, that all of the glory was showered upon those on the guts and gore side … The actual making the system work side, they were not recognized at least externally to the hospital … Their contribution was underappreciated by the larger community. But, those of us that understand how the hospital functions could not have done what we did unless they did what they did." [Participant #3]

Figure 4

Themes: The Media and #thisismylane (with exemplar quotes)

Theme	Exemplar quote
Massive media attention	
Engaging with the media during the event	*The media onslaught was unbelievable during our incident. How are you going to manage those and who is going to manage those? We have a media relations department that did a very, very good job. The onslaught of media attention is extremely stressful to deal with. How do you manage the gracious VIPs and politicians and actors and actresses that want to come to your hospital to express their sympathy, managing all of that? How your security manages that is all part of the post incident phase. I think that we didn't realize how important that was until we had to go through it.*
Sensationalism in the media	*The media response after the *** shooting was horrid. It was the worst of the worst of predatory media stuff combined with all the stuff we know not to do with media coverage of violent events. If there's a rule, they broke it … Not one mention of the heroic survivors and first responders and the stories of the lives lost, just [descriptions of] how they died and glorifying the assailants … So, we've systematically and strategically been working with all of our media partners locally and as best as we can nationally about best practices. After these terrible events, please don't fill [the time] with some dumbass who doesn't know what they're talking about. We will give you real subject matter experts. Please don't speculate about motives and causes.*
The need for a public health approach to firearm violence	
Leadership from medical professionals	*I want to do whatever I can to prevent some of these terrible events. So, that's a lot of what I do now. I write, I publish, I teach around threat management and violence prevention. I'm involved in state level activities and it's built over the years.*
Change in attitude towards firearms	*Having been a military guy and a country guy, I'm comfortable with [firearm] use. I will tell you, for me, my personal thoughts on weapons changed quite a bit as a result of this… It really changed my mind in terms of the idea of my personal enjoyment with weapons. I haven't shot any of my weapons since that event and I don't have the desire to… I also feel very strongly about the Dickey Amendment and that we really must take a public health approach to firearms and firearm violence.*
"Regular" firearm violence	*Mass shootings are horrific and garner a lot of psychological attention from the media and from the communities, but the day-to-day cold gun violence in our communities, and the community I work in, is staggering.*

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3. MASSIVE MEDIA ATTENTION

All of these incidents were accompanied by a massive amount of media coverage. Many of the interview participants were asked by their departments to interact with the national news media. Participants described the logistical difficulties of dealing with media attention in the midst of an ongoing crisis. *See* Figure 4, *infra*.

> The media onslaught was unbelievable during our incident. How are you going to manage those and who is going to manage those? We have a media relations department that did a very, very good job. The onslaught of media attention is extremely stressful to deal with … Managing all of that — how your security manages that — is all part of the post-incident phase. I think that we didn't realize how important that was until we had to go through it. [Participant #4]

Some, but not all, participants also expressed frustration with sensationalized and inaccurate information that was disseminated by the media, including descriptions of how people died. One participant even described how that experience inspired him to engage the local and national media in responsible reporting following a violent event. *See* Figure 4, *infra*.

4. COMMITMENT TO ADVOCACY FOR A PUBLIC HEALTH APPROACH TO FIREARM INJURY

One physician who owned firearms for recreational use, discussed the change in their attitude towards firearms after treating patients that were victims of a mass casualty shooting:

> I'm comfortable with [firearm] use. I will tell you, for me, my personal thoughts on weapons changed quite a bit as a result of this… It really changed my mind in terms of the idea of my personal enjoyment with weapons. I haven't shot any of my weapons since that event and I don't have the desire to. [Participant #3]

While not all participants decided to engage in advocacy, every physician we spoke with agreed that it is appropriate or even necessary for healthcare professionals to have a voice in the firearm violence debate. In addition to expressing frustration with the current political discourse around firearm injury, several participants saw the unique perspective of physicians as crucial for creating policy change surrounding firearm injury prevention:

> I want to do whatever I can to prevent some of these terrible events. So, that's a lot of what I do now. I write, I publish, I teach around threat management and violence prevention. I'm involved in state level activities and it's built over the years. [Participant #9]

This study suggests that physicians experience significant psychological symptoms from working during a public mass casualty shooting. Based on our findings, we propose that that these psychological sequelae could be mitigated with coordinated systematic plans from institutions for psychological support in the aftermath of a mass casualty event, improved guidelines and training in mass casualty events for health care providers, improved sensitivity and ethical standards from the media, and institutional support for healthcare providers engaged in firearm violence prevention work. Finally, more research needs to be done to better understand the psychological impact of these events on healthcare providers.

IV. Discussion

In this qualitative study of seventeen physicians across five medical specialties working in eight different communities that experienced a public mass casualty shooting, four major themes emerged: (1) the intense psychological toll on providers, (2) the importance of and need for mass casualty shooting preparedness, (3) the onslaught of media attention, and (4) the commitment to a public health approach to firearm injury. These four themes have important implications for

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healthcare institutions, medical professionals, and policymakers.

This study suggests that physicians experience significant psychological symptoms from working during a public mass casualty shooting. Based on our findings, we propose that that these psychological sequelae could be mitigated with coordinated systematic plans from institutions for psychological support in the aftermath of a mass casualty event, improved guidelines and training in mass casualty events for health care providers, improved sensitivity and ethical standards from the media, and institutional support for healthcare providers engaged in firearm violence prevention work. Finally, more research needs to be done to better understand the psychological impact of these events on healthcare providers.

Very little research quantitatively describes the impact of these events on healthcare providers' mental health and resiliency. To our knowledge, the only study of physician mental health following a mass casualty shooting was a study of thirty-one general surgery residents working in Orlando, FL on June 12, 2016, during the Pulse nightclub shooting.[14] The authors found a high prevalence of post-traumatic stress disorder (PTSD) and major depression that did not resolve over time, representing a large emotional toll upon healthcare providers involved in mass casualty shootings. Although our study did not formally screen for any psychiatric disorders, the vast majority of participants in our study expressed concern for or knowledge of development of acute stress disorder or PTSD in either themselves or their colleagues. They described institutional responses to mental health concerns that ranged from nothing, to individualized formal psychotherapy. Institutions may consider implementing protocols to address acute and long-term psychological sequelae after a mass casualty shooting, particularly for trainees. Future research is needed to better understand the psychological impact of these events, its relationship to mental illness and burnout among physicians.

Our findings are consistent with prior literature that details the need for improved guidelines and training in mass casualty shooting events for healthcare providers.[15] Participants expressed stress and uncertainty about whether the clinical decisions they made in response to the overwhelming demand for services were the right ones. Those participants with training in the military or prior work on mass casualty events were more comfortable with their clinical decision making and felt less stressed about their response after the fact. Development of guidelines that delineate "crisis standards of care" along with formal training and/or simulation in preparation for a mass casualty event may be beneficial.

Resource limitations, difficult triage decisions, and the need for rapid communication in emergency situations all raised concerns for providers. Multiple participants described resorting to texting on cellphones for rapid communication during the mass casualty event, which is not compliant with the Health Insurance Portability and Accountability Act (HIPAA). While the Department of Health and Human Services (HHS) has discretionary authority to modify enforcement of HIPAA violations (as it did recently to promote the use of telehealth during the COVID pandemic),[16] they have not released general guidance on the use of texting during emergencies. Hospital systems concerned about HIPAA compliance during emergencies should incorporate a Privacy and Security Rule-compliant rapid communication network into their institutional policy. Institutions, hospitals and professional societies should work alongside policymakers to ensure that the technology regularly used in hospitals is prepared to encounter a mass casualty shooting.

Further, although many states and the federal government have taken steps to limit liability for ordinary negligence in emergencies, legal protections are patchwork and full immunity from liability is often not guaranteed.[17] Medical negligence claims typically hold providers to a "reasonable" standard — meaning that a court will ask what a "reasonable" provider in the same scenario would have done. Often, demonstration that a provider followed emergency protocols for triage decision-making and resource allocation is sufficient to show reasonableness.[18] While none of our participants reported that any medical liability claims were filed in these incidents, some expressed concern for the potential for medical liability. In the absence of an agreed upon "crisis standard of care" for the extraordinary circumstances encountered in a mass casualty shooting, the courts would be left without clear guidance on adjudication of medical liability claims. This underscores the need for the development of guidelines for "crisis standards of care."

Direct interaction with and passive consumption of the media surrounding a mass casualty shooting was a central component of the lived experience for providers. Inaccurate and sensationalized reporting negatively impacted our participants by contributing to psychological suffering. The deleterious effects of misinformation and sensationalism during mass casualty shootings has been highlighted in prior publications, with specific recommendations for journalists and media outlets.[19] Our work underscores the critical need for a change in reporting tactics from various

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media outlets to ensure ethical and accurate journalism during any mass casualty shooting.

Without prompting, multiple participants described how their experience led them to recognize the need for a paradigm shift in the firearm injury debate that focuses on preventing firearm injuries through proven public health strategies. As there has been a vacuum of effective leadership on this issue, medical professionals including physicians are increasingly taking the lead in crafting and promoting these public health policies as well as devising studies to better inform policymakers in the future.[20]

Limitations

There are limitations in this study. As with all qualitative studies, our findings are hypothesis-generating, and may not be generalizable, although we strove to identify outliers and dissenting opinions. Unique to this study, our participants were temporally removed from their experiences, some by many years. Therefore their recollections were subject to recall bias, though our interviewers were trained to prompt participants for concrete details and specific memories. In addition, their accounts are likely influenced by social desirability bias — the inclination to report answers, behaviors, or attitudes that adhere to social norms.[21] To mitigate this, all interviewers did not have a personal or professional relationship with the participants and all participants were assured of having anonymity. All interviews were conducted over the phone which increases the anonymity of the interview though may impact the way participants responded or understood questions. Finally, this research was conducted using snowball sampling with referral from one physician to another which may have biased the type of participants that were included within the study, in favor of those who may feel more comfortable speaking about their experiences. To mitigate this, we recruited multiple initial "nodes" of snowball sampling to ensure a variety of participants. Finally, our findings may not be transferable to other healthcare professions, such as nurses and pre-hospital providers, who also care for victims of public mass casualty shootings.

V. Conclusion

In this study we identify four themes which characterize the lived experiences of physicians working in communities that experienced a mass casualty shooting. The intense psychological toll imposed upon physicians called to action during an unprecedented tragic event in their communities, the need for mass casualty preparedness in the hospital setting, and complications arising from the relentless media attention were clearly front and center. Finally, the medical professionals in this study expressed hope that future firearm injury could be prevented. They believed that healthcare professionals are uniquely positioned to promote and devise public health strategies to curb firearm injury and hopefully prevent the next mass casualty shooting.

Note

The authors do not have any conflicts of interest to disclose.

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