

Beirut Port Blast 2020: New Lessons Learned in Mass Casualty Incident Management in the Emergency Department

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ABSTRACT

Background: On August 4, 2020, Lebanon suffered its largest mass casualty incident (MCI) to date: the Beirut Port blast. Hospital emergency response to MCIs is particularly challenging in low- and middle-income countries, where emergency medical services are not well developed and where hospitals have to rapidly scale up capacity to receive large influxes of casualties. This article describes the American University of Beirut Medical Center (AUBMC) response to the Beirut Port blast and outlines the lessons learned.

Discussion: The Beirut Port blast reinforced the importance of proper preparedness and flexibility in managing an MCI. Effective elements of AUBMC's MCI plan included geographic-based activation criteria, along with use of Wi-Fi messaging systems for timely notification of disaster teams. Crowd control through planned facility closures allowed medical teams to focus on patient care. Pre-identified surge areas with prepared disaster cart deployment allowed the teams to scale up quickly. Several challenges were identified related to electronic medical records (EMRs), including patient registration, staff training on EMR disaster modules, and cumbersome EMR admission process workflows. Finally, this experience highlights the importance of psychological debriefs after MCIs.

Conclusions: Hospital MCI preparedness plans can integrate several strategies that are effective in quickly scaling up capacity to respond to large MCIs. These are especially necessary in countries that lack coordinated prehospital systems.

Keywords: emergency planning; emergency response; mass casualty incident; disaster planning; emergency department; mass casualty management; beirut blast

INTRODUCTION

For the past 40 years, Lebanese hospitals have developed extensive experience in their response to mass casualty incidents (MCIs). These included traditional wars, explosions, car bombs, air raids, militia battles, and street riots. On August 4, 2020, Lebanon suffered its largest MCI to date, the Beirut Port blast. At 6:07 pm on that day, amidst the COVID-19 pandemic, a large amount

of ammonium nitrate stored at the port of the city exploded, leaving approximately 230 people dead, 6500 people injured, and 300,000 homeless, in addition to billions of U.S. dollars in property damage.^{1,2} Lebanese hospitals have built their individualized response plans amidst challenges common in low and middle-income countries. There is no national or regional authority overseeing MCI response. Prehospital care is provided by multiple agencies reporting to various authorities separately. Patient transport is often via private vehicle, leaving the hospitals closest to the MCIs shouldering the response burden. Finally, resource constraints are a common challenge.³ Our medical center, the American University of Beirut Medical Center

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(AUBMC), located in the heart of Beirut, has, in the past 15 years alone, responded to more than 15 MCIs, through a response plan that is continually updated based on drills and live activations and is designed to accommodate up to 200 casualties.^{4,5} However, after the Beirut Port explosion, we received more than 360 victims in a 3-h period, including 87 admissions (19 critical care cases, 16 who were operated on immediately, and 52 regular-bed admissions) and 12 deaths. Although many elements of our previously described plan allowed us to effectively provide for all those who presented to our emergency department (ED), the scale of this MCI also left us with new lessons to consider.^{4,5}

DISCUSSION

The 2020 Beirut Port blast reinforced the importance of relativity in defining an MCI. MCI response is required when the surge in patient numbers overpowers available resources and personnel. On that day, we began receiving casualties from within the hospital premises and its direct vicinity less than 3 min after the detonation, as a result of its proximity to the site of explosion.

Effective Features

Activation

Essential to facing the influx effectively was the ability to promptly activate our internal alert to quickly mobilize resources and personnel. At AUBMC, this is triggered at the level of the ED based on geographic location of the MCI and expected casualty counts.⁴ Removing the previously required chains of approval for activation allowed us to successfully activate the MCI within 17 min of the explosion. The activation message is sent through redundant systems, including short message service (SMS), beeper paging, and Wi-Fi (WhatsApp; Meta) messaging of prepared disaster

lists. Consistent with prior experience, infrastructure damage and overload of landlines and telephone networks caused delays in SMS delivery; however, the Wi-Fi alerts were received immediately. This promptly activated additional predesignated staff to our ED in addition to all downstream actions related to activation, including security lockdown, deployment of emergency carts, opening of surge capacity, initiation of disaster triage protocol, and disaster registration and documentation modules.

Crowd control

Critical to handling the influx of patients was our effective external crowd control, which has historically been a recurring challenge.^{4,5} As per our MCI plan, security personnel immediately closed all ED entrances except for one (i.e., ambulance entrance).^{4,5} The recent addition of industrial steel bars with security reinforcements allowed restricted entry for casualties and a single companion when deemed necessary. This allowed staff to focus on patient care, prevented previously experienced assaults by emotional visitors, and ensured patient and staff safety amidst the rising community spread of COVID-19.

Triage and surge capacity

Finally, the most effective element of our response was our ability to quickly expand our physical space to designated “surge areas.” Patient triage immediately shifted from emergency severity scoring to the modified care-flight system with direction of noncritical volume to predesignated surge areas where teams and prepared supply carts were mobilized. The ritualization of expanding capacity from past experience, however, allowed us to promptly identify two additional surge areas for the walking wounded beyond what was originally identified in the existing emergency response plan. In

addition, on-the-ground decisions led to leveraging additional areas, including the interventional radiology and surgical recovery rooms, as critical care areas for patients who required critical care and stabilization.

Lessons Learned

Patient registration and electronic medical records

Patient registration, a key element of any successful MCI response, was one of the biggest challenges. Our recent implementation of the EPIC electronic medical record (EMR) system had shifted our plan from relying on prepared manual charts toward electronically preregistered mass casualty numbers that required bar-code scanning for activation. This, along with the recent dismissal of registration staff in response to COVID-19-related financial challenges, compromised our planned MCI registration process.

Calling in the registration staff delayed the first registration by 43 min, which resulted in loss of records for patients who were discharged, as well as delays in requesting and executing orders, tests, and interventions. In addition, our plan had only 200 prepared e-records, which were quickly exceeded. Use of down-time manual charts required real-time printing that was logistically nonworkable. This was ultimately circumvented with assigning manual record keepers (companions and students) for each patient; each remained with 1 patient for the duration of their ED time. Therefore, MCI plans in places with EMRs required large numbers of prepared e-charts, extensive training of registration staff on disaster registration modules, surge plans for registration staff, and preprinted back-up manual charts as another level of system redundancy. Furthermore, volunteers may be used as surrogate

companions and designated record keepers.

Crisis standards of care

Although crisis standards of care for patients arriving in cardiac arrest were a standard part of our response in the past, this MCI was the first time our teams had to shift to different standards for low-acuity patients. For example, the massive influx of patients with lacerations from broken glass quickly shifted our goal from routine imaging prior to repair to hemorrhage control, wound care, and instructions for return for definitive care the following day. In spite of this, lines of patients waiting in front of our plain radiography suite and three CT scanners continued to grow over the first 3 h. Accordingly, these patients had to be reassessed repeatedly while in line to prioritize evolving urgencies. This experience highlighted the need to better train on crisis standards of care, trigger points for activation, and processes for clear follow-up of patients who are sent home to return for delayed management after initial assessment and stabilization.

Hospital admission processes

Throughput was an additional challenge that emerged with the scale and complexity of cases seen. Within 3 h, 87 patients in our 40-bed ED were awaiting admission, bringing the ED to a gridlock of stretchers. This overwhelmed the admitting and clinical staff, with no time to place admission requests that required extensive information. This was overcome by manually matching admissions to open beds in inpatient units where the medical, surgical, and pediatric teams were launched to receive, reassess, and complete the management of the stabilized patients. This highlighted the need for a more facilitated electronic admission request process during MCI, one that bypasses the lengthy

requirements and financial clearances of routine electronic admission workflows.

Communication

Furthermore, pressure on the hospital to release patient names mounted, with dozens of family members looking for missing loved ones. This posed a security threat with crowds at ED doors threatening to break through the entrance. Eventually, this was addressed by assigning a team to collect names and release them to the public. Communication officers can play an important role in messages to the community to allow space for medical teams to focus on clinical care while registration staff catch up with identifying the casualties.

Debriefing

Previous MCIs have highlighted the importance of both technical and psychological debriefs post-MCI response.^{6,7} Given the direct impact of the blast on AUBMC responders and the move to crisis standards of care, the leadership team opted to prioritize psychological debriefs and delay the traditionally held technical debriefs. A series of debriefs were held within 72 h with faculty, residents, and nursing teams. These were led by the department chair after extensive discussion with experts in psychology and psychiatry, leaning on principles outlined in the MCI CORD Survival Package, including focusing on emotional impact and mutual support, directing away from discussion of system failures, offering a “safe space,” and sharing information on professional support services.⁸ Focusing on the emotional impact of decisions made amidst resource constraints was essential to helping responders deal with the feelings of self doubt that came with resorting to crisis standards of care and recognizing remorse as a normal response to abnormal events. Technical

debriefs that tackled analyzing the effectiveness of the different elements of the response and identifying areas for improvement were subsequently carried out 1 month after the incident.

CONCLUSIONS

What was witnessed at AUBMC fails to convey the magnitude of this tragedy and the distress experienced by the rest of the city, its people, and its hospitals. Two tertiary care centers and two hospitals were incapacitated after being directly damaged by the blast, resulting in five staff deaths and three hospital evacuations. This emphasizes the need for a centralized national command center to coordinate transfers between facilities, as well as well-structured hospital MCI preparedness plans that can ramp up capacity quickly and effectively.

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