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Corresponding author:
Mariana Helou,
Email: mariana.helou@lau.edu.lb

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Beirut Explosion: The Largest Non-Nuclear Blast in History

Mariana Helou MD, MScDM[1], Mahmoud El-Hussein MD[1], Kurtulus Aciksari MD[2], Flavio Salio MSc[3], Francesco Della Corte MD[4], Johan von Schreeb MD, PhD[5] and Luca Ragazzoni MD, PhD[4]

[1]Department of Emergency Medicine, Lebanese American University Medical Center, Beirut, Lebanon; [2]Department of Emergency Medicine, Istanbul Medeniyet University, Istanbul, Turkey; [3]World Health Organization, Geneva, Switzerland; [4]CRIMEDIM-Research Center in Emergency and Disaster Medicine, Università del Piemonte Orientale, Novara, Italy and [5]Department of Global Public Health, Karolinska Institutet, Stockholm, Sweden

Abstract

A massive explosion have ripped Beirut on August 4, 2020, leaving behind more than 6000 casualties, 800 regular floor admissions, 130 intensive care unit admissions, and over 200 deaths. Buildings were destroyed, hospitals in Beirut were also destroyed, others became nonfunctional. A disaster code was initiated in all the hospitals. Victims were transported by the Lebanese Red Cross or by volunteers to the nearest hospital that was still functional. Hospitals were flooded in patients, the coordination between health care centers was missing. Each hospital was functioning to its maximum capacity. With the many challenges we had, a rapid response was initiated. An effective triage done outside the Emergency had the major role in saving lives. After the Beirut Explosion, an assessment of the disaster plan and a major evaluation of the hospitals' coordination is needed.

On August 4, 2020, at 6:07 PM Beirut time, 2 consecutive explosions ripped through the port of Beirut, the capital of Lebanon. The second explosion occurred after 30 s and was much more substantial, with high number of casualties and significant destruction throughout the city. The explosions were linked to 2750 tons of highly explosive ammonium nitrate that was kept at the port for years. The United States geological survey measured the blast as a 3.3-magnitude earthquake and its shock waves were sent 250 km across the ground. Specialists from Sheffield University stated that the explosion was one of the biggest nonnuclear explosions in history.[1] It was felt in Syria, Israel, and Turkey and heard in Cyprus.[2] The explosion caused more than 6000 reported casualties, with over 800 hospital admissions, 130 intensive care unit admissions, and over 200 deaths to date.[3] The blast affected over half of the capital; homes were destroyed at a radius of 10 km and the shaking of buildings was felt as far as 50 km away. More than 300,000 people were displaced from their homes.[4] The estimate is 10-15 billion dollars of loss in property damage. Two hospitals were completely destroyed and became nonfunctional, 2 other hospitals were partially damaged. A rapid health assessment of the hospitals in Beirut was conducted by Connecting Research to Development with the World Health Organization (WHO), revealing that 37% had moderate to severe damages, 13% had some of their health workers injured, and 47% were still capable of delivering full health services.[5] Lebanon, a small Mediterranean country that has been struggling for the past year with increased poverty rate and an economic crisis received another blow. Due to all these recent events, the health care system became fragmented, and over 80% of hospitals needed medical supplies. Some of the hospitals were unable to pay their staff, and others were overwhelmed with coronavirus disease 2019 (COVID-19) patients.[6] On the day of the explosion, the head of Rafic Hariri University Hospital, the largest public tertiary referral hospital for COVID-19 patients in Beirut, stated that they were approaching full capacity. Given this context, we analyze the explosion in Beirut from a disaster medicine perspective.

People that were in the surrounding area of the Beirut port, whether living nearby or working there, came closer to their windows after the first explosion to watch or film the event. Therefore, most of the injured were affected by flashed glasses from broken windows or stuck under collapsed frame of the whole window. The majority of injured were minor lacerations and cuts, mostly in the upper part of the body. Within minutes of the blast, cars and ambulances began transporting the injured people to nearby hospitals. The health care staff had to face major challenges on that day. A major obstacle was that 2 of the closest hospitals to the scene were completely damaged. All vehicles were diverted to other facilities, and even the admitted COVID-19 and non-COVID-19 patients in these hospitals were managed for secondary transfers. Everything happened very fast, the disaster code was initiated in Beirut and in the nearby hospitals, but the number of casualties was much higher than expected. The emergency rooms were

becoming a disaster scene and adequate coordination between health care centers was missing. The Lebanese Red Cross (LRC), the primary emergency medical services provider in the country, coordinates the response between the hospitals regarding patient transport. However, on that day, the LRC had to transfer the injured to any hospital that was still functional, without being able to assess the number of injured already brought to this hospital by other means of transportation. Hospital staff stated that they have never received so many patients at once before. Patients arrived at a superior rate than any health care institution could have handled. To add that at that time of the day, most of the physicians and staff were outside the hospital. The blast by itself was devastating, the medical staff was working under emotional shock, many people were screaming, a lot of injured were in pain, and many others had lost their families or friends.

A major challenge was the COVID outbreak that was assumed to happen after that day. During this COVID-19 era, while doctors and nurses cared for the casualties, they stapled wounds, intubated patient, performed physical exams... wearing only surgical masks, as there was no time to put on personal protective equipment (PPE). The medical staff had to risk COVID exposure for the sake of taking rapid care of the injured.

Whatever were the challenges that the hospitals had, a rapid response was initiated. What certainly happened on that day was saving lives, from the volunteers on the blast scene to the hospital staff. Many factors were in favor of this.

First, Lebanese people have ample experience with bombing, this made the situation not uncommon to react to for the medical personnel. All the hospitals have their own disaster plan; and such experience with a massive casualty incident (MCI) impacted positively on the response to the disaster.

Second, bystanders played a major role in the initial response. Many injured were brought to the hospitals by volunteers. Not to forget that the emergency medical services (EMS) personnel were immediately deployed to the site of the blast. Direct coordination was made by the dispatch center. However, as usually happened during an MCI, victims were coming to the hospitals by all means of transport. Minor injuries arrived at the emergency departments (ED) first, by their own cars or transported by volunteers. We emphasize here on the role of mass casualty triage set up outside the ED to facilitate hospital surge capacity for major injuries Triage was certainly the most important part of the disaster response. With a high number of casualties, small space and little number of staff available, the only means to adapt and regulate is with a rapid and effective triage.

Third, Beirut city has many major university medical centers, which are very well equipped and staffed, and most of these hospitals have their own disaster plan, updated and tested yearly with simulation exercises and drills. At the Lebanese American University Medical Center, which was 2.8 km away from the blast, approximately 300 patients were admitted within the first hour, most of them were blast injuries from penetrating glass with deep wounds all over the body. All the medical staff were deployed to ensure adequate triage and care. A total of 72 patients were admitted to the hospital, 58 admitted to the operation room, 11 intensive care unit (ICU) admissions, and 5 were deceased upon arrival.

The next day after the explosion, foreign teams started getting deployed in Beirut. Given the ability and the experience of the health care system and the trauma pattern, it was clear that there was limited need for international support. Nevertheless, some field hospitals, mainly army hospitals from neighboring countries, were deployed. Very few trauma patients were treated at these hospitals, and limited admission for major surgery were reported. Additionally, other international Emergency Medical Teams (EMT) sent their forward teams in synergy with the EMT coordination mechanism early established. This highlights the importance of having a prior established global surge capacity system that can rapidly determine type and scale of health care assistance needed and activate an international response optimal to the context, ready to be coordinated with the affected country. In this regard, the WHO EMT initiative aims to promote minimum standards for surge capacity and, since 2015, a global registry for EMTs was implemented to help governments ensuring that only qualified teams are deployed in affected areas.[7] Currently, deployed international EMTs have been re-tasked to support the public health system to manage the increasing number of COVID-19 patients.

To conclude, the Beirut Explosion tells us once again that during a MCI: (1) casualties arrive at the closest hospital using all types of transportation; (2) rapid transportation to hospital saves lives; (3) health care staff with significant experience and training perform well despite the overwhelming needs; (4) every hospital needs a disaster plan that can be expanded from contingency to crisis; (5) disaster plans regularly tested through simulations and drills are key for an effective response; (6) a disaster plan for a city is challenging when the health care system is fragmented and the role of private hospitals is not well laid out.

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