

Основным фактором, влияющим на общее количество загрязняющих атмосферу веществ в обеих странах, являются твердые отходы.

Среди газообразных и жидких загрязняющих веществ в Республике Беларусь преобладают углеводороды (включая летучие органические соединения), в то время как на территории Российской Федерации — углеводороды (включая летучие органические соединения) и оксид углерода.

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УДК 614.83.028:343.326]:614.88-052(569.3)

**BEIRUT EXPLOSION:
OVERVIEW AND RESPONSE TO MASS CASUALTY INCIDENTS (MCI)**

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Introduction

On 4 August 2020, a large amount of ammonium nitrate that was stored at the port of Beirut, the capital of Lebanon, exploded, causing 210 deaths, 7,600 injuries, and US \$ 15 billion in property damage, and leaving an estimated 300,000 people homeless. A cargo of 2,750 tons of the substance (equivalent to around 1.1 kilotons of TNT) had been stored in a warehouse without proper safety measures for the previous six years, after having been confiscated by the Lebanese authorities from the abandoned ship MV *Rhosus*. The explosion was preceded by a fire in the same warehouse, but as of February 2021, the exact cause of the detonation is still under investigation.

Goal

To assess the medical consequences of the disaster and effectiveness of treatment-evacuation support.

Material and Methods of research

Relevant literature searched.

The results of the research and their discussion

210 people were confirmed dead, and over 7,500 people were injured. Foreigners from at least 22 countries were among the casualties. At least 150 people became permanently disabled as a result of the explosion.

Evacuation of casualties. Within minutes of the explosion, casualties began arriving at Beirut's 6 largest hospitals, some of which sustained damage due to the explosion. The first victims to arrive were those who could walk on foot, as streets were filled with debris, and traffic jams occurred almost everywhere within a 3km radius of the explosion. An emergency evacuation plan was devised to transfer patients from the center of the disaster to hospitals. More than 100 ambulances were immediately dispatched from North, South and Mount Lebanon to aid in the recovery and transfer of the injured, and civil defense units and fire units were dispatched to buildings with extensive structural damage to search for victims stuck in the rubble. However, many victims were transferred by uninjured people who happened to be on site, and were carried by foot.

Triage in hospital: Patients admitted to the American University of Beirut Medical center (AUBMC).

After patients reached the hospital, a Mass Casualty Incident Protocol (MCI) was initiated, and a disaster plan was outlined. The unscheduled arrival of large number of injured victims over a short period of time often causes major chaos and crowding. When a rapid surge in operational needs overwhelms available Emergency Department (ED) resources and personnel, the chaos and overwhelming mismatch between needs and resources can quickly spread to the rest of the hospital. Nonetheless, as the front door of the hospital, the ED plays a pivotal role in determining the quality and effectiveness of an institution's MCI response. This requires effective planning, which translates into preparedness. Unfortunately, many EDs are overburdened even on regular days. Damaged infrastructure further compounds the challenge.

Because Emergency Department (ED) personnel are the first providers in the hospital to receive mass casualties, they are often the first to recognize that an MCI is unfolding. This enables them to activate the facility's disaster plan to mobilize additional resources as they begin to triage and treat victims. The goal of ED care in MCIs is to identify victims with the greatest immediate need for intervention, initiate life-saving care & stabilization while the operating room (OR), intensive care unit (ICU) and inpatient units prepare to support the response. Because the ED is the front door to the community, its personnel also interface with distressed crowds, friends and families, unexpected volunteers, media and sometimes, armed parties. Typically, it is also the first unit of the hospital to recognize that an MCI is resolving so the hospital can begin deactivating its institutional response.

Most Doctors and nurses were called to the emergency department to begin the process of triaging victims. Staff were divided into several teams consisting of:

1. An Emergency physician. (In case of disaster, other specialties will suffice).
2. 1 nurse (critical care nurse/cardiac nurse/emergency nurse).

The doctors were tasked with assessing the severity of the situation of each patient, planning the course of action, and performing life-saving procedures when deemed necessary.

Nurses would implement complementary medical interventions to stabilize the patients or provide treatment prior to transfer into the operating room (OR).

Patients who were deemed stable (without immediate threat to life) would be directed into lower priority channels where they would receive the necessary care, or even transferred to other medical care facilities.

Lessons Learned:

That being said, there are several lessons to be learned from the Beirut explosion that other hospitals worldwide can benefit from.

Lesson 1: MCIs are a «predictable surprise»: One can tell when or where a major mass casualty incident will happen. «Disaster drills» can be scheduled for convenient times but MCIs cannot. MCIs often occur before hospital staff start their daily work in the OR, ICU or clinic, or hours after they have departed for the day. Therefore, everyone must know the facility's plan and multiple individuals on all shifts must have the skills and knowledge they need to lead the response.

Lesson 2: MCI definition is based on the number of casualties relative to the resources available to treat them, the facility's level of preparedness and its surge capacity at the time: What constitutes an MCI for one ED may not challenge another. Likewise, an unexpected surge in arrivals may be challenging during a busy shift in one ED but represent an overwhelming disaster for another. In addition, a significant surge in injured patient arrivals may not constitute an MCI in a well-staffed ED on a weekday morning. However, it could overwhelm that same ED and hospital at 2 am.

Lesson 3: Institutional disaster drills are important! Never assume an institution has an MCI response plan and never assume all individuals needed during a disaster response know or understand their roles and responsibilities. Follow the moto: «Test it and Drill it».

Lesson 4: Upside-Down triage: Expect «upside-down triage»! In most MCIs, the most severely injured arrive after a first wave of less injured victims who bypass EMS

and go directly to the closest hospitals. These are the «walking wounded», typically with relatively minor injuries. They are ambulatory and hemodynamically stable, often walk to, or are driven to the closest ED, bypassing EMS triage systems. If these individuals are taken into the EDs treatment areas and resuscitation bays, these facilities won't be available when more critically ill and injured patients begin to arrive. Those who arrive later are often trapped or too severely injured to leave the scene. Because many will be disabled or unstable, they will need to be transported from the scene. They will rely on bystander volunteers or wait for prehospital responders to assist them. They need transportation, sometimes extrication, fire control, safe roads and access to the ED. In a military or civil conflict, these may not be readily or rapidly available.

Lesson 5: Carefully define the ED capacity to handle mass casualty as well as when and how to activate the MCI plan: When does an external disaster warrant activation of a hospital's MCI plan? An MCI should be declared when the ED receives an influx of casualties that exceeds its available capacity. Accordingly, our experience in Beirut indicates that MCI response activation should be considered any time the ratio of patients to-provider exceeds 5 walking wounded per each medical provider team within 30 minutes AND the «team» secures information suggesting more victims are expected. Quality of care should be taken into consideration when assessing the admitting capacity of a hospital.

Lesson 6: Tiered response: To avoid unnecessary mobilization of resources, it is necessary to plan, establish and use tiered response. A two-tiered disaster plan could include two levels of activation and response.

— Level I: This is the highest level of disaster response. All health care providers & staff are called-in.

— Level II: This is the first and moderate level of activation & response. Only on-call providers/staff are called in to support the ED team on-duty. The ED team should entertain and decide calling in all emergency physicians and nursing staff to come to the ED.

Lesson 7: Tiered activation: An additional strategy that we recommend is to establish tiered activation with a two-step process that includes:

— Step 1: Alert Status. This is the first step of an activation;

— Step 2: Activation Status. This is the second and final step of an activation; and this also could be applied for either Level 1 or 2 response.

Lesson 8: Proper call routing systems: It is key to instruct ahead of time the community, hospital and ED staff not to call the ED if they hear a disaster or possible disaster has occurred. They should remember or be reminded that at such time the ED would be particularly strained.

Lesson 9: Pre-identify mobilization sites: Pre-identify mobilization sites and train all medical providers, staff, and leadership to use them; and drill them to make sure they remember to do so!

Lesson 10: Defining roles and responsibilities: Define roles and responsibilities for every service one may need, highlighting what they have in common with the rest of the institution and what is peculiar to them in terms of duties, response, mobilization, exceptions, etc. Normally, the ED attending should take on the responsibility of assigning the roles and responsibilities to physicians and nurses who are called in.

Lesson 11: Secure and control entry & exit into the ED: Keep only one ED entrance and one ED exit open and make sure they are separate from one another. Additionally, restrict entry into the ED to control crowds and reduce interference and security risk.

Conclusions

In an emergency, there is a massive flow of victims requiring emergency medical care. In conditions of a lack of manpower and resources of the health care system, there is an urgent need for medical triage. All healthcare providers must have the knowledge and skills to perform triage.

LITERATURE

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