COVID-19 PANDEMIC: A DESCRIPTION OF THE READINESS & RESPONSE PLAN OF A TERTIARY CARE CENTER IN BEIRUT, LEBANON

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Abstract

COVID-19 pandemic caused by the novel Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Cov-2) challenged even the most prepared healthcare systems. With the increasing influx of patients and exposure of healthcare workers, many countries faced issues related to healthcare system's capacity and to access to healthcare. The safety of healthcare workers and their ability to continue to effectively manage influxes of patients with COVID-19 depends on the readiness of involved hospitals. Consequently, hospitals must adopt a multidisciplinary systematic approach to assess and improve preparedness and response plans to emerging diseases such as COVID-19. This review article describes the readiness and preparedness plan of a tertiary care center in Beirut Lebanon and summarizes key measures that allowed for coping with the COVID-19 pandemic.

Keywords: COVID-19, Hospital preparedness, Readiness, Surge capacity.

COVID-19 Pandemic

COVID-19 pandemic caused by the novel Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Cov-2) challenged even the most prepared healthcare systems. Particularly, healthcare workers were susceptible because of lag of information related to the virus itself and to the scope of the outbreak in different countries. Consequently, the risk of transmission of the virus from healthcare workers to vulnerable patients was high. In Italy, almost 10% of healthcare workers tested positive for the disease which affected the entire country's healthcare system and impeded access of the general population to adequate healthcare.[1] In Lebanon, more than 30 healthcare workers contracted the disease to date. Furthermore, the safety of healthcare workers and their ability to continue to care for patients with COVID-19 is largely dependent on involved hospitals' readiness. Thus, hospital preparedness for the emerging COVID-19 disease is a major determinant of the course of this pandemic and its impact on global health.

The American University of Beirut Medical Center (AUBMC) is a regional and national

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referral center and is the largest tertiary care center in Beirut Lebanon. It has 420 beds and serves a local population of approximately 2.4 million. Each year, an estimate of 55,000 patients with various complaints visit the emergency department (ED) at AUBMC, and nearly 405,000 patients are treated in outpatient facilities.[2,3] It also has several clinical centers of excellence including the children's heart center, the children cancer center, adult cancer center in addition to several subspecialties such as trauma, neurosurgery, critical care (adult, pediatric and neonatal).

Historically, AUBMC responded regularly to Mass casualty Incidents related to bombings, riots, and civil conflicts in Beirut.[4] Although its' emergency preparedness plan addressed all hazards, it heavily relied for response on the ED and on surgical and critical care specialties with minimal involvement from other departments.

Previous Outbreaks

The Middle East Respiratory Syndrome (MERS) outbreak in 2012 caused by the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) affected most countries in the Middle East Region.[5] During the period extending from April 2012 to December 2019, a total of 2496 cases of MERS were diagnosed in over 27 different countries, out of which 868 (34.77%) died.[6] This emerging viral disease resulted in a substantial burden on healthcare systems in different countries with around 27% of identified cases being healthcare workers.[7]

AUBMC responded quickly to the emerging MERS-CoV outbreak and implemented immediate measures for screening, identifying, and isolating patients suspected to have MERS-CoV. Despite the high number of travelers from gulf countries to Lebanon, and because of national and hospital related preparedness, limited impact was felt at AUBMC as a result of this regional outbreak.

In 2015, the EBOLA outbreak presented a new challenge because a large number of expats who reside in affected African countries frequently visit Lebanon and present to AUBMC for care. At the time AUBMC responded again by revising workflows to screen for and quickly identify and isolate patients who are suspected to have EBOLA and developed policies for the influx of patients with communicable diseases. EBOLA specific response workflows and a dedicated inpatient unit were also created. This unit ended up receiving the first EBOLA suspected patient who arrived to Lebanon.

The COVID-19 Outbreak

Preparedness to respond to outbreaks from communicable diseases did not however ensure readiness of hospitals to receive and treat COVID-19 patients. In fact COVID-19 presented several challenges for healthcare organizations at many levels:

At the Patient level:

1- COVID-19 was highly transmissible.
2- The majority of patients are asymptomatic.
3- Most common presenting symptoms were mild are those of a minor upper respiratory tract infections.
4- Transmission mode was not clear (Contact and Droplet vs contact and Airborne).
5- The level of protection required for healthcare workers was not clear during the initial stage of the pandemic.

At the institution level:

1- Hospitals contributed to the escalating crisis and rise in number of affected individuals (e.g. Italy).
2- Healthcare workers were at high risk of infection (10% in Italy).
3- Hospitals in Lebanon were previously affected by the economic crisis, and at baseline had limited resources to respond to a pandemic.

At the country level:

1- Supply chain challenges related to testing kits, personal protective equipment (PPE), mechanical ventilators and other equipment.
2- Lack of a clear plan on the role of different types of hospitals in Lebanon in responding to the pandemic.
3- Lack of resources to help hospitals prepare for the pandemic.

At the international level:

1- Several countries were quickly affected and a timely

response from World Health Organization (WHO) was lacking to alert other countries about the level of transmission in each country. As a result, travel screening in EDs and hospitals was compromised.

2- Delay in implementing travel restrictions which resulted in a large number of imported cases.

AUBMC Response

At the start of the pandemic, AUBMC's administration formed a COVID-19 response task force. A multidisciplinary approach was adopted, with daily reports being shared with an executive committee. Liaison with national COVID-19 committees was also established.

The following methodology was adopted to prepare the institution to respond to this emerging disease.

Assessing Readiness level

Task Force initial activities consisted of reviewing international checklists for hospital readiness (WHO and the Centers for Disease Control and Prevention CDC) and identifying gaps to address them.[8] Most checklists include the same key elements: the implementation of a well-defined and efficient screening, triage, and admission criteria essential for an effective response. Availability of alcohol-based hand sanitizers and facemasks (especially for patients presenting with respiratory symptoms) at all entry points was needed. Furthermore, the prompt identification and isolation of COVID-19 suspected cases using clear protocols are fundamental to decrease unnecessary exposure and possible infection of other patients and staff. Such expedited triage processes are better applied in spaces designated for patients suspected with COVID-19 (e.g. respiratory symptoms, fever) where additional safety measures are possible such as placing patients at least 6 feet apart from each other while waiting. Creating a dedicated treatment area is also recommended to help receive COVID-19 suspected patients referred from all outpatient clinics. Additional screening measures should also be implemented across different communication platforms with patients. Establishing a remote (e.g. telephone) triage system, which prioritizes the evaluation of COVID-19 suspected patients with severe symptoms requiring urgent medical attention and treatment (e.g. respiratory distress) is advised. Hospitals should also have in place robust reporting mechanisms to infection control department and to local or state health departments and ideally a system to track COVID-19 patients' admissions and discharges.

Protecting hospital premises during the outbreak is also important. Revising patient movement workflows within clinical areas is needed. Limiting number of visitors to only those required for basic patient care is helpful. The adherence of visitors to infection control safety measures, including the utilization of contact and droplet protective equipment should also be ensured. Additionally, records of all personnel and visitors in contact with a COVID-19 patient should be preserved to facilitate future screening or tracking.

Furthermore, careful and apt communication channels should be established between involved hospitals, public health authorities, and other stakeholders to guarantee efficient coordination and partnership. This can also contribute to increasing public awareness and trust in the various sectors of public health, which in turn facilitates informed decision-making and cooperation at the level of tracking and prevention.[9] The management of communication with health authorities, the public sector, and media could be accomplished via the appointment of a well-informed public spokesperson. Additionally, it is of paramount significance to enroll all hospital personnel, along with COVID-19 patients and their families, in education and training courses; this will enable them to understand fundamental COVID-19 prevention and control procedures and their implications.

One of the biggest challenges faced by hospitals and medical centers when dealing with COVID-19 patients is the ability to secure the required number of pharmaceuticals, medical consumables and PPE which are essential for effective management of the outbreak; examples of such supplies are facemasks, alcohol-based hand sanitizers, gowns, gloves, eye-shields, respirators, screening and diagnostic tests (e.g. COVID-19 PCR kits). Supply inventory should be established and maintained with active monitoring mechanisms and triggers to reorder in case of a

shortage. Dynamic management of this inventory is therefore required and a plan for increased utilization in case of surge should be devised. This also requires continuous coordination with authorities involved, whether local or at the state level.[10]

Addressing gaps in readiness and capacity

Following this assessment, the Task Force identified several gaps and implemented measures to address them.

New screening and clinical algorithms were created to screen for and isolate patients suspected to have COVID-19. Guidelines for testing were also disseminated at all entry points. Clinical management protocols and communication pathways clearly explained how and where patients should be managed if they screened positive for COVID-19 case definition criteria. Strict measures were also implemented at all entry points ensuring safety practices with visible communication messages to patients, visitors and staff.

Furthermore, regular elective medical and surgical procedures and surgeries were reduced to accommodate for a potential influx of COVID-19 patients, thus allowing the allocation of adequate resources (human and medical supplies and equipment) for the response to an outbreak (e.g. conversion of regular patients' and operation rooms to negative pressure isolation rooms).

Besides implementing several measures such as the acquisition of adequate PPE, fit testing was increased initially and performed on around 250 hospital personnel from designated priority specialties such as emergency medicine, critical care, anesthesiology, pulmonary and otolaryngology. However, because of global challenges related to PPE supplies mainly N95 masks and in accordance with a CDC recommendation, fit testing was stopped and was replaced with fit checking instead. This recommendation was issued due to an unprecedented international shortage in N95 respirators and the inability to secure a sufficient quantity of them.[11,12]

Additionally several measures were implemented to improve communication related to COVID-19 outbreak. AUBMC established a Coronavirus Hotline available daily from 8 am till 11 pm to provide patients with guidance and assistance regarding COVID-19 and to address their concerns. Additionally, an online website accessible to patients and their families was launched by AUBMC to deliver daily-updated comprehensive information about COVID-19. Furthermore, AUBMC launched remote access to medical treatment for all patients through Telehealth, a platform for online patient appointments and visits.[11] Moreover, different divisions and departments revised workflows and increased safety measures to continue to provide care for medically vulnerable patient populations (cancer, pregnant and end-stage kidney disease) during the pandemic.

COVID-19 testing capabilities were also considered essential for any hospital planning to receive and treat patients during the COVID-19 outbreak. A study performed by Piguillim et al. reported on the significance of increased COVID-19 testing as an effective substitute for the quarantine policy in controlling the disease.[13] Despite the worldwide shortage of COVID-19 screening and diagnostic testing tools and kits and the economic crisis in Lebanon, AUBMC was able to increase its testing capabilities by procuring a considerable number of COVID-19 PCR toolkits and launched testing early on during the outbreak. Tests done at AUBMC accounted for around 28% of all tests conducted in Lebanon.

Effective treatment modalities were also not clear during the initial phase of the pandemic and published studies were limited. As a result a group of experts from different medical specialties at AUBMC developed multidisciplinary COVID-19 protocols for management of adult and pediatric patients. These protocols were shared with the Ministry of Public Health to facilitate their distribution and adoption by other hospitals in Lebanon.

Creating a Separate Hospital

Centralizing evaluation and treatment of COVID-19 suspected patients can help increase treatment capacity, improve efficiency and reduce staff exposure. As such, a separate hospital building was transformed to a COVID-19 facility. This new facility is comprised of a walk-in COVID-19 "Flu Clinic" for

testing and evaluation and of inpatient units (intensive care units (ICU) and a regular floor). International infection control standards were used to prepare this new building for receiving COVID19 patients.

Preparing healthcare providers to staff the newly designated COVID19 units was key. Physicians were required to take educational courses and simulations focused on how to care safely for COVID-19 patients and how to perform high-risk procedures such as rapid sequence intubation while wearing appropriate PPE. Additionally, training of staff on the appropriate use of PPE was conducted by Infection Control, Quality, and Nursing staff.

Planning for Increased Surge Capacity

Liaison with other hospitals, the syndicate of hospitals, and the Ministry of Public Health in Lebanon was also established to develop plans in response to different scales of a COVID-19 outbreak. The taskforce at AUBMC prepared a surge capacity plan in response for two scenarios:

· Expanding and planning for full capacity operations (maximum capacity whereby AUBMC can still accommodate patients without resorting to alternative standards of care).

· Disaster scenario where the entire country is overwhelmed, during which alternative standards of care would be required.

Planning for securing additional stock of medical supplies based on need (PPE, medications, testing kits) and for avoiding shortage in case of a prolonged response was also done. Training of staff from other specialties to help cross cover in case of staff shortage was also planned for. Specific courses were also developed to help train physicians quickly on how to provide critical care treatment for a large number of COVID-19 critical patients.

The surge capacity plan also included increasing treatment capacity by using a field hospital. This field hospital would be set up within one week time based on triggers reflecting volumes that exceed traditional clinical space capacity.

Resuming Regular Operations, Recovery & Planning for Future Responses

A key component of a hospital's readiness plan involves activities related to the recovery phase and ability to resume routine operations after the response. Identifying triggers to gradually increase routine surgeries, open outpatient clinics and increase patient volumes in different clinical areas is needed. The COVID-19 pandemic proved to be challenging not only for the healthcare sector but for all sectors. This review described one institution's approach to cope with the pandemic. Other institutions in other countries used other response strategies. Some were overwhelmed despite being prepared for usual communicable diseases outbreaks. Planning for future responses will require hospitals to adapt quickly to changing environmental factors using a multidisciplinary and systematic approach. They should also communicate and collaborate extensively with other national and regional stakeholders to improve the overall capacity of the healthcare system to care for patients during major outbreaks.

References

1- Istituto Superiore di Sanità. Sorveglianza integrata COVID 19 in Italia. Epicentro website. Available from: https://www.epicentro.iss.it/coronavirus/sars-cov-2-sorveglianza-dati. Published 2020 April 5, 2020.

2- El Sayed MJ, Tamim H, Nasreddine Z, Dishjekenian M, Kazzi AA. Out-of-hospital cardiac arrest survival in Beirut, Lebanon. European Journal of Emergency Medicine. 2014;21(4):281-3.

3- Facts and Figures 2018. Available from: http://www.aubmc.org/Documents/publications/aubmc_corporate/facts_fig.pdf

4- *Lebanon protests: 40 injured as violence flares again in Beirut*. The Guardian. **(**2020**)**

5- Pillaiyar T, Manickam M, Jung SH. Middle East respiratory syndrome-coronavirus (MERS-CoV): an updated overview and pharmacotherapeutics. Med chem. 2015;5(8):361-72.

6- Meo SA, Alhowikan AM, Al-Khlaiwi T, Meo IM, Halepoto DM, Iqbal M, Usmani AM, Hajjar W, Ahmed N. Novel coronavirus 2019-nCoV: prevalence, biological and clinical characteristics comparison with SARS-CoV and MERS-CoV. Eur Rev Med Pharmacol Sci. 2020;24(4):2012-9.

7- Suwantarat N, Apisarnthanarak A. Risks to healthcare workers with emerging diseases: lessons from MERS-CoV, Ebola, SARS, and avian flu. Current opinion in infectious diseases. 2015;28(4):349-61

8- World Health Organization. Preparedness, prevention and control of coronavirus disease (COVID-19) for refugees and migrants in non-camp settings: interim guidance, 17 April 2020. Available from: https://www.who.int/publications/i/item/preparedness-prevention-and-control-of-coronavirus-disease-(covid-19)-for-refugees-and-migrants-in-non-camp-settings

9- World Health Organization. Critical preparedness, readiness and response actions for COVID-19: interim guidance, 22 March 2020. Available from: https://www.who.int/publications/i/item/critical-preparedness-readiness-and-response-actions-for-covid-19

10- Nogee D, Tomassoni AJ. Covid-19 and the N95 respirator shortage: Closing the gap. Infection Control & Hospital Epidemiology. 2020;13;1

11- Planning P. Recommended guidance for extended use and limited reuse of N95 filtering facepiece respirators in healthcare settings. US Government. 2020

12- Hollander JE, Carr BG. Virtually perfect? Telemedicine for COVID-19. New England Journal of Medicine. 2020;382(18):1679-81

13- Piguillem F, Shi L. Optimal COVID-19 quarantine and testing policies. EIEF Working Papers Series 2004, Einaudi Institute for Economics and Finance (EIEF), revised Apr 2020.