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Table 1 (continued)

S. No	Areas	Description
17	Medical Supply chains	<ul style="list-style-type: none"> Evolution of Risk resilient supply chains for PPE (Personal Protection Equipment) like masks, ventilators etc. The emergence of quick response transportation and logistics enabled by IT in PPE Humanitarian logistics with collaborative efforts from various academic entities Role of the disaster management group
18	Public health and Policy	<ul style="list-style-type: none"> Issues of managing public health systems, especially given current infrastructure and our ability to manage the same Role of state vis-à-vis private sector Public Policy on Affordable medical care, especially to disadvantaged sections of society

1. Research objectives

This manuscript highlights potential areas of academic research which are likely to be impacted by COVID-19. The main objectives of this paper are to provide awareness and to identify the research areas related to COVID-19. It may help improve the understanding of this disease and describe the psychological impacts of this pandemic and how these could change as the disease spreads.

2. Current limitations and gaps in the knowledge of Coronavirus and its effects

It appears the Coronavirus is zoonotic and originated in China. Scientists have not yet been able to identify the animal source of the infectious agent and have not determined whether a persistent animal reservoir of the infectious agent exists. It is also unclear whether SARS, like influenza, is a seasonal disease that would have receded on its own. It remains to be seen whether it will reemerge on a seasonal basis, and if so, how virulent future manifestations would be. The answers to these questions would undoubtedly advance the world's ability to predict and prepare for a resurgence of COVID-19.

3. Significant research areas on COVID-19

COVID-19 has disrupted the economies and the lives of individuals around the world. There are many areas of research needed regarding COVID-19 [4–6]. Table 1 identifies significant research areas which are profoundly impacted by this pandemic. We need to undertake extensive research on these areas.

Extensive research is required for the development of a vaccine for the prevention of Coronavirus infection. There is an urgent need for early production and manufacturing of the essential items like personal protective equipment, medicines, and ventilators to combat this pandemic. All measures to keep a social distancing by the public must be ensured by avoiding social-cultural and religious programs and festivals etc. during this pandemic. Along with these, healthcare measures to deal with COVID-19 pandemic, there is also an imminent requirement for thereseearch to improvethethe global economy, which has taken a tremendous beating and is unlikely to recover in the near future [7,8].

4. Conclusion

COVID-19 pandemic is a public health emergency of international concern. It has posed new challenges to the global research community. With the help of academic research, there is a need for a better understanding of the COVID-19 and its socio-economic ramifications on society. The future research will be multi-disciplinary and trans-national.

We see a new wave of research in the biological and the medical sciences for the well-being of the civilization.

Declaration of competing interest

None.

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30 March 2020

<https://doi.org/10.1016/j.ajem.2020.04.022>

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The role of emergency medical services in containing COVID-19



To the editor,

The number of worldwide cases of COVID-19 has exceeded one million. The approach of the World Health Organization has emphasized the role of containment of the virus [1] in the context of countrywide operational planning [2]. Emergency medical services (EMS) can play a significant role in designing and implementing an effective approach.

Magen David Adom (MDA) is the Israeli national EMS organization (8.9 million residents). Dispatch is overseen by the National Medical Emergency Dispatch Center (NMEDC). Routinely MDA is responsible for operating over 1000 ambulances, 2500 salaried workers and 24,000 volunteers. By the end of January 2020, the Israeli Ministry of Health

instructed MDA to act to prevent and contain the spread of COVID-19 and to prepare to respond to potential cases of infection. MDA then expanded the NMEDC and opened a dedicated COVID-19 call center. The goal is to contain viral exposure by keeping suspected patients in quarantine at home and away from the public. Upon excluding medical emergency, if the call is concerning COVID-19 and fulfills either the clinical or epidemiological criteria, it is transferred to the COVID-19 call center.

The center is manned by EMS dispatchers along with representatives from the Ministry of Health (MOH). Over 200 MDA volunteers and 50 management staff the center around the clock. Information technology staff provide around the clock support. Routinely, an average of 6000 calls are received a day by the NMEDC. As the pandemic progressed the number of calls increased to 120,000/day.

A flow-chart was developed and programmed into the command and control system together with the infected patient routes. Patients clearly not exposed to an index case, can return to their normal routine. If exposure is confirmed, they are instructed to stay in home quarantine (for 14 days) and a paramedic contacts them to inquire about symptoms. If the case is suspicious of COVID-19, a physician then decides whether to send a paramedic with personal protective equipment to the home to collect samples for testing. Over 25,000 samples have been collected. Cases, where COVID-19 are confirmed, are transported by paramedics on a dedicated negative-pressure hooded bed in an ambulance to the hospital (Fig. 1).

As the number of calls and COVID positive patients increased, the system became overwhelmed. MDA then opened four stationary and 8 mobile drive-in testing centers that allow prescreened patients to stay in the car. QR code technology is used for patient identification and flow. Over 23,400 samples have been collected this way.

Maximizing EMS during a pandemic by carrying out phone triage, home testing, and drive-in testing significantly decreases visits to physicians' offices and hospitals and allows early identification of those with COVID-19. These activities contribute to the effort to contain the spread of disease.

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8 April 2020

<https://doi.org/10.1016/j.ajem.2020.04.023>

Protecting our healthcare workers during the COVID-19 pandemic



Currently, there are 1.2 million physician Healthcare Workers (HCWs) in the United States (US), 20% over the age of 55 [2]. Similarly, in the hospital setting, there are 2 million registered nurses, with 22% are over the age of 55 and of the 1.2 million registered nurses employed outside of the hospital, 29% are over the age of 55 [1]. According to the CDC, older adults are at higher risk of infection and complications related to COVID-19, particularly those over the age of 65, the age group that currently comprises 8 out of 10 US deaths from COVID 19 [2]. All ages are susceptible to COVID-19, with close contact with an infected individual [3]. Given this assessment, physicians, nurses and other staff risk their personal health each time they tend to COVID-19 patients and this is made worse by the shortage of PPE (Personal Protective Equipment). Lack of PPE and inadequate social distancing are the two modifiable risk factors that if addressed through the implementation of enforced physical distancing, increasing the availability of PPEs, and proper guidelines would significantly reduce transmission rates and help save lives [4,5]. In March 2020, Italy reported over 2600 HCWs were infected, devastating their already worn-down workforce [6]. Observing the wreckage ensuing across the globe, it is imperative to better prepare and care for our HCWs.

Many hospitals and states have not yet released their number of HCWs testing positive for COVID 19. Those who have released their numbers include hospitals from Washington State, Massachusetts and Alabama. The number of US HCWs confirmed infected with COVID 19 is over 800 [7-11]. As more states release their numbers, the amount is expected to rise, possibly dramatically, as more states are issuing tests to their HCWs in high risk exposure situations [12]. Additionally, there is an ever-growing list of HCWs from across the globe who have lost their lives due to COVID-19 [13-15]. As the number of HCWs infected and dying continue to rise, so our providers continue to diminish.

The physical and psychological well-being of our HCWs are being tested as patient loads continue to increase and fellow co-workers become infected with COVID-19, contributing significantly to burnout among healthcare workers [16-18]. The effects of this increase in workload in the dangerous atmosphere of this pandemic are the decline in the mental health of our HCW [16,17]. Throughout this pandemic HCWs have had to self-isolate from their own families for fear of transmitting the virus to their loved ones [17]. There will be guilt when a family member becomes infected. Our HCWs are bravely living in a constant state of psychological stress founded in fear; fear of transmitting the virus and stress of the unknown aspects of this virus. The long-term effects of stress can result in post-traumatic stress disorder, anxiety and depression [19]. Thus, it is imperative to employ productive strategies to care for the mental health of our HCW.

The mental health needs of our providers must be addressed with the same priority of their physical health. Keeping our HCWs updated

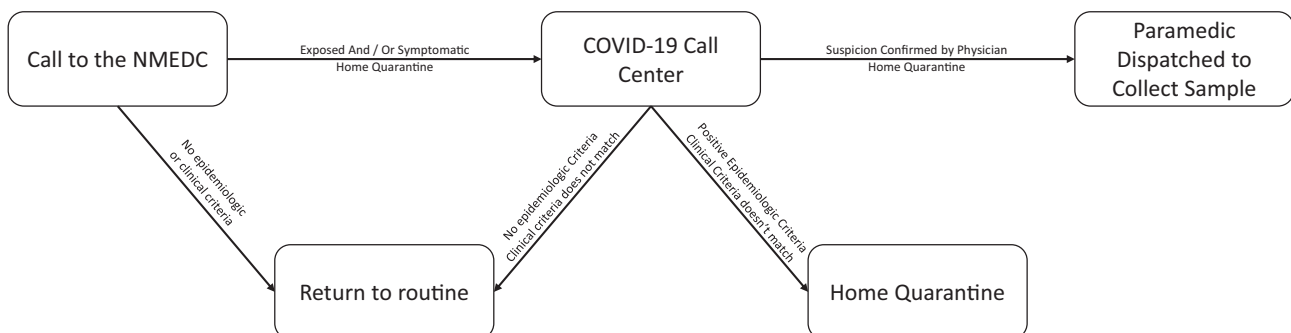


Fig. 1. COVID-19 call center flowchart.