Novel Coronavirus (COVID-19): Leveraging Telemedicine to Optimize Care While Minimizing Exposures and Viral Transmission

The following Joint Position Statement represents a collective contribution of emergency and acute care experts from the World Academic Council of Emergency Medicine and the American College of Academic International Medicine Task Force on Telemedicine for COVID-19 Pandemic.

Over the past 3 months, the world witnessed historic and dramatic developments related to the rapid emergence of a novel coronavirus. Real-time, detailed global media coverage brought live updates on the infection to every corner of the planet. Social media outlets are abuzz with minute-to-minute alerts, reflections, witness accounts, and personal reactions. We are witnessing stories of human suffering, including overwhelmed health-care systems, limited access to emergency care, vacationing passengers stranded on cruise ships, large-scale evacuations, overnight economic shutdown, and empty streets in China and Italy.[1-3] The imagery is comparable to an epic movie depicting martial law with large populations confined to their homes in the wake of a deadly virus. This time, it is a novel coronavirus, and the associated disease has been named COVID-19. Moreover, the current world-wide event has now been declared a pandemic by the World Health Organization (WHO).[4,5]

Pneumonia of unknown cause detected in Wuhan, China, was first reported to the WHO on December 31, 2019. In turn, the WHO declared the event a Public Health Emergency of International Concern (PHEIC) on January 30, 2020.[5] Soon, there was a total shutdown of free travel between China and the rest of the world, expanding the human and medical dimensions of the outbreak into the economic and political spheres.[6,7] The epicenter of the current outbreak was the city of Wuhan in China’s Hubei province. In an attempt to contain the spread of COVID-19, the Chinese government has implemented metropolitan-wide quarantine of Wuhan and several nearby cities, effectively forcing millions of people to remain indoors and avoid unnecessary outdoor travel.[8] In a record period of 10 days, a massive 1000-bed hospital was built to help cope with the rapidly increasing number of cases.[9]

Despite these efforts, as of February 25th, there were 78,064 confirmed infections, 8752 patients in serious condition, and 2715 reported mortalities in Mainland China alone. Moreover, Chinese authorities estimate a total of 647,406 people who had close contact/proximity with infected people, and more than 79,000 individuals who are under medical observation.[10] There is also a case of a Chinese person who may face a jail sentence for lying about his movements in Singapore during the mandatory quarantine period.[11] Finally, there is a real possibility that the Federal Emergency Management Agency in the United States (US) may declare emergency over the COVID-19 infection.[12]

At the time of this commentary, COVID-19 has spread throughout the world and has infected 37,371 confirmed cases in 113 countries with 1130 deaths outside of China.[5] A sudden increase in cases has been reported in Iran, Italy, and South Korea. Cases linked to travel to/from Iran have been found in Bahrain, Iraq, Kuwait, and Oman. Similarly, cases related to Italy have been found in Algeria, Austria, Croatia, Germany, Spain, and Switzerland.[5,13] Most recently, Nigeria confirmed its first case in Sub-Saharan Africa, whereas the US reported its first coronavirus-related death in Washington state.[14,15] Thus, COVID-19 has established itself outside of China and now appears to be spreading across new regions, countries, and continents. The geographic diversity of the above locations suggested that a pandemic was imminent and ultimately, on 11th of March, 2020 WHO declared COVID-19 a pandemic.[5,16] In the meanwhile, various international and regional authorities are following the footsteps of China to impose movement restrictions on their populations with an aim to curb the human-to-human spread of the virus.

Few health-care systems around the world are equipped to deal with the potentially massive numbers of infections, acutely ill patients, as well as population-level anxiety related to both COVID-19 and the restrictions put into place to help contain its spread.[17-19] In China, COVID-19 infections escalated quickly and without warning, with little time for emergency procedures or other mitigation efforts. Other provinces in China have not shown similar massive increase in infections and deaths as seen in the Hubei province. However, this was achieved at a great cost for the 40–60 million residents of Wuhan and 15 other surrounding cities within Hubei Province who were subjected to community containment measures.[13,20] The human movement restrictions may be prolonged for now as approximately 14% of recovered coronavirus patients in China’s Guangdong have tested positive again after being declared virus free and there is no consensus on the optimal length of the quarantine.[21]

Like any other defining challenge in human history, the current emergence of COVID-19 comes with its own unique opportunities and innovative solutions. Technological advances provide humanity with new, previously unavailable options. Although the ultimate solution to the COVID-19 infection will be multifaceted, one important avenue that has not yet been explored fully is to leverage existing technologies to facilitate optimal care delivery while minimizing the risk of direct human-to-human exposure. In this context, telemedicine represents an attractive, effective, and affordable option. Moreover, this technology is of critical importance when one considers the consequences of health-care providers contracting COVID-19 as a result of direct exposure; something that can be especially devastating in low-resource areas or under the circumstances of massive stress to the existing health-care infrastructure and staff.[22]

When movement is restricted throughout the world and entire cities are quarantined, affected populations are susceptible to increased stresses of daily life, unexpected economic burdens, communicable and noncommunicable diseases, and various mental health sequelae.[23-25] Consequently, unique and innovative solutions are called for to help address the critical needs of not only those acutely ill with COVID-19 but also all others who may require medical attention but are unable to receive it due to limited access or lack of resources. Under such conditions, telemedicine services (TMSs) become a critical asset, with important implications across the entire health-care delivery spectrum. The use of TMS offers several advantages, especially in the setting of nonurgent/routine care and in situations where services do not require direct provider–patient interaction, such as focused/abbreviated medical consultations or mental health visits.[26-28] This, in turn, reduces resource use across the already stressed health-care infrastructure, improves access to care, and at the same time minimizes the risk of direct person-to-person transmission of the infectious agent.[29-32] Furthermore, the associated reduction in resource consumption due to the lower need for personal protective equipment can amount to substantial financial savings when considered at national, continental, or global scale.[33,34]

Based on the above rationale, the availability of TMS can become a critical need for populations and patients affected by the COVID-19 infection, especially when under active quarantine. Enabling patients to consult a health-care provider via teleconferencing, in real-time, to allay one's fear and anxiety, seek advice regarding their routine health problems, and learn self-care, all become critically important in the setting of hospitals and clinics being overwhelmed with more acute complaints.[35-37]

Using tailored approaches, TMS providers can remotely identify patients who may require further escalation of care. Thus, TMS can be a powerful gate-keeping and coordination mechanism to ensure more appropriate use of provider offices, emergency departments (EDs), and hospitals, as understood within the above broader context.[36,38-40] The overall emergency implementation of TMS can also be augmented by the addition of point-of-care clinical assessment and diagnostic testing, further strengthening the efficacy of the emergency response infrastructure.[41,42]

Spatiotemporal analyses of telehealth data, specifically those focusing on calls regarding the complaint of "fever," have in the past provided a timely and useful picture of the evolution of a national influenza outbreak in the United Kingdom (UK).[43] The high burden of seasonal influenza outbreaks prompted the implementation of innovative TMS-based solutions as first-line approaches to reduce patient visits to the ED.[44] Taking a cue from the fight against influenza, a robust and responsive health-care system should consider adopting similar innovative TMS-based approaches in the setting of COVID-19. For countries and regions with limited or no identified transmission of COVID-19, rapid adoption of TMS and appropriate training of the health-care workforce in use of TMS should be considered among the top priorities. The level of urgency increases further in the presence of active and/or accelerating viral spread.

When evaluating options for rapid mass-scale implementation of TMS capabilities across the entire regions, countries, or even continents, important logistical issues must be taken into consideration. With the rapid evolution and miniaturization of portable electronic devices, most households own at least one digital device that is capable of rudimentary TMS patient–provider interactions.[45-47] Moreover, most regions of the world have some form of connectivity, even if intermittent, thus enabling the use of patient- or community-owned devices over the existing infrastructure.

During the current COVID-19 pandemic, the WHO has asked nations to increase their preparedness, suggesting the following three priorities:[13]

- First, all countries must prioritize protecting health-care workers
- Second, communities must actively work on ways to protect people who are most at risk of severe disease, particularly the elderly and individuals with pre-existing health conditions
- Third, the global community must protect the most vulnerable countries, by doing everything possible to effectively contain the epidemic and/or minimize its spread.

Within the context of the above WHO priorities, TMSs are perfectly positioned to help achieve the objectives for all three priorities, as follows:

- First, TMS use actively protects health-care workers by reducing nonacute patient-provider interactions, thus minimizing the risk of COVID-19 transmission involving infected but mildly symptomatic individuals
- Second, TMS will assist communities with protecting high-risk individuals (i.e., elderly and those with co-morbid health conditions) by reducing their exposure to hospitals and other health-care locations that may be frequented by those with acute COVID-19 infection
- Third, countries or regions with ample health-care staffing and resources will be able to help countries or regions with limited access to staffing and/or resources by providing

TMS-based services within an established, agreed-upon framework.

One of the Israel's medical centers has reported the use of TMS to more effectively care for the 12 Israeli COVID-19 patients received from the cruise ship that was quarantined in Japan for several weeks.[1,48] The various TMS platforms and modalities tested include remote patient examination without medical staff presence, robotic telemedicine cart equipped with a camera, screen and medical equipment controlled by doctors and nurses, and remote monitoring using a thermometer, blood pressure instruments and pulse oximetry, without additional human presence.[48]

Approximately 1700 health-care personnel have been reported infected with COVID-19 in China and 14.8% have been classified as severe or critically ill, with a total of 5 associated deaths.[49] Fortunately, infection rates appear to be lower than the 2002–2003 severe acute respiratory syndrome (SARS) outbreak where 30% of infections occurred in health-care workers; furthermore, the case fatality rate among health-care workers for SARS was 11% and with COVID-19 it is 0.3%.[50] COVID-19 is demonstrating an estimated reproduction number of 2.2, which signifies that, on average, every patient with COVID-19 will infect just over 2 other individuals.[51,52] Until the reproduction number is below 1, the pandemic will continue to escalate unless transmission strategies (i.e., containment or technological innovations like TMS) prevail.

In Italy as on March 5 more than 3000 positive cases have been reported, 50% of whom are hospitalized, including 10% in intensive care units with severe respiratory manifestations. Also the mortality in Italy is somewhat higher (107 cases) at around 3.5% and this is probably due to the primary infection clusters that are located in small towns in remote part of North of Italy, far from larger hospitals where the availability of testing for COVID-19 detection is greater.[53]

On planetary scale, as the number of documented cases of COVID-19 continues to rise, health officials and providers are exploring virtual care delivery to screen patients for infection away from crowded EDs and provide a safer care alternative for those in isolation after a positive diagnosis. In addition to TMS being beneficial by keeping unaffected individuals safe, including the general public, patients and health workers, another crucial advantage is its ability to provide a powerful "force multiplier" that dramatically extends the reach of caregivers. Medical professionals such as triage nurses and emergency medical technicians can quickly screen larger numbers of patients and lessen the burden on physicians and specialists who can perform remote consults when needed.

This is not the first time that telemedicine has been considered as an adjunct in the treatment of infectious disease outbreak, but growing concerns over the emergence of a pandemic are certainly pushing TMS to the forefront. Health organizations can employ digital health in a number of ways in preparation for COVID-19 cases – ranging from transitioning patients with cold and flu symptoms into virtual appointments, installing telemedicine stations in isolation units, to setting up dedicated triage units off-site to send patients for screening and specialist consults.

Decision-making algorithms incorporating telemedicine, designed through the utilization of artificial intelligence tools, could also be used in order to assist with definitive disposition of the evaluated patients by remote analysis.

Our working group believes that innovative TMS solutions need to be adopted and promoted worldwide to safeguard health-care workers and high-risk patient populations, as well as to provide supplemental care for nations and regions where resources are insufficient to cope with cumulative burdens of the COVID-19 pandemic.

Based on the current reports from around the world, the management of COVID-19 infections should be based on multidisciplinary team approaches. The number and causes of mortality are somewhat variable, with multiple organ failure and myocarditis featuring prominently on the list. Moreover, the left ventricular ejection fraction is affected negatively and cardiac biomarkers have been significantly elevated in a substantial number of cases.[54] Such complex scenarios necessitate collaborative strategies involving multi-specialty teams. In addition to bringing much needed expertise to the patient, the adoption of TMS based consultations for such cases also helps reduce direct COVID-19 exposure among health-care experts.

The real risk of COVID-19 extends well beyond the current period. In fact, the true game changer scenario would be the transition of COVID-19 from a one-time pandemic event into an endemic phenomenon, circulating permanently within the human population.[54] Under such as yet hypothetical circumstances, the endemic coronavirus would co-exist with seasonal influenza, leading to potentially permanent new equilibrium state. In this context, TMS in conjunction with point-of-care testing will become an important asset, allowing early differentiation between influenza and coronavirus infections and facilitating targeted therapeutic approaches while reducing viral transmission risk.[55]

In summary, the WHO and other global health care organizations should take into account and issue directions to countries to adopt and strengthen TMS services that will augment and optimize the planetary effort to extinguish the COVID-19 pandemic.

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In the wake of the COVID-19 pandemic, the Joint Task Force from The World Academic Council of Emergency Medicine and The American College of Academic International Medicine has published this Position Statement on Telemedicine. The Task force had an extensive telemedicine based interaction to chalk out this position statement as the cases surged across the world.

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