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**EDITORIAL**

**COVID-19 and spinal surgery**

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**I**T is ironic that during the celebration of the Chinese New Year, a new virus, now called COVID-19, was spreading in the Wuhan province of China and has since brought enormous suffering as we start the year 2020.<sup>1,2</sup> The virus had infected approximately 80,000 people in China at the time of this writing and rapidly spread throughout the world. COVID-19 has now resulted in a global pandemic, with 877,584 infected people in the world as of April 1, 2020.<sup>3</sup> Over 40,000 people have lost their lives, including many medical workers who became infected during the battle to save patients.

The United States saw its first case on January 20, and as of April 1, there were more than 185,000 cases, with over 4000 deaths. This disease can result in pneumonia and the need for hospitalization in many cases. Many hospitalized patients require ICU support and artificial ventilation for a period of 2–3 weeks.<sup>4,5</sup> The mortality rate is estimated to range between 1% and 4%.<sup>5</sup> The mortality rates have been higher in Spain and Italy, and the numbers of infected patients have overwhelmed hospitals. As the virus has spread, public health officials all over the globe have passionately advocated for social distancing in order to flatten the curve of the pace of infection as a means to prevent the overwhelming of hospital systems.

Hospitals in the United States have responded to the COVID-19 pandemic quickly and in similar ways. First, travel bans were placed on most physicians by their insti-

tutions in early or middle March 2020. These bans were imposed to prevent the community spread of COVID-19 as well as to preserve the physician workforce for the upcoming surge of patients with COVID-19. Second, the neurosurgery workflow was changed dramatically by the cancellation of elective surgery cases in order to increase hospital capacity for future COVID-19 patients. Third, much outpatient neurosurgical care is being rapidly transformed into telehealth in an effort to mitigate the risk of infection and slow down the community spread of infection. In most hospitals, all interventional spine procedures have been postponed to decrease patient exposure to COVID-19 and allow surgeons to focus their efforts on the treatment of patients who require urgent care.

Spinal surgeons often do urgent surgery to prevent neurological impairment. Many hospital systems have developed protocols for evaluating which operations should be done urgently and which should be delayed. Urgent surgery has been considered the appropriate option in patients exhibiting the following conditions:

1. Risk of permanent and/or potentially reversible serious neurological dysfunction. For example, in some cases surgical stabilization of a traumatic spinal fracture is crucial to preserve spinal cord function. Other urgent cases have included decompression of the spinal cord when it is compressed by metastatic cancer.

2. New and progressive foot drop or hand weakness resulting from compression of specific nerve roots has often been considered urgent surgery.
3. Acute cauda equina compression with progressive severe neurological symptoms.
4. Progressive myelopathy from degenerative disease has also been considered urgent in patients who are falling or at risk of losing important neurological functions.
5. Severe pain from nerve compression is considered urgent in some cases, such as in patients at risk of using opioids or using valuable emergency room resources for pain control management in the outpatient setting. This last situation is subjective to a certain extent and thus decisions regarding the urgency of the need for surgical intervention in these cases varies across health systems.

Another major factor for spinal surgeons, as with other elective proceduralists, are the policies regarding personal protective equipment (PPE). As more patients are admitted to hospitals with active COVID-19 infections, the risk of exposure for spinal surgeons increases. Many hospitals have developed protocols to intubate patients with confirmed COVID-19 infections outside of the operating room (OR) or to have all OR personnel leave the OR during intubation and up to 30 minutes after intubation to allow for airflow management and thus avoid exposing the surgical team to the possible aerosolizing effect on viruses present in the airway during respiratory management. Anesthesiologists have been required to wear N95 masks, while most surgeons have been expected to use regular surgical masks during spinal procedures for which the risk of aerosolization is minimal. While caring for COVID-19–positive patients who might need emergency spine surgery, all personnel are required to wear N95 masks and no personnel other than the anesthesiologist are allowed in the OR for 30 minutes following intubation.

As elective surgery has been reduced in hospitals, many spinal surgeons have been asked to participate in the care of medical patients. In most hospital systems, plans for incorporating non-ICU specialists and surgical physicians into the medical service have been variable. Even so, neurosurgeons and spinal surgeons have been eager and willing to participate on the front lines in the battle against COVID-19, highlighting the high work ethic, commitment to patients, and expertise in critical care inherent in our specialty.

Another consequence of the reduction of elective surgery is lost revenue for hospitals and surgeons. The magnitudes of the effects of lost revenues on medical personnel vary widely, depending on the institutional model for compensation. Most neurosurgeons and hospitals continue to serve the patients in need of care without great concern regarding compensation. However, as the COVID-19 crisis subsides, it will be important to have a strategy in place to manage compensation for spinal surgeons and other specialists who were unable to perform the work that normally would have been done during this period. In addition, the capacity for providing neurosurgical care will need to be increased to accommodate the many patients who had surgery postponed.

The COVID-19 crisis continues to strain our economy,

our spinal surgical providers, and our hospital capacity, and continues to make thousands of people sick—some of whom will die. The impact of this pandemic will be felt for years to come.

Many novel paradigms are rapidly being tested and adopted as a result of the COVID-19 crisis. Some public health principles regarding how to slow infectious disease epidemics will be reinforced by this crisis. In spinal surgery, we are learning that many aspects of what we do can be accomplished with telehealth. Having models to compensate physicians and hospitals for the effective use of telehealth will be one positive aspect of this crisis, which has provided many opportunities for new learning. Other advances as a result of this crisis include maximizing the utilization of web-based meeting and conference platforms as well as remote learning opportunities and course offerings.

These advances are likely to have a broad range of effects, including potentially reduced travel for neurosurgeons, creative changes to revenue streams using web-based educational and conference platforms for organized spine surgery, and more flexible mechanisms to fulfill requirements for continuing medical education. The positive results of these advances include potentially increased access of patients to their surgeons.

The field of neurosurgery was itself born after the First World War, with the need for and ability to care for patients with head and spinal injury in the theater of war. A century later, with the COVID-19 crisis, the minds of today are likely to forge new methods by leveraging cutting edge technology to lead to innovative, effective and potentially revolutionary care for patients with spinal disease.

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## Disclosures

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