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**Commentary on:**

*Spine Surgery in Italy in the COVID-19 Era: Proposal for Assessing and Responding to the Regional State of Emergency* by Rispoli et al. *World Neurosurg* 2020  
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## COVID Contingencies: Resource Rationing on a Global Scale

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Since the beginning of 2020 and its rapid spread across the globe, the coronavirus disease identified in 2019 (COVID-19 pandemic) has presented unique challenges to health care providers of all specialties.<sup>1</sup> Hospitals, particularly in “hot zones,” have been forced to reallocate both personnel and equipment to effectively combat the massive surge in cases that has overwhelmed many health care systems internationally. Spine surgeons have not been immune to the necessary procedures and policies put in place in order to limit patient risk and ration resources, such as personal protective equipment and ventilators. Algorithms have begun to emerge proposing to guide surgical urgency, weighing the presence of or potential for neurologic compromise against system capacity in order to limit treatment in the face of a global pandemic.<sup>2,3</sup>

As capacity became threatened at our institution, proposed surgeries were reviewed on a case-by-case basis by an oversight committee that designated level of acuity across surgical specialties. Relative to spine surgery and even under “pre-COVID” circumstances, our urgent cases have been normally defined by the presence of an acute neurologic deficit or the risk of one if surgery is not provided in a timely fashion. This includes any combination of:

- progressive cervical or thoracic myelopathy
- nerve root compression resulting in acute/progressive motor neurologic deficit
- deformity or instability threatening acute neurologic compromise, such as in the case of neoplasm, infection, or trauma

Otherwise “elective” surgeries, mostly consisting of chronic degenerative disease with stable neurologic function, were postponed. Cases were reviewed weekly by the oversight committee, and appropriateness determined relative to 1) the number of COVID-19 cases in the region and 2) the remaining health care resources available (hospital beds, intensive care unit [ICU] beds, ventilators, etc.). These metrics are still being used to guide hospitals across the Arizona health care system, predicting stress and capacity on a statewide basis. Although governed by stakeholder consensus, the process is both time and manpower intensive.

Despite a significant reduction in spinal surgeries, the challenges imposed on patient advocacy and the negative financial implications not only for departments but for hospital systems as a whole, neurosurgeons and orthopedic spine surgeons have been incredibly responsive and committed to “flattening the curve,” even if it has meant temporarily disrupting their busy elective practices. At the University of Arizona from May through July we saw a decrease in the order of 50%–75% of all surgical volumes during what is hoped to have been the height of our pandemic. In some circumstances, surgeons not in the operating rooms were asked to contribute to staffing emergency departments and ICUs to help accommodate the surge in COVID ventilator-dependent cases.

It is well known that Italy has been one of the hardest hit countries in the international spread of COVID-19. The disease was more densely focused in the northern regions of Italy, where the majority of confirmed cases affected individuals older than 70 years of age, more often men than women, and was “severe” in a quarter

**Key words**

- COVID-19
- Emergency
- Making decision
- Spine surgery

**Abbreviations and Acronyms**

- **COVID-19:** Coronavirus disease identified in 2019
- **ICU:** Intensive care unit

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of those affected.<sup>4</sup> Rispoli et al describe their valuable experience in northern Italy during the first wave of the disease and its inevitable effect on spine surgery and their health care system. Their strategy for quantifying available health care resources factors in doubling-time of the disease obtained from government data and ICU capacity, which together determine an alert status of red, yellow, or green (high, medium, or low system stress). Similarly, they organize spinal conditions into categories of red, yellow, or green: red = acute spinal cord and/or root compression; yellow = chronic but progressive cord and/or root compression, intractable pain, impending deformity; and green = absent or stable neurologic deficit, minimal or absent pain.<sup>3</sup> In this approach only surgical cases with the same or worse color code as the health care alert status can be performed. For example, during "green" system stress all types of spine surgeries are performed, but during "red" system stress only "red" designated spine cases can be considered for surgery. This framework for enabling spine care is particularly clever in that it intuitively quantifies both system stress and the severity of spinal disease in an easy-to-use context, thereby providing objective decision criteria for surgeons and hospital administrators alike.

At the University of Arizona we developed a similar approach for spine surgeries, designating 2 levels of importance consisting of emergent/urgent (Tier II = acute or progressive neurologic deficit or impending deformity ± intractable pain) and elective (Tier I = chronic or nonthreatening disease with normal or stable neurologic function). While our surgical oversight committee has a less quantifiable method for determining system stress, it more broadly looks at trends of cases seen in the region, positivity rates, number of beds and ventilators unoccupied, and the amount of personal protective equipment available to providers for the coming weeks. These resources are reevaluated weekly guiding whether or not surgical cases will be restricted to Tier II only, or if Tier I cases will be allowed to go forward. At the peak of our COVID hospitalizations (June–July) surgical capacity was limited to 50% of normal; Tier I (elective) cases were put on hold for 6 consecutive weeks.

Interestingly, since the arrival of COVID-19 in Arizona in March through to the end of July, only 2 of 127 patients undergoing inpatient spine surgery developed hospital-acquired COVID-19. One was a recently bed-ridden 82-year-old male with progressive spinal deformity and intractable pain who underwent a T10-pelvis

spinal reconstruction and fusion; he tested positive for COVID-19 one week after surgery. Not surprisingly, given his age and the invasiveness of his procedure, the patient had a 3-week stay in the ICU, most of which was spent intubated. He has since recovered and is undergoing rehabilitation in an off-site specialized nursing facility. The second patient was a 63-year-old male who developed a deep wound infection from lumbar decompression surgery in May. On day 5 after irrigation and debridement of his wound, he tested positive for COVID-19 while finalizing his intravenous antibiotic regimen. Uncontrolled fever on postoperative day 4 was the main symptom suspicious of coronavirus infection. After his fever subsided, his course was relatively uncomplicated and he was discharged home. In both cases, consultation with infectious disease and internal medicine was critical in achieving a collaborative, multidisciplinary approach to treat the novel coronavirus acquired in spine surgery patients.

The novel coronavirus has fundamentally changed health care systems around the world and how all specialties practice medicine for now and the foreseeable future. Given the wide variability of spine pathologies ranging from emergent to elective and acute to chronic, spine surgeons in particular have had to adapt to the challenges presented by COVID-19. There is a great necessity to minimize stress on the health care system while keeping up with the number of our patients who need surgery, even if only elective. We commend Rispoli et al<sup>3</sup> for their exceptional dedication and commitment to both their own spine patients and those who benefitted from their strategic approach to prioritizing surgical treatment of spine pathologies in a time of regional crisis. Since Italy was one of the first epicenters outside of China, their work serves as a compelling example for how to treat spine patients in the midst of a pandemic.

Without a guarantee of an effective vaccine in the near future and a resurgence of COVID-19 cases around the world, developing a balanced, methodic strategy for the treatment of spinal disease patients during this pandemic is imperative. Close communication using a multidisciplinary, collaborative approach will maximize the ability of health care systems to simultaneously manage both the COVID-19 pandemic as a whole and the many patients who continue to need our care.

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