

# Economic Shocks From the Novel Coronavirus Disease 2019 Pandemic for Anesthesiologists and Their Practices

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## GLOSSARY

**3D** = 3-dimensional; **CARES** = Coronavirus Aid, Relief, and Economic Security; **CMS** = Centers for Medicare and Medicaid Services; **COVID-19** = Coronavirus Disease 2019; **CRNA** = certified registered nurse anesthetist; **PPE** = personal protective equipment; **WHO** = World Health Organization

On January 30, 2020, the World Health Organization (WHO) declared an outbreak of a novel coronavirus traced to a wet market in Wuhan, a city in the Hubei province of China, a “public health emergency of international concern.”<sup>1</sup> WHO classified the Coronavirus outbreak, commonly known as novel Coronavirus Disease 2019 (COVID-19), as a pandemic on March 11, 2020,<sup>2</sup> and to date, COVID-19 has had a profound impact on the United States health care system and economy.

Anesthesiologists in the United States have responded in several important ways to the clinical surge in demand for inpatient medical and critical care services. Associated fundamental major impacts to anesthesiologists’ practices have included eliminating nonessential surgeries and other procedures, shifting efforts from perioperative to critical care services,

and planning for a “new normal” after the first wave of the pandemic.

The uncertainty and rapid pace of responses to mitigate clinical and socioeconomic impacts of the pandemic are causing added stress to the professional environment for anesthesiologists and their practices. The number and timing of COVID-19 cases vary by locality, which leads to additional uncertainty regarding timing of surges in health care utilization in each community as it responds to the pandemic. This article provides a reflection on the rapid set of fundamental changes in hospital and anesthesia services with a discussion of the responses that might have longer-term implications.

The COVID-19 pandemic represents an “economic shock,” or an unexpected or unpredictable event, that impacts the ability of markets to function normally, leading to a broader economic impact.<sup>3–5</sup> Depending on the situation, economic shocks can affect supply, demand, or both. Examples of past disruptions to the overall United States health care system that have had broad economic impacts include (1) implementation of new payment policies such as Medicare prospective payment systems for inpatient care and bundled payments by some insurers, which led to different incentives regarding the resources used to treat hospitalized patients; (2) the “baby boom” after World War II that shaped many health care planning strategies to project the impact of a surge in the aging population on demand for medical and surgical services in relation to resource allocations, demographics, and preferences that differed from previous generations; and (3) the 1918 influenza virus, which demonstrated that controlling the pandemic was the key to economic recovery.<sup>6</sup> The recent COVID-19–related disruptions have happened both rapidly and globally, which has limited the ability

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This is not a clinical article; it is a longer-term economic, organizational, and policy outlook. The COVID-19 pandemic represents a health care challenge that we have not seen in our lifetimes. We are tremendously appreciative of the efforts, expertise, sacrifices, and risks undertaken by anesthesiologists and other health care professionals. Our opinion is that human nature, science, and market forces support the conclusion that in the long term, the United States health care system will be stronger as a result of the efforts and knowledge gained during this pandemic.

The first author is director of the Center for Anesthesia Workforce Studies (CAWS), which estimates that there are currently 2234 anesthesiologists who are board certified in critical care medicine.

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of the overall health care system and economy to absorb the shocks.

In this article, we use a health economics lens to focus on the various shocks to hospital and anesthesia services in response to the first wave of the COVID-19 pandemic. Current public health emergency efforts have centered around limiting exposures, reducing transmission, and “flattening the curve” so that the gap between health care capacity and patient care needs is smaller when the number of active cases peak.<sup>7,8</sup> Epidemiological data analyses forecast a peak in the number of new COVID-19 cases that varies widely by locality, with the large metropolitan areas of New York, Seattle, New Orleans, and Detroit experiencing earlier surges—prototypic experiences that may help other areas identify with more certainty how many diagnosed cases transition into requiring acute care hospitalizations, intensive care unit admissions, and often prolonged mechanical ventilation.<sup>9–12</sup> We discuss the immediate COVID-19 shocks, what might be expected in the near future, and likely future ebbs and flows of response to COVID-19.

## **COVID-19 SHOCKS TO THE MARKET FOR ANESTHESIA SERVICES**

### **Anesthesia Workforce: Direct and Indirect Effects**

Although not universally implemented, nonessential surgical procedures were placed on hold as an initial response to prepare for an impending surge in COVID-19–related inpatient hospital stays and to mitigate potential spread of the virus within health care facilities. This sudden decrease in demand quickly and directly reduced the planned workload and related financial stability for many anesthesiology practices.

However, the impact of and response to this demand shock can differ depending on the anesthesia practice size, financial structure, and types of services offered within the practice. Reductions in workforce of anesthesia providers and other staff who support practices are a standard, although feared, response to the short-term reduction in nonessential procedure workload. Small- to medium-sized private practice groups whose professional compensation is directly linked to payment for services may be forced to reduce staffing levels more quickly than larger practices and those with other payment arrangements. In a practice arrangement that supports physician anesthesiologists, certified registered nurse anesthetists (CRNAs), and anesthesiologist assistants, decisions regarding the number and type of anesthesia professionals who are furloughed (laid off) are challenging and stressful for practice leaders. Planning for when or if they can be rehired is not feasible until the pandemic subsides. Anesthesia professionals employed by large academic medical centers and health systems may be relatively

more protected from labor force reductions during the initial wave of COVID-19 response due to the overall diversity of services and financial structure of these organizations.

The federal government has issued the Coronavirus Aid, Relief, and Economic Security (CARES) Act to provide financial support to small businesses and individuals who will be adversely impacted by the COVID-19 pandemic.<sup>13</sup> Signed on March 27, 2020, the CARES Act will offer financial support to practices facing furloughs and layoffs, and is expected to temper the direct impact of the short-term reduction in nonessential procedures on anesthesiologists and those they employ.

Limitations on nonessential surgical procedures will temporarily limit opportunities for training new anesthesiologists because many residents will be unable to participate in as many procedures during the COVID-19 pandemic. There will be differences in impact depending on the various types of services delivered by attending anesthesiologists and their trainees. For example, pain medicine specialists with limited critical care or surgical experience may be well positioned to offer consultations using telemedicine technologies, while anesthesiologists who primarily work in ambulatory surgery settings will be more impacted by the sudden reduction and delays in resuming nonessential surgical procedures. Short-term demand for some essential procedures with some flexibility to preschedule, notably those related to normal labor and delivery, have increased temporarily in preparation for anticipated COVID-19 cases. However, the relative number of these procedures is low in comparison to the overall workload reductions from canceling or delaying nonessential procedures.

The increase in COVID-19 patients admitted to hospitals created a sudden surge in demand for anesthesiologists to support critical care. As the disease spreads and the numbers of cases increase, there is an immediate need for even more critical care services. This response will partly hinge on the availability of anesthesiologists for sedation, intubation, and monitoring of ventilator patients. Surge demand for delivering care to critically ill patients will undoubtedly lead to increased risk to the mental health, including stress and burnout, because the role of trained anesthesiologists in caring for ventilator patients is central to supporting the pandemic response.<sup>14</sup>

Caring for critically ill patients with COVID-19 also carries an added risk to the health of anesthesiology professionals and their families. The need to ensure the health and safety of all health care professionals has been a consistent message during the preparations and response to the pandemic.<sup>15,16</sup> Unfortunately, the ability to ensure that safety with adequate supplies of personal protective equipment (PPE) has been met

with challenges in the supply chain that are not thus far being easily remedied.

### **Availability of Anesthesia Inputs and Other Practice Resources**

Several resource inputs commonly used to provide anesthesia services have been rapidly depleted during the early wave of the COVID-19 pandemic. They are anticipated to remain in short supply as the pandemic grows. The impact of this shock is a reduction in the supply of anesthesia services because it reduces the ability of providers to deliver care using the same types of inputs. Lower availability of some inputs will have a more dramatic impact on anesthesia services than others, such as the conversions of anesthesia equipment for use as ventilators. In the short term, this equipment cannot be used to support perioperative care. In a quick response, 3-dimensional (3D) printers have been used to improvise on parts needed to supplement existing machines or repair equipment that was out of service.

As state and federal government agencies along with industry respond to this debilitating shortage in the near and long term, new innovations in ventilator technology are expected. Economic theory maintains that holding all else fixed, innovations will lead to lower costs and more efficiency. The immediate impact of ventilator shortages means that anesthesia services will lack an important resource. The response to increase the supply of ventilators during the current pandemic has come from nontraditional manufacturers, including firms in the automobile and vacuum cleaner industry,<sup>17</sup> which may lead to further innovations through the expanded diversity of design and engineering of new equipment. The influx of new ventilators will remain in the marketplace even after the pandemic subsides, and this equipment can continue to support anesthesia services as either reserve supply or to replace older ventilators.

The increased demand for ventilators to support critically ill COVID-19 patients also increases the demand for and availability of anesthesia drugs and related supplies. Potential shortages of fentanyl, propofol, other sedatives, and muscle relaxants used for ventilator patients are a growing concern. Until this supply recovers, anesthesiologists supporting surgical services will likely increase the use of regional anesthesia, nerve blocks, or other methods that may require advanced skills and more intensive monitoring.

Other supplies that are necessary for infection control, including face shields, gloves, sanitization supplies, and other PPE are scarce, but there have been consistent efforts to improvise, rapidly increase production, and identify priorities in allocating these supplies to address critical shortages. Health care entities and government authorities have been coordinating efforts in many states to identify needed resources that can be provided either

through the federal strategic stockpile of health care supplies for emergencies or through purchases directly from domestic and international manufacturers.

Beyond ventilators and supplies, physical locations of care have rapidly shifted to increase surge capacity for inpatient care. Impacts on anesthesia services due to changing the locus of care from prepandemic settings in hospitals or ambulatory surgical centers to other venues, which are being used to temporarily increase capacity, likely depend on where the temporary surge capacity is housed. Tents, convention centers, hotels, or other temporary facilities may be more disruptive to anesthesia service delivery compared to surge capacity efforts that expand or redeploy existing hospital units/floors or entire hospitals for use during this emergency.

Based on their organizational and governance structures, integrated health care or hospital systems are anticipated to have resource allocation advantages over standalone hospitals. For example, NorthShore University HealthSystem in Evanston, IL, is a 5-hospital system that has designated one of its hospitals to treat only COVID-19 patients.<sup>18</sup> Even when more critical care beds become available and operations return to a new normal, sustained supply chain issues related to basic inputs may persist.

### **Future Surge of Postponed Nonessential Surgeries and Procedures**

Service disruptions due to emergencies typically lead to pent-up demand, or an opposing positive shock, after the emergency subsides. Methods to track disruptions to scheduled care and workloads due to emergencies are available to gauge the severity and impact on individual practices and health care systems.<sup>19,20</sup> Delays in nonessential elective procedures will lead to an increased need for anesthesia services in surgical suites after the surge demand for COVID-19–related critical care declines and facilities are able to safely treat other patients.

Shortages of other medical supplies, such as PPE, have led to increased production of these items, but may cause additional delays in a return to “normal” practice for anesthesiologists. The supply chain for these items is likely to be a short-term concern that recovers relatively quickly and in concert with a return to scheduling of elective surgical procedures.

### **WAVES OF COVID-19**

In the situation and scenarios above, we describe the initial shock to anesthesia services related to the first wave of the COVID-19 pandemic in the United States. Most models of the pandemic predict that COVID-19–related illnesses will occur in several waves, with the most disruptions to health care systems and overall economy during the first wave. Likely innovations in prevention, testing, diagnosis, and treatment will be

used to more quickly inform best practices to support faster identification of outbreaks and to lessen the overall consequences to society in each progressive wave of COVID-19. Because there have already been many lessons learned in the initial wave of the pandemic, better preparation of the health care system, supply chain, and population for future outbreaks is also expected.

Along with more readiness for subsequent waves of COVID-19, or other novel influenza-like illness-causing viruses, there should be less impact in the future on anesthesia services based on the current COVID-19 response. It is crucial to note the relatively flat growth curve in locations around the world (eg, China, South Korea, and New Zealand) where total quarantines and/or strict social isolation were quickly implemented versus the devastating exponential growth in locations where adequate social distancing was not achieved. Clinicians can anticipate that the impact on their practices will be in proportion to the policies enacted in their own location, overall adherence to those policies, population demographics, and other factors that are well beyond their immediate control.

**SUMMARY AND DISCUSSION**

Our assessment of the economic shocks suggests an optimistic outlook for anesthesiologists after the pandemic—a view that may be difficult to accept given the short-term challenges and perceptions of health care sector chaos. The Figure summarizes our perceptions of the economic shocks, including the timing, magnitude, and duration from the first wave of the COVID-19 pandemic.

However, we note that “shocks” in economics are defined as interruptions to a system after which there is

a recovery or return to a new normal of operations. With an overriding concern that the duration and severity of the current pandemic remain unknown, some anesthesiologists and practices are better positioned for the current economic shocks due to differences in training and practice environment. It is likely that, on the margins, some physicians, especially early careerists, may be attracted to organizational structures perceived to be more protected from demand shocks. However, we believe variability in practice type will still exist after the pandemic, and small private-practice groups need not face extinction from the “COVID-19 meteor.”

Based on standard economic concepts, the investments made in most resources needed for the temporary response—surge capacity—can readily return to pre-COVID-19 norms. Changes in the health care workforce may take longer to recover. While the federal stimulus provided through the CARES Act will help mitigate the impact of temporary workforce reductions caused by stopping nonessential procedures, other policies may not match short-term changes in demand for anesthesia services. For example, on March 30, 2020, the US Centers for Medicare and Medicaid Services (CMS) issued regulatory waivers “to rapidly expand the health care workforce,” which included the temporary suspension of the requirements for physician supervision of CRNAs during the COVID-19 response.<sup>21</sup> Although well intentioned, there seems to be no economic need to do so in light of the reduction in nonessential surgical and procedural care. While these waivers are expected to expire when the pandemic ends, policies that change scope of practice for health care practitioners could have much longer-lasting effects.

Shocks to Anesthesia Service Delivery	Timing	Magnitude	Impact
<b>Reduced/postponed non-essential health services</b>			
Layoffs due to changing economic conditions and mismatch of expertise	Short-term	Large	National
Interruptions to education and training	Intermediate	Moderate	National
<b>Surge demand for inpatient medical and critical care services</b>			
Increased need for workforce (medical inpatient and critical care)	Short-term	Moderate	Regional
Shortages of beds	Short-term	Large	Regional
Equipment shortages (ventilators)	Short-term	Large	Regional
Personal protective equipment (PPE) shortages	Short-term	Large	National
Drug shortages	Intermediate	Large	National
<b>Future surge demand for postponed health services</b>			
Workforce return to work/availability	Intermediate	Small to Moderate	Local to Regional
Availability of beds, equipment & supplies	Short-term	Small	Local to Regional

**Figure.** Economic shocks caused by initial COVID-19 wave impacting anesthesia services in the United States (future waves or outbreaks of COVID-19 or other novel influenza-like illness-causing viruses would lead to similar shocks, but would be expected to have a more attenuated effect relative to the current COVID-19 pandemic and response). COVID-19 indicates Coronavirus Disease 2019.

Anesthesiology is a preeminent specialty, and the value of physician anesthesiologists has been clearly demonstrated during the early stages of the COVID-19 pandemic. The US surgeon general is an anesthesiologist. The vice president of the United States recognized the leadership roles of physician anesthesiologists and the American Society of Anesthesiologists.<sup>22</sup> Anesthesiology will continue to be viewed as a more versatile and desirable specialty option for medical students due to the ability to have training in perioperative, pain, and critical care medicine. The number of anesthesiology residency programs and residents continues to increase. In 2020, anesthesiology had a 99.4% match with 1883 anesthesiology candidates matched to 1894 anesthesiology available positions.<sup>23</sup>

These are unprecedented times. The immediate priorities are to mitigate the spread of the current pandemic, ensure appropriate health care services capacity, and provide health care professionals with the resources needed to effectively and safely care for COVID-19 patients. Anesthesiologists have quickly demonstrated their value beyond the perioperative setting in caring for critically ill medical patients. ■

#### DISCLOSURES

**Name:** Thomas R. Miller, PhD, MBA.

**Contribution:** This author helped develop the topic and its outline, and with drafting and review of the manuscript.

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**Contribution:** This author helped develop the topic and its outline, and with drafting and review of the manuscript.

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