

# COVID-19 and Trauma Care: Improvise, Adapt, and Overcome!

Richard P. Dutton, MD, MBA,\*† Thomas E. Grissom, MD, FCCM,‡ and Frank Herbstreit, Dr Med§

## GLOSSARY

**BAL** = bronchoalveolar lavage; **COVID-19** = coronavirus disease 2019; **CT** = computed tomography; **ICU** = intensive care unit; **PONV** = postoperative nausea and vomiting; **PPE** = personal protective equipment; **SARS-COV-2** = severe acute respiratory syndrome coronavirus 2

The global coronavirus pandemic has affected every aspect of modern life, including health care, yet few specialties are so directly affected as trauma anesthesiology. Quieter city streets with less vehicular traffic have reduced the volume of trauma cases, but injured patients now pose a unique new challenge: the risk of infection with severe acute respiratory syndrome coronavirus 2 (SARS-COV-2).<sup>1</sup> The need for infection control measures, superimposed on the need for rapid treatment, has forced the development of new protocols.

This issue of *Anesthesia & Analgesia* includes an article by Gong et al<sup>2</sup> from Wuhan, China, describing their experience caring for trauma patients during the initial coronavirus disease 2019 (COVID-19) surge in Wuhan, China.

The key recommendations of Gong et al<sup>2</sup> include the following:

- Screening and testing every patient on admission for coronavirus infection
- Rigorous adherence to the use of personal protective equipment (PPE) for medical care of emergency surgery patients, regardless of screening status
- Collection of bronchoalveolar lavage (BAL) specimens at the time of intubation in patients with uncertain status

- Use of computed tomography (CT) scan, a common diagnostic tool in trauma patients, to additionally diagnose COVID-19
- Use of negative pressure operating rooms for emergency cases
- Preoperative review of medications, noting the potential anesthetic interactions of chloroquine or hydroxychloroquine (dysrhythmia) and lopinavir–ritonavir (increased placental transfer of bupivacaine)
- Consideration of the potential for coagulation disorders in COVID-19 patients
- For general anesthesia, rapid sequence intubation with minimal bag-valve-mask ventilation
- Damage control principles for surgery in severely injured patients, minimizing organ manipulation and surgical duration
- Lung-protective ventilation and goal-directed fluid therapy, with individualized resuscitation aimed at restoring and maintaining euvolesmia
- Extubation in the operating room, with transport directly to a dedicated COVID unit if possible
- Measurement of D-dimer to assess ongoing systemic inflammation, with aggressive use of thromboprophylaxis once bleeding risk has dissipated
- Routine use of multimodal analgesia and postoperative nausea and vomiting (PONV) prophylaxis
- Limited family visitation with appropriate social distancing

While much of this information will seem routine for experienced trauma anesthesiologists, the integration of COVID-19–specific recommendations for avoiding viral spread makes this article an important read. The need for trauma and emergency surgery is not going away, but the additional need for preserving the health and safety of the anesthesia workforce—**not to mention other patients in the hospital—**makes

From the \*US Anesthesia Partners, Dallas, Texas; †Texas A&M University College of Medicine, Dallas, Texas; ‡Department of Anesthesiology, R Adams Cowley Shock Trauma Center, University of Maryland School of Medicine, Baltimore, Maryland; and §Department of Anesthesiology and Intensive Care Medicine, University Hospital Essen, Universitaet Duisburg-Essen, Essen, Germany.

Accepted for publication April 30, 2020.

Funding: None.

The authors declare no conflicts of interest.

Reprints will not be available from the authors.

Address correspondence to Richard P. Dutton, MD, MBA, US Anesthesia Partners, Dallas, TX. Address e-mail to richard.dutton@usap.com.

Copyright © 2020 International Anesthesia Research Society  
DOI: 10.1213/ANE.0000000000004944

the tactical advice in this article a useful guide for any hospital anesthesia department and staff.

Not addressed by Gong et al,<sup>2</sup> but very much on the minds of those confronting a local surge in COVID-19 patients, are the difficult ethical questions posed by the disease: protection of health care workers versus rapid treatment of critical trauma patients; rationed use of blood products; and tough decisions about surgical timing and resource allocation.

During the COVID-19 pandemic, there has been a focus on protecting perioperative health care providers to sustain their ability to care for both nonelective and COVID-19 patient populations. For many hospital systems, this has been a challenge with shortages of PPE, changes in patient flow, and altered staffing requirements.

For regions with a high incidence of COVID-19, Gong et al<sup>2</sup> have suggested that the standard PPE approach should include implementation of high-level precautions (level 3) for all trauma and acute care surgical patients, including the use of negative pressure receiving and operating rooms where available. Given the need for universal precautions in all trauma admissions, this adds the requirement for an N95 respirator or powered air-purifying respirator system for all clinicians in close patient proximity. Additional gowning might be needed as well, depending on available supplies.

While the approach does not appear to add a large burden for trauma admission preparation, the shortage of PPE, limited access to true negative pressure capability, and need to emergently move patients from the receiving location or emergency department to the operating room can challenge our usual expectations for trauma care.

When time from the field to admission is adequate, there should be little trouble preparing for the patient's arrival. In the urban setting, however, this time interval can be extremely short. In the face of sometimes chaotic early evaluation and treatment period, the maintenance of strict level 3 precautions becomes extremely challenging. Medical professionals supporting trauma need to balance rapid interventions, including intubation, manual ventilation, chest tube placement, and other invasive procedures, against the risk of exposure. This applies not only to anesthesiologists but also all medical professionals providing care for the trauma patient.<sup>3,4</sup> The need to preserve our highly skilled workforce must be emphasized even in settings where time to interventions is critical.

We are seeing other challenges related to trauma management that might influence our actions. One of the major concerns is a decrease in blood product availability. While the risk of transmission of the SARS-CoV-2 remains theoretical, donor centers are excluding symptomatic individuals or potential

donors with known or potential close contact with a person with COVID-19.<sup>5</sup> Current recommendations are that these individuals should refrain from donating until at least 28 days after resolution of symptoms or last contact, respectively. The real threat, however, is not from the virus itself, but from the impact of social distancing on blood collection, as donor centers might be closed, and prospective donors might choose to remain home.<sup>6</sup>

Many institutions have implemented blood conservation programs affecting blood availability, transfusion triggers, and massive transfusion events. In specific cases, this might require a discussion among the care team regarding the utility of ongoing resuscitative efforts due to concerns about diverting resources that might benefit other patients. Gong et al<sup>2</sup> acknowledge that increased attention to blood conservation practices might be necessary to minimize difficult decisions.

In the face of a potentially lethal and highly contagious disease and international shortages of equipment and medications, anesthesiologists have led their hospitals in adopting new standards for PPE and have pioneered mechanisms for recycling and reusing needed equipment. As innovators, we have developed novel solutions for infection control and workforce safety, ranging from homemade respirator systems, to the intubating teams used in Wuhan, to "intubation boxes" to limit viral spread in the operating room.

In our capacity as intensivists, anesthesiologists have helped open thousands of new intensive care unit (ICU) beds around the world and have equipped them with repurposed anesthesia machines, invasive monitoring, and expert clinician coverage. Anesthesiologists in less busy facilities have welcomed transfers from hard-hit areas or travelled themselves to provide additional coverage where desperately needed.

In the face of a global crisis, an unexpectedly high number of patients, and shortages in personnel and equipment, anesthesiologists and intensivists have initiated interprofessional collaborations to optimize patient care. Through mostly informal contacts, knowledge has been transferred from countries that were heavily impacted early to enable better care in areas affected later by the pandemic. We have developed collaborations that will reach far into the future.

Trauma anesthesiology is already one of the most collaborative specialties in medicine, spanning from prehospital to the operating room to intensive care, and connecting with multiple surgical and medical subspecialties. Even more than local connections, though, the trauma care community has always been closely connected across systems, nations, and the entire world.

Our outcome research has benefitted from multi-institutional registries and from the ability to share knowledge rapidly through scientific and practice communities. Early in the crisis, the Trauma Anesthesiology Society, working with DocMatter, created an open discussion forum with >30,000 users (<https://www.docmatter.com/dm/app/profile/specialty/?id=11110>). Anesthesiologists around the world are in regular communication with colleagues in hard-hit areas—including Wuhan, Milan, and New York City—and are sharing the lessons learned with their professional colleagues and hospital administrators.

A novel disease requires novel therapies. Anesthesiologists worldwide are collaborating with intensivists and infectious disease specialists to expedite clinical trials of promising prophylactic and therapeutic agents. These efforts are likely to lead to therapies that can effectively counter the disease and limit its spread, with a future cascade of benefit to medical knowledge and the treatment of other viral conditions. Even the risk to health care workers is being assessed, for example, the IntubateCOVID project organized by researchers at the University of Pennsylvania is designed to gather real-world experience from anesthesiologists called to care for patients with COVID-19 ([www.intubatecovid.org](http://www.intubatecovid.org)). We urge every practicing anesthesiologist to participate.

While COVID-19 has changed the world as we know it, the ability of trauma anesthesiologists to adjust to chaotic circumstances, novel patient injuries, and changing environmental conditions will stand us

in good stead. Like the US Marines, we have improvised, we have adapted, and we will overcome! ■■

#### DISCLOSURES

**Name:** Richard P. Dutton, MD, MBA.

**Contribution:** This author helped review the primary paper and conceive, draft, and edit this commentary.

**Name:** Thomas E. Grissom, MD, FCCM.

**Contribution:** This author helped review the primary paper and conceive, draft, and edit this commentary.

**Name:** Frank Herbstreit, Dr Med.

**Contribution:** This author helped review the primary paper and conceive, draft, and edit this commentary.

**This manuscript was handled by:** Thomas R. Vetter, MD, MPH.

#### REFERENCES

1. Samsami M, Zebarjadi Bagherpour J, Nematihonar B, Tahmasbi H. COVID-19 pneumonia in asymptomatic trauma patients; report of 8 cases. *Arch Acad Emerg Med.* 2020;8:e46.
2. Gong Y, Cao X, Mei W, et al. Anesthesia consideration and infection precaution for emergency trauma patients during COVID-19 epidemic. *Anesth Analg.* 2020;XX:XXX.
3. Givi B, Schiff BA, Chinn SB, et al. Safety recommendations for evaluation and surgery of the head and neck during the COVID-19 pandemic. *JAMA Otolaryngol Head Neck Surg.* 2020 March 31 [Epub ahead of print].
4. Khak M, Manafi-Rasi A, Zanjani LO, Nabian MH. Trauma orthopedic surgeries in COVID-19 pandemic; a trauma management algorithm. *Arch Bone Jt Surg.* 2020;8(Suppl 1):286–290.
5. AABB. COVID-19 Toolkit. Available at: <http://www.aabb.org/advocacy/regulatorygovernment/Documents/COVID-19-Toolkit.pdf>. Accessed April 22, 2020.
6. Gehrie EA, Frank SM, Goobie SM. Balancing supply and demand for blood during the COVID-19 pandemic. *Anesthesiology.* 2020 April 13 [Epub ahead of print].