human angiotensin-converting enzyme 2, the virus entered the brain *via* the olfactory bulb generating a lethal infection linked to involvement of medullary respiratory centers and secretion of interleukin 6.[4] Viral cytopathic effects on the brain could potentially complicate other neurocognitive sequelae of critical illness.

Additional clinical manifestations merit attention. Conjunctivitis has been reported as a presenting syndrome, emphasizing the importance of eye protection to reduce transmission. Maculopapular eruptions and pseudo-chilblains are among dermatologic symptoms of COVID-19.[5] Emerging data suggest that COVID-19 may present like Kawaski syndrome in children, with fever, gastrointestinal symptoms, conjunctivitis, rash, and/or myocarditis.[6] Now that COVID-19 has become prevalent in many regions, providers must be vigilant for atypical or asymptomatic presentations.

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Competing Interests

The authors declare no new competing interests.

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Perioperative Care for Patients with COVID-19: Comment

To the Editor:

I have read Chen *et al.*'s[1] article "Perioperative Management of Patients Infected with the Novel Coronavirus: Recommendation from the Joint Task Force of the Chinese Society of Anesthesiology and the Chinese Association of Anesthesiologists" with great interest. After the coronavirus disease 2019 (COVID-19) pandemic, I believe that there will be a substantial need for management strategies focused on care of the patient previously infected with COVID-19. As of March 28, 2020, more than 1,000 patients required ICU level of care related to COVID; this number is certainly much higher at the time of this letter.[2] There appears to be sparse data published up to this point regarding COVID-19 patients in the weeks and months after infection, particularly when intensive care is required. I believe that your team is uniquely suited to provide informed guidance on the perioperative care of these patients. Given the number of unanswered questions, any experiences that you have pertaining to this population after the acute setting may address the potential medical needs of this unique population as elective surgeries again resume in the United States and worldwide.

Competing Interests

The author is a paid scientific speaker for Merck Pharmaceuticals, Kenilworth, New Jersey.

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Perioperative Care for Patients with COVID-19: Reply

In Reply:

We sincerely thank Dr. Williams[1] for his interest in our article[2] and for his provocative question. As the world passes five million recorded cases of coronavirus disease 2019 (COVID-19) and the number is still rising, we also recognize the importance of developing management strategies for COVID-19 patients after the initial discharge home. As of May 25, 2020, more than 79,000 patients, or 94% of all registered cases in China, have been discharged home from either designated facilities or hospitals. The discharge criteria for COVID-19 patients include (1) body temperature return to normal for more than 3 days, (2) oxygen saturation measured by pulse oximetry (Spo_2) at or greater than 94% on room air, and (3) two consecutive negative nucleic acid tests.[3] However, data have shown that with the current discharge criteria, 38 (29%) of 131 discharged patients, half of whom were severe cases of COVID-19, still had one or more symptoms including cough, fatigue, expectoration, and chest tightness in the second week after discharge.[4] There is no significant difference in the profile and severity of the symptoms between the patients in severe and nonsevere COVID-19 categories.[4] It had been reported that several cases whose nucleic acid test was negative at discharge had reappeared positive afterward.[4,5] Therefore, we routinely follow up on these patients 2 to 4 weeks after discharge, and quarantine either at home or a designated facility is often required during the follow-up.

If a COVID-19 patient after being discharged home is readmitted for surgery or anesthesia care, precautions in perioperative settings should be taken. However, standardized protocols have not yet been well defined. In most hospitals in China, the nucleic acid tests are done at readmission. A patient is usually considered a non–COVID-19 patient if she or he has two consecutive negative nucleic acid tests within the past 7 days with an interval of more than 24 h. In some patients having symptoms or signs indicating a possible recurrence of COVID-19, the additional nucleic acid test is performed even if there are two negative results. If the patient's surgery or intervention is emergent and the results of the nucleic acid tests remain unavailable, she or he is treated as a suspected patient. The protective measures for a suspected or confirmed patient in perioperative settings are the same as those described in our recent article.[2]

We hope that we have answered adequately the question posed by Dr. Williams. However, at present, rehospitalization for surgical treatment after the recovery of critically ill patients with COVID-19 infection is rare. The best strategy of follow-up and long-term care of this population remains to be determined. We are keen to work with our international colleagues to address this issue in the future with scientific evidence.

Competing Interests

The authors declare no competing interests.

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Shared Ventilation: Toward Safer Ventilator Splitting in Resource Emergencies

To the Editor:

Shortages of mechanical ventilators during the COVID-19 pandemic have prompted clear messaging about the hazards of ventilating multiple patients with a single ventilator.[1] Nonetheless, some hospitals are forced to undertake the practice. A protocol using pressure control ventilation for well-matched patients under deep sedation and neuromuscular blockade[2] and novel solutions for some limitations of ventilator splitting have been published.[3–5] These recommendations mitigate some concerns about ventilator settings and monitoring.[1] Adequate matching of ventilator parameters (driving pressure, respiratory rate, and positive end-expiratory pressure [PEEP]) and continuous or frequent monitoring for each individual patient (oxygen saturation measured by pulse oximetry, end-tidal carbon dioxide, pH, and PCO_2) are complimented by monitoring of shared ventilator parameters (*e.g.*, driving pressure, PEEP, total tidal volume [V_T], and dynamic compliance), with alarms set for deviations from initial values.[2]

However, several potential situations deserve further thought to improve safety in an inherently unsafe technique:

(1) Changes in one patient affecting the other: Potential issues include respiratory compliance changes, saturation of airway filters (increasing resistance, which may be imbalanced across circuits), pneumothorax, or obstruction in the circuit or airway. In pressure control ventilation, none of these scenarios would lead to significantly changed ventilation in the shared patient(s), but clearly risks hypoventilation for the affected patient. We found that even seemingly minor obstructions like failure to fully retract a closed suction catheter can decrease V_T for that circuit in test lungs with shared ventilation. Similarly, secretions that saturate heat and moisture exchange filters or obstruct the airway could impact V_T unequally. Compliance changes or obstruction should be detected with individual patient monitoring and ventilator alarms set for small deviations from expected total V_T. Although total V_T is an inherently inaccurate reflection of patient ventilation, a trended change should prompt evaluation for changes in individual patient V_T. Options for earlier detection include (a) individual patient V_T monitoring (as close to the patient as possible, on the ventilator side of the distal filter) and/or (b) continuous side stream measurement of distal circuit airway pressures, with peak and trough (PEEP) alarms set (fig. 1). A pressure transducer can be attached to a sampling port as near the patient's airway; this can be directly connected without tubing and used dry, to avoid introduction of fluid that may saturate filters.

(2) Importance of deep sedation and neuromuscular blockade: Patient–ventilator interactions (and impact on shared patient[s]) are largely mitigated by maximized ventilator trigger thresholds and deep sedation/neuromuscular blockade. Added protection can be provided by one-way check valves distal to the splitter for each patient's inspiratory and expiratory circuit limbs, preventing flow of expiratory gas from a coughing patient into shared patients' circuits. Still, coughing would pause ventilation for both patients. Thus, early detection of inadequate sedation/neuromuscular blockade and impending patient–ventilator dyssynchrony can be facilitated by continuous measurement of distal airway pressures, with alarms sensitive to high or negative airway pressures (this can be monitored remotely).

(3) Matching of patients throughout shared ventilation: Ideally, patients with divergent V_Ts or compliances should not share ventilation. Even if initially matched, deterioration or recovery may occur differentially, resulting in compliance mismatching. Adding inspiratory limb flow