

Table 2. Recommendations and statements

| | Recommendation | Strength |
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| | Infection Control and Testing: | |
| 1 | For healthcare workers performing aerosol-generating procedures* on patients with COVID-19 in the ICU, we recommend using fitted respirator masks (N95 respirators, FFP2, or equivalent) , as opposed to surgical/medical masks, in addition to other personal protective equipment (i.e., gloves, gown, and eye protection, such as a face shield or safety goggles) | Best practice statement |
| 2 | We recommend performing aerosol-generating procedures on ICU patients with COVID-19 in a negative pressure room. | Best practice statement |
| 3 | For healthcare workers providing usual care for non-ventilated COVID-19 patients, we suggest using surgical/medical masks, as opposed to respirator masks, in addition to other personal protective equipment (i.e., gloves, gown, and eye protection, such as a face shield or safety goggles). | Weak |
| 4 | For healthcare workers who are performing non-aerosol-generating procedures on mechanically ventilated (closed circuit) patients with COVID-19, we suggest using surgical/medical masks, as opposed to respirator masks, in addition to other personal protective equipment (i.e., gloves, gown, and eye protection, such as a face shield or safety goggles). | Weak |
| 5 | For healthcare workers performing endotracheal intubation on patients with COVID-19, we suggest using video-guided laryngoscopy, over direct laryngoscopy, if available. | Weak |
| 6 | For COVID-19 patients requiring endotracheal intubation , we recommend that endotracheal intubation be performed by the healthcare worker who is most experienced with airway management in order to minimize the number of attempts and risk of transmission. | Best practice statement |
| 7.1 | For intubated and mechanically ventilated adults with suspicion of COVID-19: For diagnostic testing, we suggest obtaining lower respiratory tract samples in preference to upper respiratory tract (nasopharyngeal or oropharyngeal) samples. | Weak |
| 7.2 | For intubated and mechanically ventilated adults with suspicion of COVID-19: With regard to lower respiratory samples, we suggest obtaining endotracheal aspirates in preference to bronchial wash or bronchoalveolar lavage samples. | Weak |
| | Hemodynamics: | |
| 8 | In adults with COVID-19 and shock , we suggest using dynamic parameters skin temperature, capillary refilling time, and/or serum lactate measurement over static parameters in order to assess fluid responsiveness. | Weak |
| 9 | For the acute resuscitation of adults with COVID-19 and shock , we suggest using a conservative over a liberal fluid strategy. | Weak |
| 10 | For the acute resuscitation of adults with COVID-19 and shock , we recommend using crystalloids over colloids. | Weak |
| 11 | For the acute resuscitation of adults with COVID-19 and shock , we suggest using buffered/balanced crystalloids over unbalanced crystalloids. | Weak |

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| 12 | For the acute resuscitation of adults with COVID-19 and shock , we recommend against using hydroxyethyl starches. | Strong |
| 13 | For the acute resuscitation of adults with COVID-19 and shock , we suggest against using gelatins. | Weak |
| 14 | For the acute resuscitation of adults with COVID-19 and shock , we suggest against using dextrans. | Weak |
| 15 | For the acute resuscitation of adults with COVID-19 and shock , we suggest against the routine use of albumin for initial resuscitation. | Weak |
| 16 | For adults with COVID-19 and shock , we suggest using norepinephrine as the first-line vasoactive agent, over other agents. | Weak |
| 17 | If norepinephrine is not available, we suggest using either vasopressin or epinephrine as the first-line vasoactive agent, over other vasoactive agents, for adults with COVID-19 and shock . | Weak |
| 18 | For adults with COVID-19 and shock , we recommend against using dopamine if norepinephrine is available. | Strong |
| 19 | For adults with COVID-19 and shock , we suggest adding vasopressin as a second-line agent, over titrating norepinephrine dose, if target mean arterial pressure (MAP) cannot be achieved by norepinephrine alone. | Weak |
| 20 | For adults with COVID-19 and shock , we suggest titrating vasoactive agents to target a MAP of 60-65 mmHg, rather than higher MAP targets. | Weak |
| 21 | For adults with COVID-19 and shock with evidence of cardiac dysfunction and persistent hypoperfusion despite fluid resuscitation and norepinephrine , we suggest adding dobutamine, over increasing norepinephrine dose. | Weak |
| 22 | For adults with COVID-19 and refractory shock , we suggest using low-dose corticosteroid therapy (“shock-reversal”), over no corticosteroid. Remark: A typical corticosteroid regimen in septic shock is intravenous hydrocortisone 200 mg per day administered either as an infusion or intermittent doses. | Weak |
| Ventilation | | |
| 23 | In adults with COVID-19, we suggest starting supplemental oxygen if the peripheral oxygen saturation (SPO ₂) is < 92%, and recommend starting supplemental oxygen if SPO ₂ is < 90% | Weak Strong |
| 24 | In adults with COVID-19 and acute hypoxemic respiratory failure on oxygen , we recommend that SPO ₂ be maintained no higher than 96%. | Strong |
| 25 | For adults with COVID-19 and acute hypoxemic respiratory failure despite conventional oxygen therapy, we suggest using HFNC over conventional oxygen therapy. | Weak |
| 26 | In adults with COVID-19 and acute hypoxemic respiratory failure , we suggest using HFNC over NIPPV. | Weak |
| 27 | In adults with COVID-19 and acute hypoxemic respiratory failure , if HFNC is not available and there is no urgent indication for endotracheal intubation, we suggest a trial of NIPPV with close monitoring and short-interval assessment for worsening of respiratory failure. | Weak |
| 28 | We were not able to make a recommendation regarding the use of helmet NIPPV compared with mask NIPPV. It is an option, but we are not certain about its safety or efficacy in COVID-19. | No recommendation |

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| 29 | In adults with COVID-19 receiving NIPPV or HFNC, we recommend close monitoring for worsening of respiratory status, and early intubation in a controlled setting if worsening occurs. | Best practice statement |
| 30 | In mechanically ventilated adults with COVID-19 and ARDS, we recommend using low tidal volume (Vt) ventilation (Vt 4-8 mL/kg of predicted body weight), over higher tidal volumes (Vt>8 mL/kg). | Strong |
| 31 | For mechanically ventilated adults with COVID-19 and ARDS , we recommend targeting plateau pressures (Pplat) of < 30 cm H ₂ O. | Strong |
| 32 | For mechanically ventilated adults with COVID-19 and moderate to severe ARDS, we suggest using a higher PEEP strategy, over a lower PEEP strategy. Remarks: If using a higher PEEP strategy (i.e., PEEP > 10 cm H ₂ O), clinicians should monitor patients for barotrauma. | Strong |
| 33 | For mechanically ventilated adults with COVID-19 and ARDS, we suggest using a conservative fluid strategy over a liberal fluid strategy. | Weak |
| 34 | For mechanically ventilated adults with COVID-19 and moderate to severe ARDS , we suggest prone ventilation for 12 to 16 hours , over no prone ventilation. | Weak |
| 35.1 | For mechanically ventilated adults with COVID-19 and moderate to severe ARDS : We suggest using, as needed, intermittent boluses of neuromuscular blocking agents (NMBA), over continuous NMBA infusion, to facilitate protective lung ventilation. | Weak |
| 35.2 | In the event of persistent ventilator dyssynchrony, the need for ongoing deep sedation, prone ventilation, or persistently high plateau pressures, we suggest using a continuous NMBA infusion for up to 48 hours. | Weak |
| 36 | In mechanically ventilated adults with COVID-19 ARDS, we recommend against the routine use of inhaled nitric oxide. | Weak |
| 37 | In mechanically ventilated adults with COVID-19, severe ARDS and hypoxemia despite optimizing ventilation and other rescue strategies, we suggest a trial of inhaled pulmonary vasodilator as a rescue therapy; if no rapid improvement in oxygenation is observed, the treatment should be tapered off. | Weak |
| 38 | For mechanically ventilated adults with COVID-19 and hypoxemia despite optimizing ventilation, we suggest using recruitment maneuvers, over not using recruitment maneuvers. | Weak |
| 39 | If recruitment maneuvers are used, we recommend against using staircase (incremental PEEP) recruitment maneuvers. | Strong |
| 40 | In mechanically ventilated adults with COVID-19 and refractory hypoxemia despite optimizing ventilation, use of rescue therapies, and proning, we suggest using venovenous (VV) ECMO if available, or referring the patient to an ECMO center. Remark: Due to the resource-intensive nature of ECMO, and the need for experienced centers and healthcare workers, and infrastructure, ECMO should only be considered in carefully selected patients with COVID-19 and severe ARDS. | Weak |
| Therapy | | |
| 41 | In mechanically ventilated adults with COVID-19 and respiratory failure (without ARDS), we suggest against the routine use of systemic corticosteroids. | Weak |
| 42 | In mechanically ventilated adults with COVID-19 and ARDS , we suggest using systemic corticosteroids, over not using corticosteroids. | Weak |

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| | <p>Remark: The majority of our panel support a weak recommendation (i.e. suggestion) to use steroids in the sickest patients with COVID-19 and ARDS. However, because of the very low-quality evidence, some experts on the panel preferred not to issue a recommendation until higher quality direct evidence is available.</p> | |
| 43 | <p>In mechanically ventilated patients with COVID-19 and respiratory failure, we suggest using empiric antimicrobials/antibacterial agents, over no antimicrobials.</p> <p>Remark: if the treating team initiates empiric antimicrobials, they should assess for de-escalation daily, and re-evaluate the duration of therapy and spectrum of coverage based on the microbiology results and the patient’s clinical status.</p> | Weak |
| 44 | For critically ill adults with COVID-19 who develop fever, we suggest using acetaminophen/paracetamol for temperature control, over no treatment. | Weak |
| 45 | In critically ill adults with COVID-19, we suggest against the routine use of standard intravenous immunoglobulins (IVIG). | Weak |
| 46 | In critically ill adults with COVID-19, we suggest against the routine use of convalescent plasma. | Weak |
| 47.1 | In critically ill adults with COVID-19: we suggest against the routine use of lopinavir/ritonavir. | Weak |
| 47.2 | There is insufficient evidence to issue a recommendation on the use of other antiviral agents in critically ill adults with COVID-19. | No recommendation |
| 48 | There is insufficient evidence to issue a recommendation on the use of recombinant rIFNs, alone or in combination with antivirals, in critically ill adults with COVID-19. | No recommendation |
| 49 | There is insufficient evidence to issue a recommendation on the use of chloroquine or hydroxychloroquine in critically ill adults with COVID-19. | No recommendation |
| 50 | There is insufficient evidence to issue a recommendation on the use of tocilizumab in critically ill adults with COVID-19. | No recommendation |