

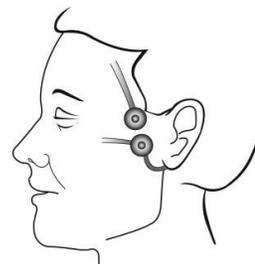
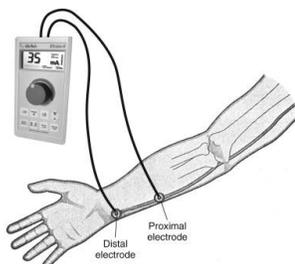
Neurological systems assessment

If your patient is intubated and sedated:

- Perform full neurological assessment at shift change with oncoming nurse and Q4hours.
- If your patient is intubated, it may not be appropriate to perform a sedation vacation and assess them for a spontaneous breathing trial. Please discuss whether this is appropriate with your clinical team members and obtain an order to hold SAT/ SBT as appropriate.
- Critically ill COVID-19 patients may require advanced ventilator settings that may be painful or difficult for these patients to tolerate. It is important to ensure adequate pain management and sedation.
- If your patient has to be paralyzed to achieve ventilator synchrony, ensure that their pain management is addressed and appropriate RASS goal is ordered.
- Paralyzed patients on a continuous neuromuscular blockade infusion should be monitored using the peripheral nerve stimulator (train of four assessment):

How to use the peripheral nerve stimulator:

Clean the area of skin where you will apply the electrodes with alcohol pads. The electrodes can either be placed on the forearm or on the face:



Ulnar testing preferred: Using the ulnar nerve makes assessment of twitches more accurate.

Ulnar nerve testing: extend arm, palm up, in relaxed position

- ✓ Place the distal (black) electrode at the flexor crease, and the proximal (red) electrode about 2 cm further up the forearm.
- ✓ Attach leads from PNS to patient: black (-) → distal electrode (near flexor crease) red (+) → proximal electrode.
- ✓ Depress the TOF button- use visual or tactile (more accurate) assessment to determine THUMB twitches.

Facial nerve testing:

- ✓ Place (+) (red lead) electrode at outer canthus (-) (black lead) electrode 2 cm below aligned with tragus.
 - ✓ After depressing TOF button, use visual or tactile (more accurate) assessment to determine number of twitches above eyebrow.
 - ✓ Goal: 2-3 twitches in response to stimulation. If you have 0 out of 4 twitches, your patient may be overparalyzed. If you have 4 out of 4 twitches, your patient is likely underparalyzed.
 - ✓ Perform a TOF assessment 15 minutes after you titrate your paralytic to ensure you are meeting your TOF goal as written in your continuous paralytic infusion.
 - ✓ If you are on a steady rate infusion of paralytic, perform TOF assessment Q4H
- Common medications used to paralyze patients:

Drug	Standard Concentration	Starting Dose and Titration	Max Rate	Goal Parameter
Cisatracurium [Nimbex®]	100 mg/100 mL 0.9% NaCl	Recommended start dose: Bolus 0.15-0.2 mg/kg Infusion 1 mcg/kg/min Recommended rate change: 1 mcg/kg/min every 10 minutes	Critical Care 10 mcg/kg/min	PNS 2 to 3 out of 4

Drug	Standard Concentration	Starting Dose and Titration	Max Rate	Goal Parameter
Vecuronium [Norcuron®]	100 mg/100 mL 0.9% NaCl	Recommended: Bolus: 0.08 to 0.1mg/kg Infusion: 0.8mcg/mcg/kg/min Recommended rate change: 0.1 mcg/kg/min every 10 min	Critical Care 1.2 mcg/kg/min	PNS 2 to 3 out of 4 (Avoid in renal or hepatic failure)

If your patient is awake and interactive:

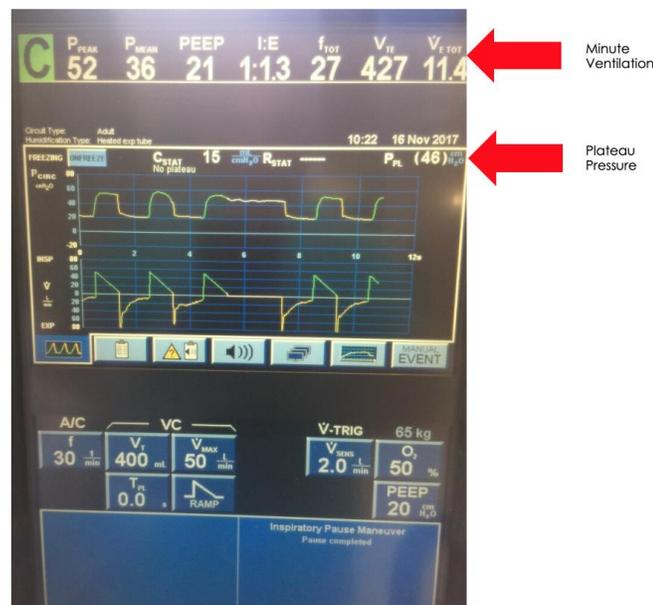
- Perform full neurological assessment at shift change with nurse giving report and Q4hours.

- Be understanding about the anxiety and uncertainty this disease can bring in our patients. Ensure that patients are updated regarding the plan of care.
- Pain management is important – excess coughing may cause muscle strain, as well as muscle aches and pains that are a symptom of this infection.

Respiratory systems assessment

Critically ill COVID-19 patients will often present similarly to ARDS with extreme hypoxia, although these patient's lungs are generally more compliant than traditional ARDS presentation. This means that they may require advanced ventilatory support modes such as APRV, which generally requires **higher PEEP and low tidal volume** ventilatory strategies:

- Monitor the plateau pressure. Plateau pressure represents the pressure inside the alveoli, and should be **less than 30**. RT may have to do a maneuver to have the vent calculate this value, or it may be on the ventilator display screen. It is abbreviated P_{PL} – see example below.



- Monitor your patient's **minute ventilation**. Minute ventilation tells you how much work the lungs are doing. If the minute ventilation (V_e tot) is >10 , your patient may be hyperventilating (could lead to respiratory alkalosis) or in a hypermetabolic state such as sepsis.
- Monitor ABG and peripheral O₂ sat: goal PaO₂ 55-80%, goal SaO₂ 88-92%, permissible PH 7.20-7.35.

Critically ill COVID-19 patients may require manual pronation.

- If the care team is discussing whether to prone patients, you should ensure a huddle with MDs/ APPs, RNs, and RTs occurs to ensure this is an appropriate plan for your patient.
- Review your order set carefully to ensure contraindications are considered.

If you have to manually prone your patient:

- When preparing to prone or supine your patient, have a respiratory therapist or APP at the head of the bed to manage the airway and act as team leader, and 4 additional clinicians to help with repositioning (total of 5 clinicians).
- If manually proning, obtain a proning pillow from the OR to protect the ETT when patient is laying face down. If these are unavailable, you can also use a towel or sheet under your patient's head to allow the ETT to be protected while being able to visualize your patient's face.
- The patient's arms should be positioned in 'swimmer's position' with the head turned towards their raised arm. Head and arm position should be alternated every 4 hours.
 - In order to reposition the patient's head and shoulders, 2 clinicians should enter the room. One will be responsible for rotating the head and **ensuring the ETT remains stable** while the second clinician lifts the patient's shoulders to facilitate this.



General considerations:

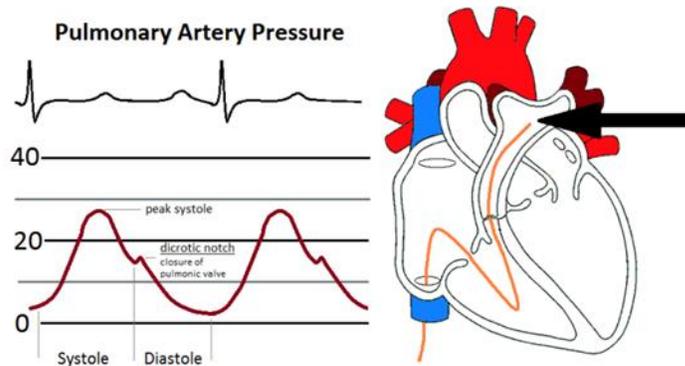
- **Patients who are prone require meticulous attention to skin care and eye protection.** Please review order sets to ensure lacrilube is ordered, and if appropriate, consider placing dressings over eyes to keep them shut and protect from corneal abrasions.
- COVID-19 patients may remain intubated for several weeks. Please perform oral care Q4H and as needed to reduce the risk of VAP or other bacterial secondary infections.
- Patients may also be on medications such as inhaled epoprostanol. Epoprostanol is a prostacyclin that directly vasodilates pulmonary and systemic vascular beds and helps improve oxygenation – this medication is managed by the critical care team in conjunction with respiratory therapy.

Cardiovascular systems assessment

COVID-19 patients may be at high risk for developing cardiogenic shock.

- Cardiogenic shock is generally defined as:
- Systolic blood pressure <90mmHG or a drop of 30mmHg from patient's baseline with adequate fluid resuscitation and may be refractory to vasopressor support, a cardiac index of <2.2 and PAOP >15 (signs of poor cardiac contractility and fluid overload) and signs of poor tissue perfusion and oxygenation that damages end organs.
- First line medications for these patients will be inotropes such as dobutamine or milrinone (increase the contractility of the heart) and vasopressors (first line vasopressor is generally norepinephrine).
- Patients may require advanced mechanical circulatory support such as an Impella or intra-aortic balloon pump.
- Monitor your patient closely for signs of peripheral ischemia or poor perfusion, particularly if they are on high dose vasopressors.
- COVID-19 patients may require placement of a PA catheter in order to manage cardiogenic shock or direct fluid resuscitation therapy.
- Manage PA catheters per individual entity's policy.

□



- Normal values for pressures calculated by PA catheter:
 - CVP: 2-6 mmHg (6-12mmHg may be tolerated in ICU pts)
 - Pulmonary artery pressure: 25mmHg/10mmHg
 - Pulmonary artery occlusion pressure: <18mmHg
- Keeping a PA catheter safe:
 - If you ever see a right ventricular waveform or a pulmonary artery occlusion waveform, it is a medical emergency and the provider must come to the bedside to reposition.

Patients who need more advanced cardiopulmonary support may require advanced modalities (i.e. extracorporeal membrane oxygenation - ECMO) and may be transferred to a different facility within the Medstar Health system to receive this care. Refer to Appendix A for ECMO information.

GI/GU systems assessment

- Nutrition is a crucial part of the healing process. If appropriate, please advocate for your patients to receive a diet order or to begin tube feedings.
- Monitor your patient's urine output – remember that adequate urine output is 0.5cc/kg/hour! If your patient's urine output drops, it could be a sign that tissue oxygenation and end organ perfusion have dropped.
- COVID-19 management often includes keeping the patient fluid balance negative/ being cautious with fluid replacement. Please be aware of your patient's intake and output and document accurately.

Integumentary system assessment

As with all ICU patients who are immobilized or hospitalized for long periods of time, we must continue to monitor for signs of skin breakdown and intervene to ensure these patients do not develop pressure injuries.

- **Check skin under invasive devices such as trach plates, oxygen tubing/ BiPAP masks, or other such devices which might lead to device related breakdown.**
- **Reposition ETT on intubated patients Q4H to avoid mucosal injury.** Ideally, the ETT should be repositioned Q2H, and if possible, collaborate with RT to alternate repositioning to minimize entry into COVID-19 rooms.
- Prophylactically apply Allevyn dressings to all bony prominences on patients who are going to be prone.
- Continuing to turn and reposition patients Q2H.
- Float heels and use cushions or wedges to offload pressure.

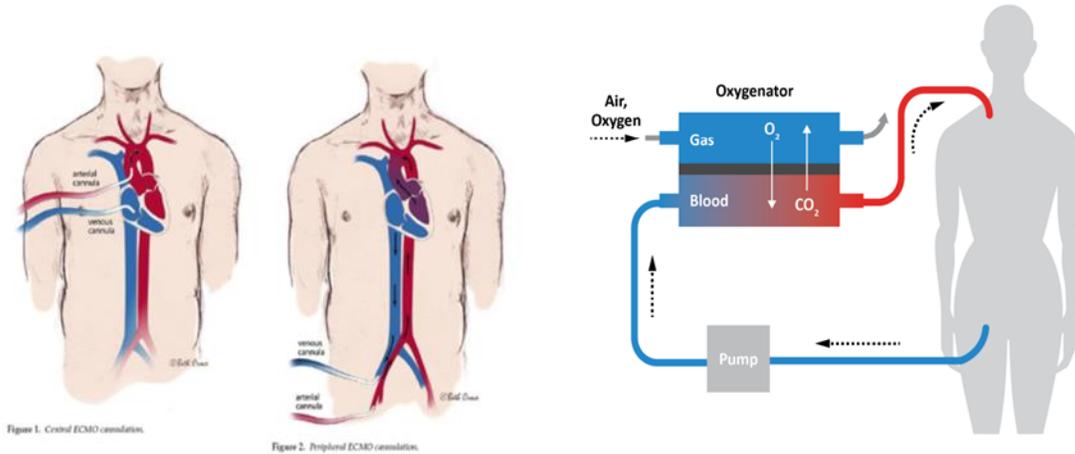
Psychosocial system assessment

- Please be aware of the psychological and emotional toll this disease can take on patients and their family members, and do your best to update patients regarding their care.
- If there are visitor restrictions in place at your facility, be understanding and collaborate with your care team to ensure that family members are updated via telephone.
- Take a moment for yourself as well – if you find yourself struggling during these difficult times, please reach out to Employee Assistance Program or your leadership to ensure you receive the support you need.

Appendix A: ECMO

For patients receiving ECMO:

- If the patient needs ventilatory support only, they will receive veno-venous cannulation.
- If the patient is hypotensive/ refractory to pressors or has critically low cardiac output/ index, they will be cannulated veno-arterially to support both heart and lungs



Considerations for patients on ECMO:

- At shift handoff, consider a safety huddle with your perfusionist to review current settings (VA vs. VV ECMO, vent settings) and visualize cannulation sites (central vs. peripheral)
- Review your facility procedures regarding what to do in case of emergency such as equipment malfunction or accidental decannulation
- Review your facility procedures regarding required assessments or labs that should be monitored. In general, expect to do vital signs including end-tidal CO₂ Q1H.
 - Pulse oximetry should be placed on the right hand if possible
 - Expect NIRS to be applied to the patient's forehead and lower extremities to assess tissue oxygenation. This is managed by perfusionist, but values should be >50-60%



- Other labs you should expect to draw:
 - Daily CXR to confirm cannula placement
 - Daily CBC, BMP, Mg, PO4
 - ABG/lactate Q4-6H for the first 24 hours, then q12H
 - ACT q2-4H for the first 24 hours (done by perfusionist)
- These patients are high risk for stroke, bleeding event, or infections – prioritize assessment findings and lab values that may indicate these conditions when escalating findings to your team
 - Consider pupillometric assessment if unable to decrease sedation to assess neuro exam
- **Do not reposition patient/ move patient in bed OR move the bed without perfusionist present to manage ECMO cannulas**
- **Must perform neurovascular checks distal to cannulation site hourly**