

Management of Critically Ill Adults with COVID-19

General Concerns for PUI / COVID-19

1. COVID-19 patients can deteriorate rapidly
2. Early recognition of PUI/COVID-19 patients with respiratory failure is essential
3. High risk procedures (i.e. intubation) require the proper donning of protective gear
4. Early planning for intubation allows time to prepare the team for proper donning of protection and avoids exposing the teams to more risk
5. **Aerosolized inhalers** to any PUI and COVID-19 positive patients should be avoided – Automatic conversion from nebulizer to MDI (a spacer/self-administered) for patients needing bronchodilators
6. Running out of ICU Beds – use of alternative areas (PACU & OR space)
7. **Recommend Early Code Status discussion**

Airway Concerns in PUI / COVID-19 Patients

1. Avoid crash intubation
 - a. Increases risk of exposure
 - b. Reduces time for proper preparation
2. Consider creating an intubation team
3. Notify the team of any new PUI/ COVID positive patient
4. Assure such patients are on the COVID surveillance list
5. Notify the ICU and PUI/COVID airway team early
6. Use of thoracic ultrasound can show early indicators of COVID disease
7. PUI/COVID-19 infection and **pre-existing sleep apnea** deemed at risk for respiratory failure without therapy **may receive non-invasive ventilator support**
 - a. Provide such treatment using a V30 or V60 ventilator without use of humidification (considered aerosol generating and requires airborne isolation)

Infection Control:

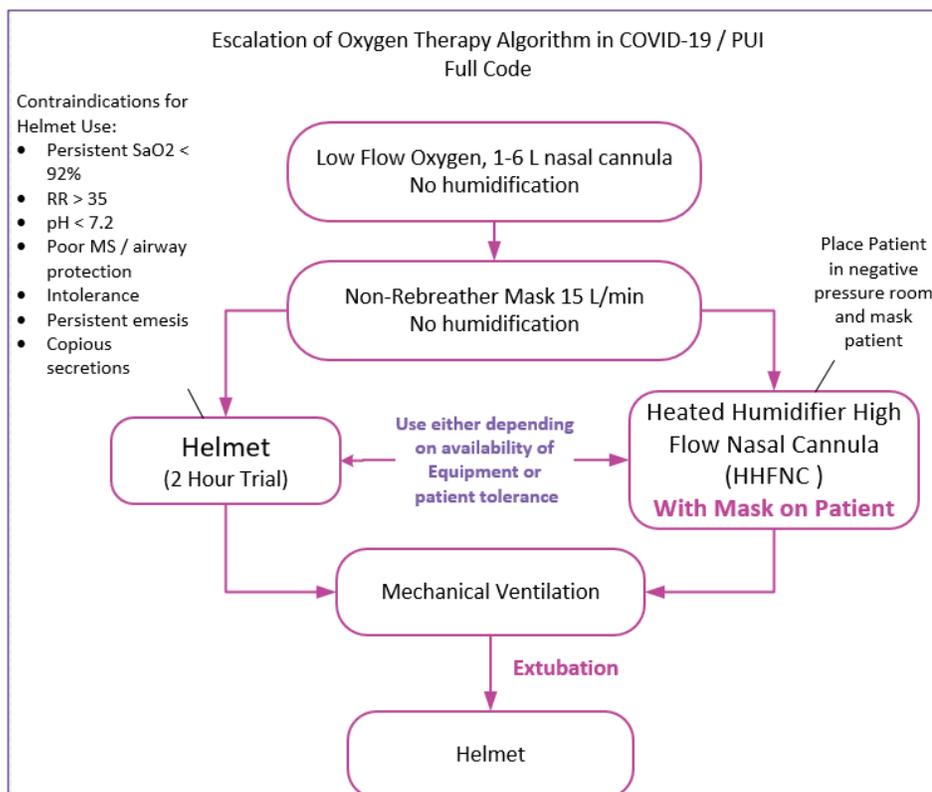
1. Healthcare workers performing **aerosol-generating procedures** on patients with COVID-19 in the ICU, we **recommend** using fitted respirator masks (**N95 respirators or equal or higher such as a PAPR/CAPR**)
1. We **recommend** performing **aerosol-generating procedures** on ICU patients with COVID-19 in a negative pressure room if available. If not we recommend HEPA filters be placed in the patient room and provide at least 6 air changes per hour (12 optimal)
2. **Care for non-ventilated COVID-19 patients – use simple mask and PPE including eye protection**
3. **Performing non-aerosol generating procedures on mechanical ventilation (closed circuit) –use simple masks /PPE/ Face shield**
4. For prone positioning procedures use N95/eye protection as a precaution for potential tube dislodgement

Supportive Care for COVID-19

1. In adults with COVID-19 and shock, **suggest using dynamic parameters** (skin temperature, capillary refill, &/ or lactate) over static parameters to assess fluid responsiveness
2. For acute resuscitation of adults with COVID-19 and shock – **suggest using conservative over liberal fluids** – using crystalloids over colloids. (No gelatins, hetastarch, dextrans or albumin). **This DOES include the initial 30mL/kg. (see appendix A)**
3. Recommend use of **Norepinephrine as 1st line agent** → then vasopressin or epinephrine if norepinephrine is not available.
 - a. **Target MAP of 60-65** (SCCM Guidelines 2020)
4. Recommend **against use of dopamine** if norepinephrine is available

Escalation of Oxygen Therapy

1. Place patient in contact / droplet isolation
2. Determine patient code status and Initiate early goal of care discussions & Consider palliative care consultation.
3. Prone positioning in the non-ventilated patient is strongly supported (see Appendix B and [CommonSpirit Health Non-Vented Prone Positioning for COVID Guideline](#))
4. The NIH Panel recommends against using awake prone positioning as a **rescue therapy** for **refractory hypoxemia** to avoid intubation in patients who otherwise require intubation and mechanical ventilation (AIII).
5. In the absence of an indication for endotracheal intubation, the NIH Panel recommends a closely monitored trial of NIPPV for adults with COVID-19 and acute hypoxemic respiratory failure **for whom HFNC is not available** (BIII) (negative pressure room, full PPE/PAPR)
6. Consider rescue therapy including epoprostenol (ventilated patients) and VV ECMO
7. Follow diagram below for escalating oxygen support



Intubation Criteria Guidelines

1. PO₂ < 65 or SaO₂ < 92% on 100% NRB mask
2. Labored breathing with RR > 35-40, or PCO₂ > 50 (in patient w/o history of chronic CO₂ retention) with pH < 7.30
3. **Do not wait for these criteria** to be present before notifying the ICU
4. **DO NOT INTUBATE without proper PPE**
5. Intubation with Rapid Sequence Intubation (RSI)
6. Minimize bagging once patient has been pre-oxygenated.
7. Glideslope or C-MAC preferred to minimize operator exposure to droplets

Intubation of PUI/COVID-19 Positive Patients

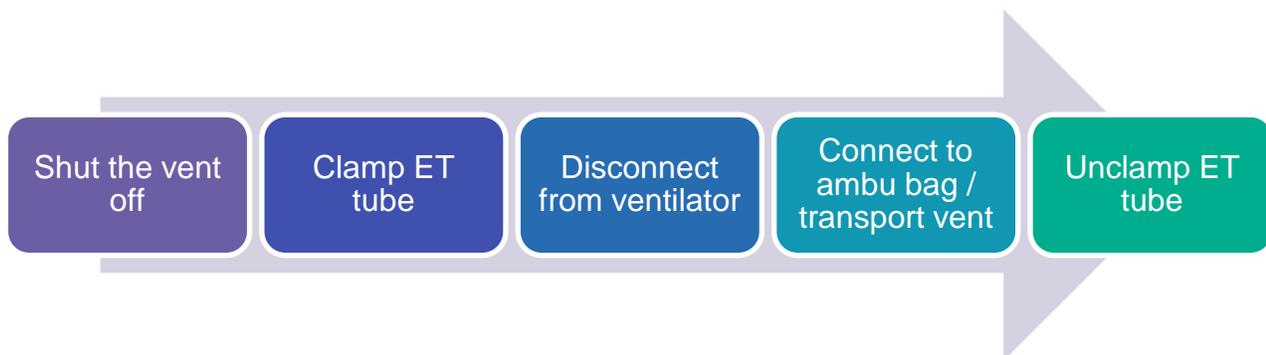
1. Intubation should be conducted by the *most experienced practitioner*
 - a. to decrease the attempts at intubation
 - b. to handle a difficult airway if presented
2. Consider COVID/PUI airway team
3. **Avoid awake fiber optic intubation** unless specifically indicated
4. Avoid using inhaled Gas for intubation induction, or sedation in patients with PUI/confirmed COVID-19, Intravenous sedation is preferred.
5. **Don an N95 respirator at minimum, CAPR/ PAPR gear are strongly suggested for all intubations if available**
6. All intubations should occur in negative pressure rooms or room equipped with a HEPA filter
7. If surgery is needed, patients should be intubated in negative pressure rooms PRIOR to transfer to OR
8. Avoid atomized/nebulized local anesthetics
9. Pre-oxygenate for 5 minutes with 100% oxygen and perform rapid sequence induction
10. **Avoid manual ventilation and potential aerosolization** of virus from the airways
 - a. If manual ventilation is needed, apply small tidal volumes
11. NO Positive Pressure Ventilation until ETT cuff is INFLATED.
12. HEPA filter must be used with ETT/BMV Resuscitation bags and ventilators should have **HEPA filters**
13. Run ventilator on “dry circuits” using heat-moisture exchangers

Invasive Mechanical Ventilation Management

1. Heat Moisture Exchangers (HME) rather than humidification of ventilator circuits
2. Droplet isolation for use of mechanical ventilation
3. ARDSnet protective lung ventilation (SCCM 2020) **** [ARDSNet PEEP table](#) or other evidence based practice PEEP tools**
 - a. Recommend using low tidal volume (V_t 4-8 mL/kg predicted body wt) ventilation (V_t – over higher tidal volumes (V_t > 8 mL/kg) (strong recommendation)
 - b. Target plateau pressures of <30 cmH₂) (strong recommendation)
 - c. Moderate to severe ARDS - higher PEEP (weak recommendation)
4. May consider APRV or inhaled epoprostenol
5. The COVID-19 Treatment Guidelines Panel (the Panel) recommends using dexamethasone (at a dose of 6 mg (IV or PO) per day for up to 10 days) in patients with COVID-19 who are mechanically ventilated

(AI) and in patients with COVID-19 who require supplemental oxygen but who are not mechanically ventilated (BI).

6. The Panel recommends against using dexamethasone in patients with COVID-19 who do not require supplemental oxygen (AI).
7. **Prone Position Ventilation – 12 – 16 hours** (SCCM 2020) (See Appendix C)
8. Neuro-muscular blockers – intermittent boluses over continuous infusion – **exception** is in persistent ventilator dyssynchrony
9. May **consider** ECMO in very select patients – (weak recommendation- outcome data is not clear)
 - a. Decision to use ECMO should be determined by a team of experts using the standardized predictive scoring tools.
10. Recommend against use of routine inhaled nitric oxide (strong recommendation)
11. Use of **Anesthesia devices can be used as ventilators**. Click [here](#) for a link on guidelines and instructions on how to convert and manage these devices
12. Pre-prepare ventilator with appropriate settings, shut vent off before removing mask.
13. **Have clamp at the bed side** in case there is need to use an ambu bag with a filter in place
14. **Only Use for BiPAP** is after extubation (BiPAP on vent) with mask as the vent has exhalation viral filter valve with low threshold for early reintubation only in a negative pressure room.
15. Do not use suction catheter with open endotracheal tube
16. Minimize travel out of ICU
17. No need for daily CXR
18. High threshold for fiber optic bronchoscopy , thus to use catheter directed BAL if needed
19. Avoid BMV but if clinically needed:
 - a. HEPA viral filter must be used with bag valve mouth (BMV)
 - b. LOW VOLUMES and HIGH RATE if bagging is required
 - c. Avoid laying patient flat prior to meds, assure no agitation.
20. **Any intended disconnection from ventilator**, please follow this process -



Acute Kidney Injury and Renal Replacement Therapy

1. For critically ill patients with COVID-19 who have acute kidney injury and who develop indications for renal replacement therapy, the Panel recommends continuous renal replacement therapy (CRRT), if available (BIII).
2. If CRRT is not available or not possible due to limited resources, the Panel recommends prolonged intermittent renal replacement therapy rather than intermittent hemodialysis (BIII).

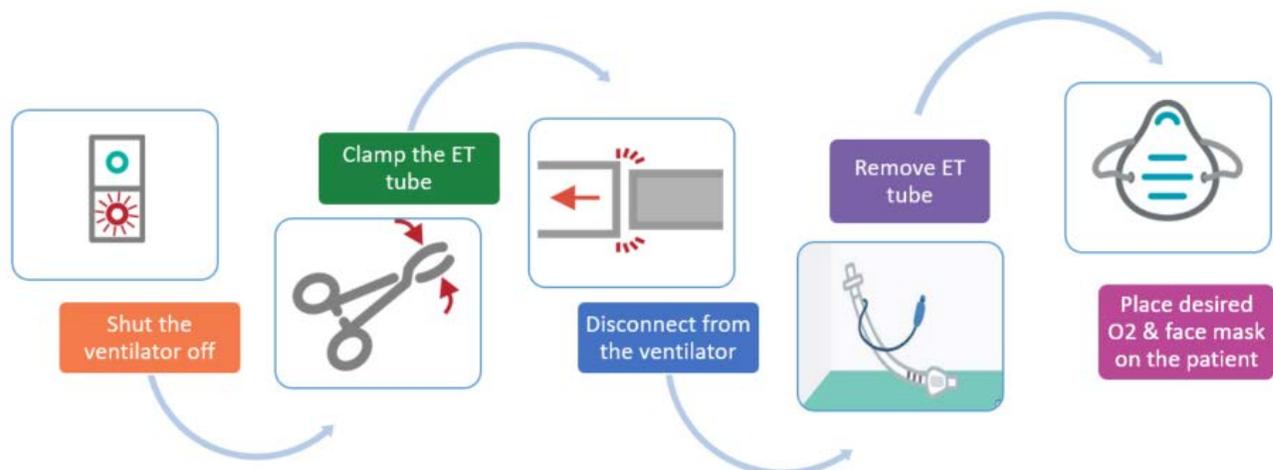
Diagnosis and Treatment of Influenza and COVID-19 When Influenza Viruses and SARS-CoV-2 Are Co-circulating

1. When SARS-CoV-2 and influenza viruses are co-circulating, the Panel recommends testing for both viruses in all hospitalized patients with acute respiratory illness (AIII).
2. When SARS-CoV-2 and influenza viruses are co-circulating, the Panel recommends influenza testing in outpatients with acute respiratory illness if the results will change clinical management of the patient (BIII).
3. The treatment of influenza is the same in all patients regardless of SARS-CoV-2 coinfection (AIII).
4. The Panel recommends that hospitalized patients be started on empiric treatment for influenza with oseltamivir as soon as possible without waiting for influenza testing results (AII).
 - a. Antiviral treatment of influenza can be stopped when influenza has been ruled out by nucleic acid detection assay in upper respiratory tract specimens for non-intubated patients and in both upper and lower respiratory tract specimens for intubated patients.

Testing for other pathogens should be considered depending on clinical circumstances, especially in patients with influenza in whom bacterial superinfection is a well-recognized complication.

Extubation Guideline

1. Due to this being an aerosolizing procedure - **when possible**, perform extubation in a negative pressure or HEPA filtered room.
2. PPE/N95/Face shield should be worn by persons in the room while extubation occurs.
3. Minimize in-room personnel when extubating.
4. Follow the steps below:

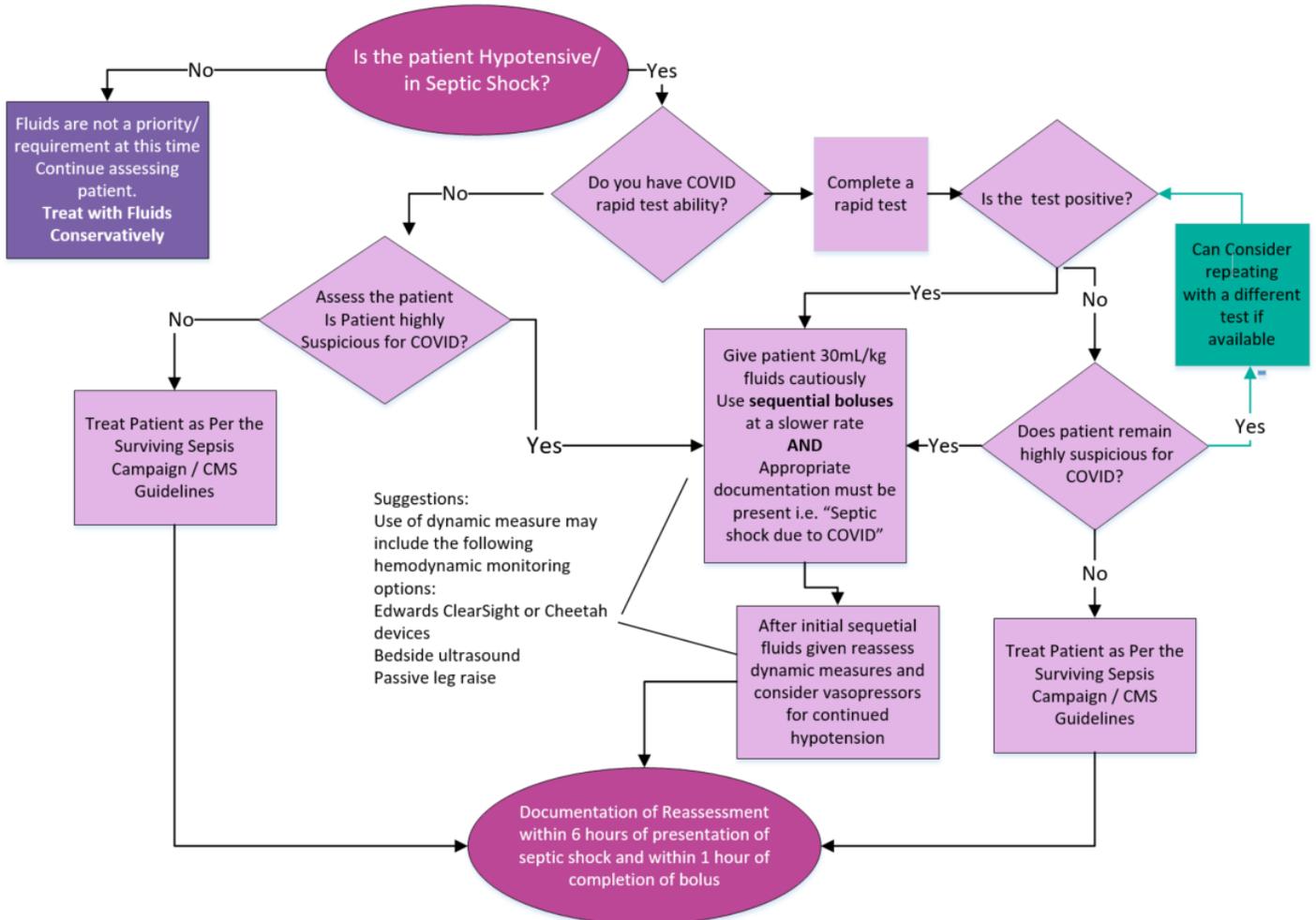


Aerosol Generating Procedures & Isolation Recommendations

Aerosol Generating Procedures	Contact + Droplet Isolation	Airborne Isolation with PPE including Eye Protection/goggles, N-95 or PAPR/CAPR
Intubation/extubation	Not recommended	Acceptable
Mechanical ventilation	Recommended if calm /sedated w/o risk of dislodgement	Acceptable if any risk of dislodgement e.g. prone position
Bronchoscopy Upper Endoscopy Procedures	Not recommended	Acceptable Use disposable bronchoscope
Open suction catheter use (trach, ETT, or NTS)	Not recommended	Acceptable
Placing or exchanging tracheostomy tubes	Not recommended	Acceptable
Nebulizer treatments – encourage MDI use	Not recommended - use MDI's	Acceptable Use MDI except if Aerogen on vent
High flow nasal cannula Generally defined > 6L	Not recommended	Acceptable Full code In IMC: Max 30L/50%, then transfer to ICU “No intubation” on floor or IMC: Allowed without restrictions ICU: Acceptable without restrictions.
OSA CPAP for chronic severe sleep apnea	Not recommended	Acceptable. Do not use humidification; dry circuit only.
Non- invasive ventilation for respiratory failure (includes CPAP and BiPAP)	Not recommended	Full Code: acceptable only in ICU. No humidification; dry circuit only No Intubation: Acceptable in IMC and ICU. Do not use humidification; dry circuit only
Aerobika	Not recommended	Acceptable; encourage self-use by patient
Chest PT / Percussion	Not recommended	Acceptable
IPV/Metaneb	Not recommended	Acceptable
Active Humidification of Ventilator Circuit	Not recommended	Requires ventilator circuit modification, discuss with RT prior to initiation
Continuous aerosol therapy (e.g. epoprostenol)	Not recommended	Requires ventilator circuit modification, discuss with RT prior to initiation
Heliox-spontaneously breathing	Not recommended	Acceptable
Heliox-ventilated	Not recommended	Acceptable

Appendix A - Fluids in COVID /PUI Patients with Hypotension/Shock

Giving Fluids for Initial Presentation of PUI / COVID-19 Hypotensive or Septic Shock Patients



Appendix B – Non-Ventilated Prone Positioning

Flow Diagram Decision Tool for Non-Ventilated Prone Positioning Process

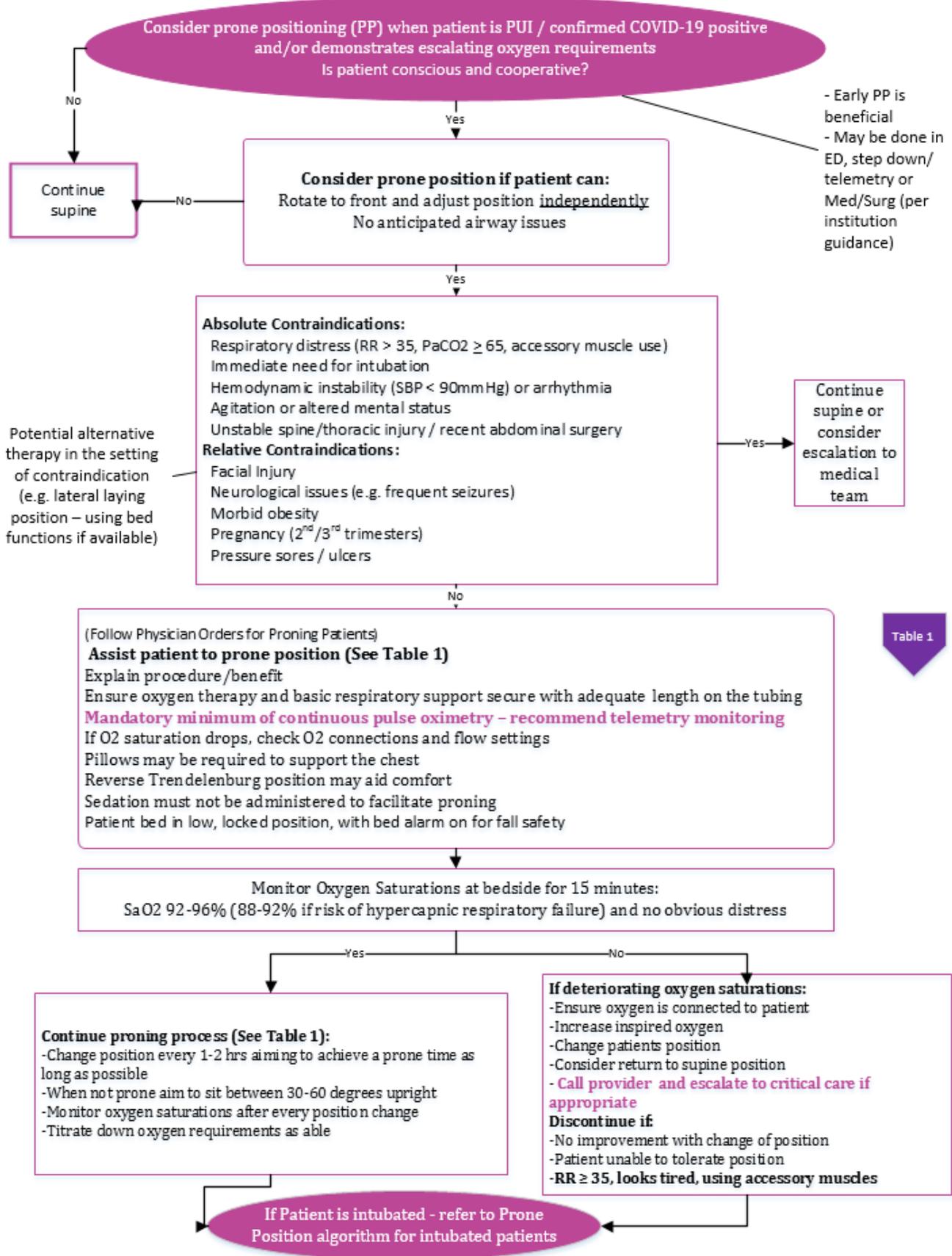


Table 1

Table 1 – Timed position changes for patients undergoing non-ventilated proning process**Timed Position Changes:**

If patient fulfills criteria for proning ask the patient to switch positions as follows. Monitor oxygen saturations 15 minutes after each position change to ensure oxygen saturation has not decreased.

Start at 15-30 minute intervals and assess for tolerance. If **patient tolerates** the position – they can **stay in that position as long as they are able** with a goal of 2 hours minimum

If **unable to tolerate complete prone** for desired timeframe, consider the following alternative.

Example Routine:

- 30 minutes to 2+ hours lying fully prone (bed flat)
- 30 minutes to 2+ hours lying on right side (bed flat)
- 30 minutes to 2+ hours sitting up (30-60 degrees) by adjusting head of the bed
- 30 minutes to 2+ hours lying on left side (bed flat)
- 30 minutes to 2+ hours lying prone again
- Continue to repeat the cycle.....

Non-Ventilated Prone Positioning Procedure:**C**

- **C**onfirm Appropriateness for Prone Positioning (Review inclusion/exclusion criteria, follow algorithm)

O

- **O**ffer Patient and Family Education (What is it, why we use it and what is the process)

V

- **V**erify Supplies and Patient Readiness to Prone (ECG leads, pillows, prep patient, position patient)

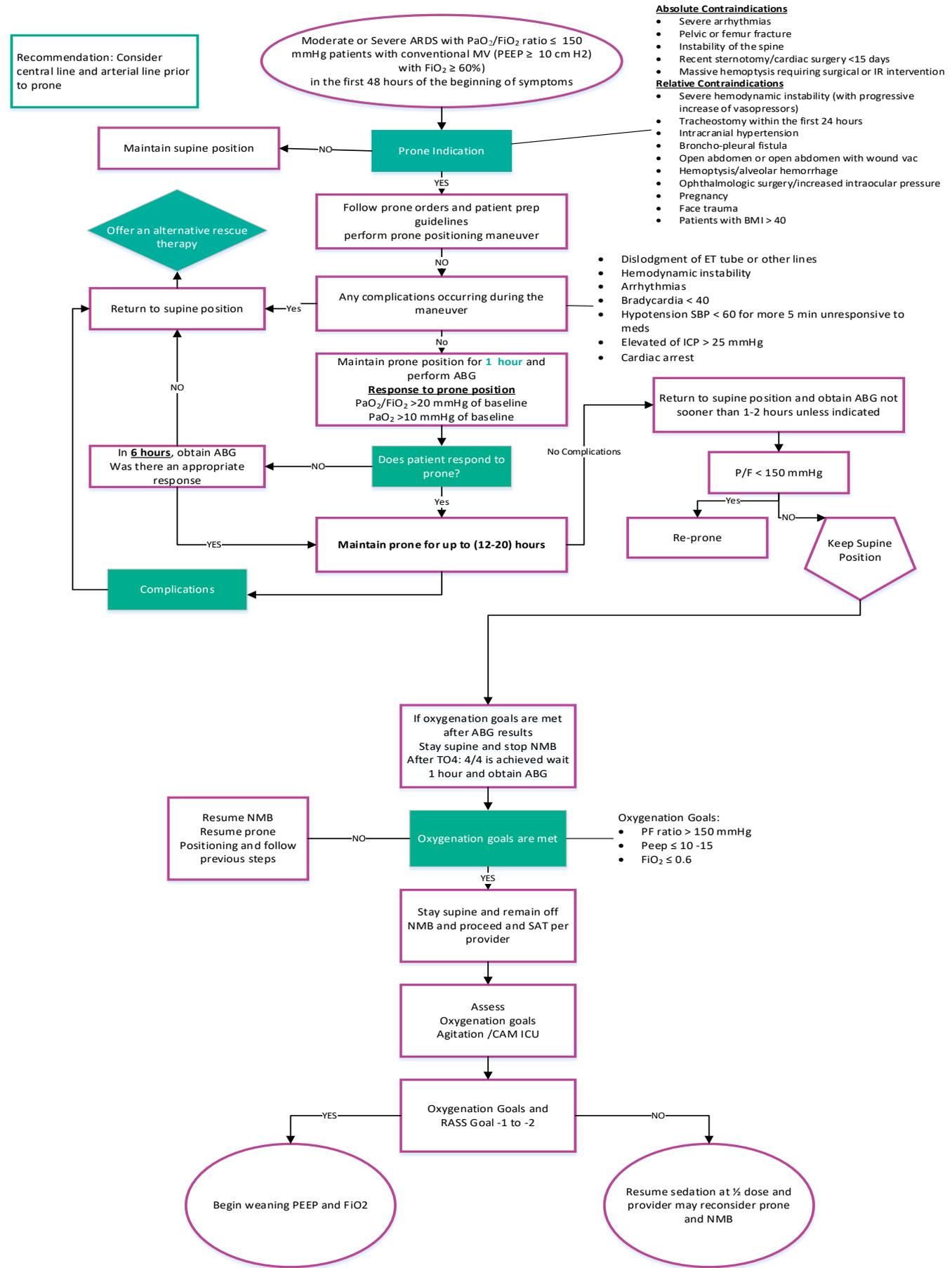
I

- **I**nitiate Monitoring of Patient to Ensure Safety (Monitor oxygen saturation, assess for patient tolerance)

D

- **D**etermine the Appropriate Frequency/ Document Patient Position and Response (Prone cycle target **2 - 4 hours** or longer, minimum of **2 cycles per day**)

Appendix C – Ventilated Prone Positioning



References:

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 - The COVID-19 Treatment Guidelines Panel regularly updates the recommendations in these guidelines as new information on the management of COVID-19 becomes available. The most recent version of the guidelines can be found on the COVID-19 Treatment Guidelines website (<https://www.covid19treatmentguidelines.nih.gov/>).
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