

NEW YORK-PRESBYTERIAN | WEILL CORNELL MEDICINE
MICU TREATMENT GUIDE FOR INTUBATED CRITICALLY ILL PATIENTS WITH COVID-19: Hospital Medicine Edition

UPON ARRIVAL

- Bundle all procedures prior to CXR: CVC, arterial line, Foley, OGT
- Ensure appropriate sedation
- Ensure appropriate ventilator settings
- **Cultures/antibiotics only if shock or lobar infiltrate on CXR**
 - If COVID+ without shock or infiltrate, no empiric antibiotics
- If SARS-CoV2 [+], COVID ID consult (pager 32843)
- Check the following labs/studies:
 - CBC + differential
 - BMP, LFT, Mg, Phos
 - PT/PTT/INR, fibrinogen
 - CK, D-dimer, ferritin, LDH
 - ESR, CRP, procalcitonin
 - EKG, troponin, BNP
 - HBV, HCV and HIV serologies

VENTILATION STRATEGY

See reverse side and Servo-U ventilator video for more information

- Set ventilator to volume control (VC) mode
- Enter the patient's height
- Adjust tidal volume (VT) to obtain 6-8 mL/kg based on ventilator's calculation of predicted body weight (PBW) **do not use actual body weight**
- Measure Pplateau by inspiratory pause and keep value < 30 (see reverse for tips)
- Adjust PEEP based on FiO2:PEEP table
- **Target SpO2 88-94%, PaO2 >60**

ACID/BASE MANAGEMENT

- **Goal pH 7.2 – 7.45**
- If pH <7.15, increase RR (max 35) until pH 7.2 - 7.3
- If pH still <7.15, increase Vt by 1 mL/kg
- If pH >7.5, decrease RR

SEDATION

- **Remember:** if patient was recently intubated, the sedation used during RSI will wear off much faster than paralytic. **You MUST start sedation with propofol.**
- Goal RASS -2 to -3 to start (briefly awakens or opens eyes/movement to voice)
- Start propofol with 20mg bolus x 1 and then 20mcg/kg/min infusion -> assess RASS and vent synchrony (see vent synchrony page) -> increase propofol in increments of 10mcg/kg/min to max of 40 mcg/kg/min. Remember to bolus 20mg of propofol with each increase of the drip.
- If RASS and/or vent synchrony is not at target -> start Dilaudid with 1mg bolus and 0.5 mg/hr infusion, increase in increments of 0.5mg/hr to max 3mg/hr. Remember to bolus 0.5 mg of Dilaudid with each increase of the drip.
- Use lowest doses of sedative/opioid combination possible to achieve vent synchrony and patient comfort

HEMODYNAMICS

- Use phenylephrine if vasodilation is primary suspected reason for hypotension (i.e. related to sedation, and not shock)
- Remember that increasing PEEP doses may result in hypotension
- Continue ACEI/ARB, *if not in shock*
- Worsening shock, bradycardia, conduction abnormalities – consider myocarditis
 - POCUS/TTE, EKG, troponin
 - **Contact ICU outreach**

OTHER THERAPIES

- **No** glucocorticoids for respiratory failure, unless other strong indication
- Avoid NSAIDs
- Advanced therapies (tocilizumab, convalescent plasma, etc.) for SARS-CoV2 in consultation with MICU/ID advised

STUDIES TO TREND

- **Daily** CBC, CMP, PTT/INR, ABG
- **Every 3 days** check
 - CK, D-dimer, ferritin, LDH, ESR, CRP, fibrinogen, TGs
 - EKG, troponin
- **No** daily CXR needed (check if change in oxygenation/HD stability)

DAILY MONITORING

- Calculate P:F (paO2/FiO2) every day
- Measure Pplateau q4 to q6h
- **Pplateau, ABG & P:F ratio with every adjustment to ventilator, 30-60 minutes after change**
- Keep fluid balance even to net negative, using diuretics as needed
 - **No** maintenance fluids
- Watch for skin breakdown
- **Aggressive treatment of fever** to reduce O2 consumption (APAP, cooling devices)

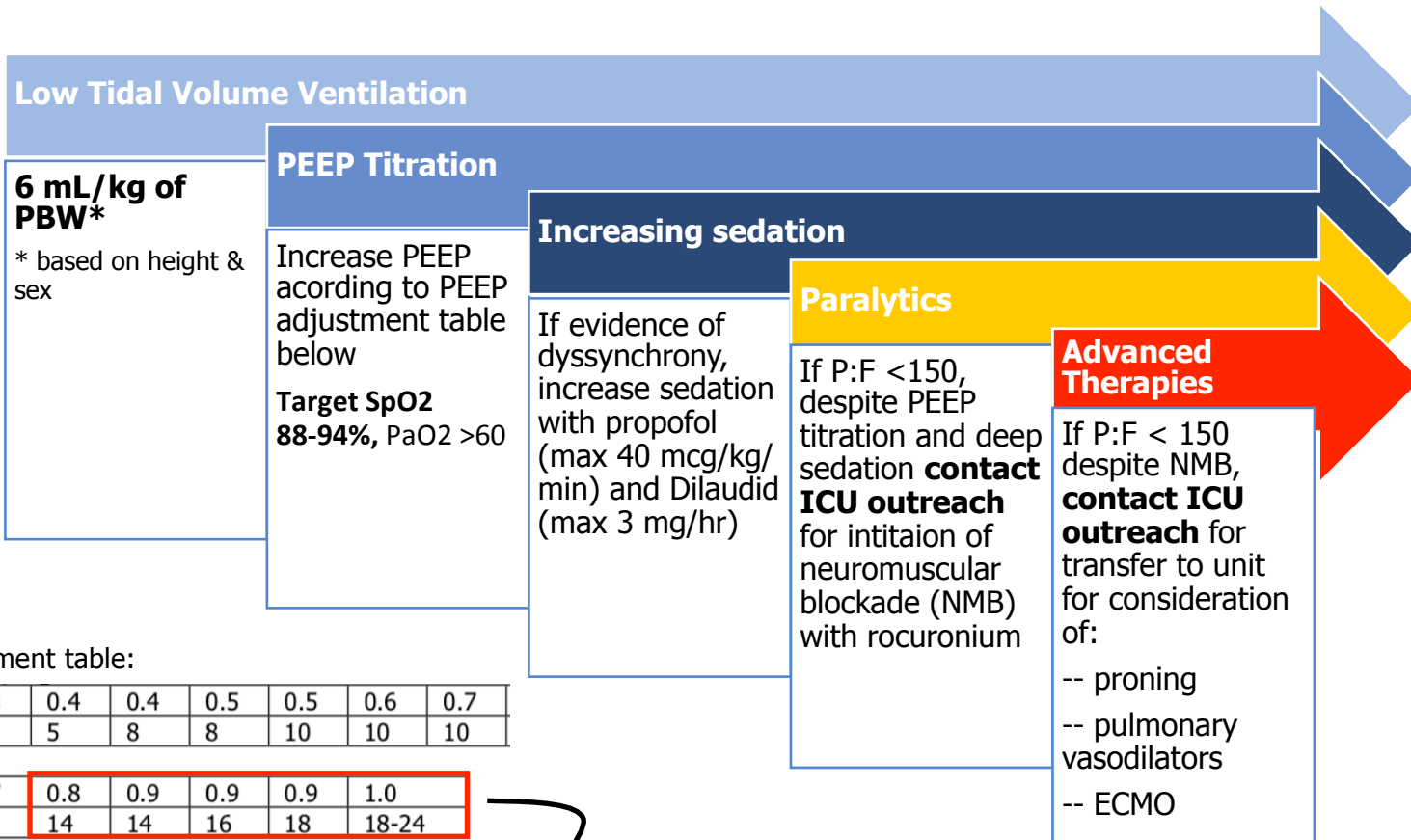
READINESS FOR EXTUBATION

- Once respiratory support weaned to FiO2 ≤ 40%, PEEP ≤ 8 for 12+ hrs, contact ICU outreach for extubation assessment

PROPHYLAXIS/MAINTAINANCE

- DVT (Enoxaparin preferred)
- GI (Protonix 40mg daily, Senna, Miralax)
 - Bisacodyl and methylalntrexone as adjunct if above ineffective
- Order "vent bundle"
- Eye (*DuraTear* ointment q8h)

ESCALATION OF RESPIRATORY THERAPIES



PEEP adjustment table:

| | | | | | | | |
|------------------------|-----|-----|-----|-----|-----|-----|-----|
| FiO₂ | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 |
| PEEP | 5 | 5 | 8 | 8 | 10 | 10 | 10 |

| | | | | | | |
|------------------------|-----|-----|-----|-----|-----|-------|
| FiO₂ | 0.7 | 0.8 | 0.9 | 0.9 | 0.9 | 1.0 |
| PEEP | 14 | 14 | 14 | 16 | 18 | 18-24 |

If FiO₂ exceeds 0.7 (70% O₂) or PEEP exceeds 14 cmH₂O, contact ICU outreach for further recommendations

Be aware that increasing PEEP will act to reduce cardiac output and will result in hypotension. This effect may be very pronounced if patient is underresuscitated. Be sure to monitor blood pressure while titrating. If hypotension is significant decrease PEEP, consider 500cc fluid bolus and/or starting phenylephrine at 20 mcg/min.

PLATEAU PRESSURE
Check Pplat (0.5 sec change in PEEP or V_T)
If Pplat > 30 cm H₂O
If Pplat < 25 cm H₂O
Pplat > 25 cm H₂O or
If Pplat < 30 and Pplat > 25 increase V_T in 1ml/kg H₂O.

Vent alarm assessment:

High peak pressure alarm: *Examine patient and perform inspiratory pause and measure Pplat*

High Ppeak, low Pplat:

Circuit issue (kinked vent tubing, fluid pooling in tubing, clogged filter) – fix kink if present, contact RT immediately, **DO NOT DISCONNECT CIRCUIT**

Patient biting tube – increase sedation

Bronchospasm – albuterol into circuit (assistance from RT)

Obstruction of tube or distal airway – in line suctioning of ET tube, **if not cleared call RT and ICU outreach**

High Ppeak, high Pplat:

Pneumothorax (sudden increase in Ppeak, +/- new hypoxia/HD instability -> POCUS, decrease PEEP, **call ICU outreach immediately for decompression**)

Tube migrated into mainstem -> check tube depth, consider STAT CXR, reposition tube with RT assistance

Pulmonary edema -> diuresis, CRRT if necessary

Lung injury (ARDS) -> call ICU outreach for management

Other alarms:

Low VT:

Obstruction (tube or airways) -> in line suctioning

Cuff leak -> can often hear gurgling from patient's mouth, add 2cc of air to cuff and alert RT

ET tube migrated above vocal cords -> STAT CXR, advance tube with RT assistance

Low end tidal CO2:

Vent disconnect -> assess tubing, reconnect

ET tube obstruction -> in line suctioning, assess sedation if biting

ETCO2 monitor malfunction – dx of exclusion, contact RT

Always call ICU outreach for:

FiO2 0.7 or greater, PEEP 14 or greater

P:F < 150, assistance with paralysis

Phenylephrine > 200mcg/min, Norepi > 12mcg/min

Dilaudid > 3 mg/hr, propofol > 40 mcg/kg/min

Cardiogenic shock

Non-resolving vent alarms

ANYTHING YOU ARE UNCOMFORTABLE WITH!

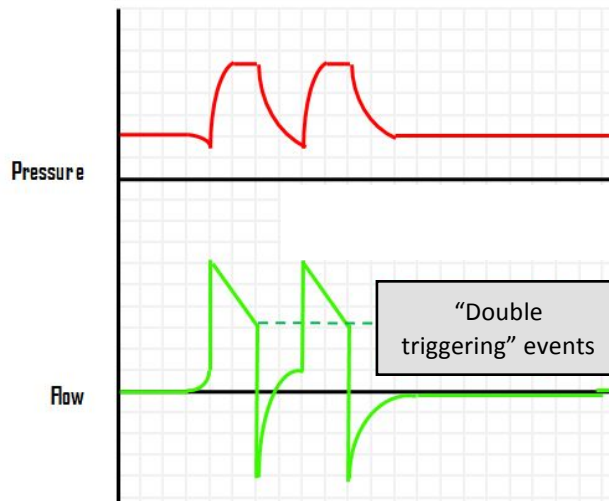
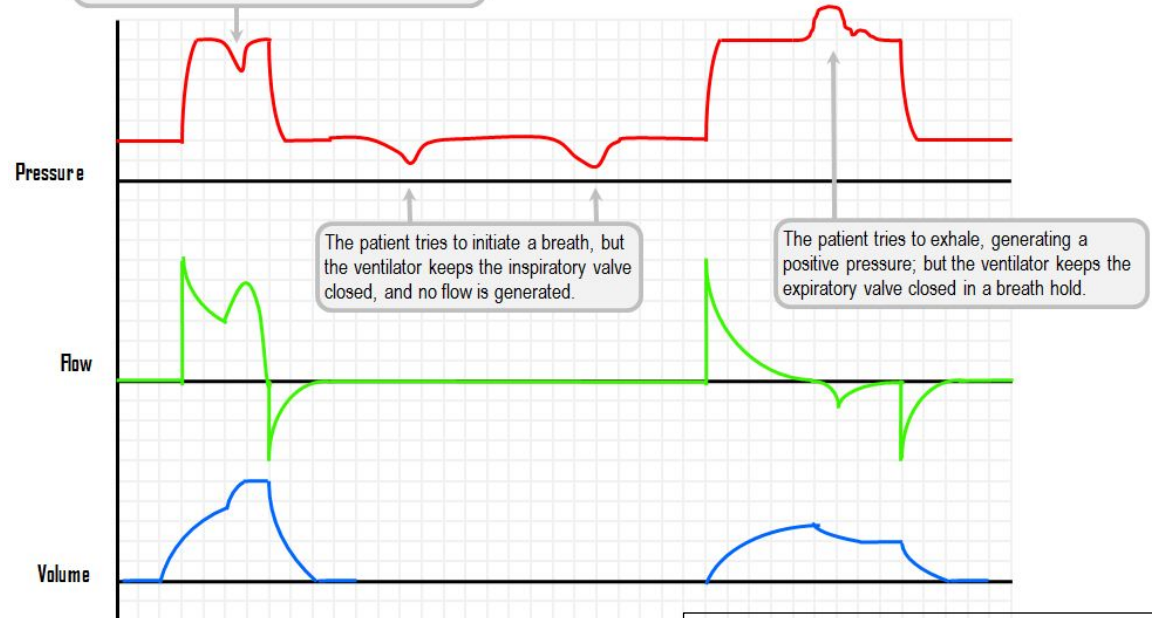
EVIDENCE of VENTILATOR DYSSYNCHONY

EXAMINE THE PATIENT

- Biting ET tube?
- Coughing?
- Paradoxical movement of abdomen/chest?

Below are 2 examples of patient triggering breaths, leading to dyssynchrony.

Mid-breath, the patient tries to inhale more gas than the ventilator is willing to deliver, generating a negative pressure and some negative flow.



Vent dyssynchrony fixes:

The low tidal volumes used in lung protective vent strategies are uncomfortable for patients and can result in dyssynchrony.

(1) Increase sedation as outlined in sedation section

(2) Contact ICU outreach team to initiate neuromuscular blockade

(3) If all above fails liberalize tidal volume from 6 cc/kg PBW to 7 – 8 cc/kg