### RICU Management

#### Neuro
- Given patient volume and need to don PPE prior to entry sedation is heavier than normal ICU patients
- Physical restraints may be necessary to prevent self-extubation
- If you think patient is appropriate for SAT/SBT, please make sure night team is aware so they communicate this with nursing/RT in the early morning
- Monitoring of daily triglycerides for pts on propofol infusions; consider alternatives to propofol if TG > 750

#### Cardiovascular
- Daily troponin, EKG
- Echocardiography available on limited basis; need to discuss with cardiology

#### Pulmonary:
- See UM ARDS ventilation algorithm ***
- No chlorhexidine oral care; regular oral care should continue for mechanically ventilated patients
- Continuous subglottic suctioning preferred over intermittent Yankauer suctioning
- Daily SAT/SBT not routine (risk of self-extubation and stretch of nursing/RT resources); SAT/SBT for appropriate patients should be at direction of attending intensivist
- Minimize bronchoscopy; Pepe de Cardenas available for consultation for urgent therapeutic bronchoscopy; disposable bronchoscopes available in anesthesia staging area
- Nitric oxide available; preferred over other inhaled pulmonary vasodilators that require more frequent breaking of ventilator circuit

#### Gastrointestinal:
- Early nutrition unless contraindication
- PPx:
  - No routine GI ppx unless home medication
  - Active GI bleeding: PPI
  - High risk for bleeding: H2 Blocker
| Hematology: | - ***See preliminary algorithm from vascular team regarding DVT PPx/Anticoagulation given high risk of DVT/PE in COVID patients***  
- Xa levels will be drawn three times daily for all RICU patients (0400, 1200, 2000) |
| --- | --- |
| Renal: | - Renal team is on unit during day for consultation  
- Anticoagulation while on RRT (if not on systemic anticoagulation):  
  o 1000 u/hr for CRRT while on and no bolus  
  o With shift therapy 2000 units bolus and 1000 units/hr |
| Infectious Disease: | - ID consulting on all new admissions (commenting on therapy and possible clinical trial entry)  
- Inflammatory labs:  
  o Every other day check: C-Reactive Protein, LDH, D-dimer, procalcitonin, Westergren Sedimentation Rate, Ferritin, triglyceride |
| Endocrine: | - Hospital Intensive Insulin Program (HIIP) is following RICU patients and will be involved as necessary:  
  o Goal BG 150-200 mg/dl especially if on tube feeds (different than our postsurgical goal which is tighter)  
- General approach for tube feeds and hyperglycemia is basal Lantus plus scheduled tube feed Regular insulin q 6 hourly and a Regular insulin sliding scale  
- If tube feeds stop the tube feed regular insulin should be held otherwise pts get HYPOGLYCEMIC  
- If regular insulin is given and tube feeds stop the SAFETY order asks the nurse to start D5 at same rate as tube feeds |
| Lines/Tubes/Drains/Airway: | - Consider multiple procedures (intubation, CVC, a-line) if needed in order to minimize exposure and PPE use  
- Anesthesia teams in RICU to manage airways unless additional help is needed (MOTT airway team is available to respond) |
Overview of ARDS Ventilator Management Strategies

1. Basic Lung Protective Ventilation
   - ARDS Network ventilation strategy
     a. Use VCV or PCV, targeting VT 6 mL/kg IBW
     b. Maintain Piot 30 cm H₂O
     c. Reduce VT to 5 or 4 mL/kg if necessary
     d. PEEP/FIO₂ per table (see bottom of page)
   - Consider maintaining driving pressure <12-16 cm H₂O
   - If consolidation is asymmetrical, consider placing 'good lung' in dependent position

2. Patient-Ventilator Asynchrony
   - Consider minor ventilator adjustments (e.g., flow rate, pattern, inspiratory pause)
   - Assess potential to treat with pharmacologic agents (e.g., sedation, NMB), especially in pt with severe ARDS and strong respiratory drive (double-triggering)
   - For double-triggering, consider increasing VT 1 mL/kg
   - For low PEEP, consider increasing VT 5 mL/kg
   - For pressure breath mode of ventilation:
     - Volume targeted PC (PRVC, Vc, Autotflow)
     - Pressure control, pressure support

Prose Positioning
   - Consider after initial 12-24 hrs of stabilization
   - Use 16 hr/day (generally 4 pm to 10 am)
   - Discontinue when:
     - Instability in prone position
     - Sustained 4 hr, PaO₂/FIO₂ > 150 on FIO₂ ≤ 0.60 & PEEP ≤ 10
   - Higher PEEP
     - For pts with PaO₂/FIO₂ < 150, consider higher PEEP table
   - Recruitment Maneuvers
     - Consider for pts with clear de-recruitment, negative Ptp or PaO₂/FIO₂ ≤ 150
     - Recommend PCV with 1) Δ PEEP 0.05-0.25 cm H₂O for 3-5 min (as tolerated) or 2) Infra-P of 15 and increase PEEP by 5 to 10 cm H₂O
     - If CAP method used, limit to 15-30 seconds
     - Provider should be at bedside if pressures >40 cm H₂O used
   - Neuromuscular Blockade
     - No benefit of routine use of NMB in moderate-severe ARDS
     - Consider use if significant asynchrony and concern for VILI
   - Pharmacological Pressure (New) Guided Therapy
     - Intravenous or inhaled vasodilator (PA and end-expiratory (PEEP) pressures
     - Requires AV/SA ventilator & placement of femoral catheter
   - Airway Pressure Release Ventilation (APRV)
     - Increases Pmean with lower PEEP, lacks outcomes benefit
     - Concern for P-SIL in pr with strong respiratory drive
   - Inhaled Nitric Oxide (INO)
     - Start at 10 ppm
     - If positive response (improved oxygenation) or brought by Survival Flight
     - Maintain at 10 ppm and reduce FIO₂ down to 0.8, then titrate INO down, or consider Veineth or lipoest, per Respiratory Care policy
     - If no response, discuss with team to consider stopping
     - NOTE: INO is a very costly drug compared to alternatives
   - Extracorporeal Membrane Oxygenation (ECMO)
     - Absolute contraindications: hemorrhagic pulmonary process
     - Evaluate, but lower survival if after vent 7-10 days pre-ECMO
     - Consider if PaO₂/FIO₂ < 50 x 3 hrs or < 80 x 5 hrs, or pH < 7.25 w/ PaO₂/FIO₂ > 50 x 6 hrs
   - High Frequency Oscillatory Ventilation (HFOV)
     - Strong recommendation against routine use, may have benefit if PaO₂/FIO₂ ≤ 84, goal is to increase Pmean

FIO₂/PEEP Tables

See page 2 for general comments & recommended reading

Updated: 1/6/20
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Pg 1 of 2
COVID-19 Algorithm for PE Assessment

Critical Ill Patients

Clinical Suspicion for PE

Risk Assessment by Modified Wells

PE Unlikely (< 4)

Low Risk ≤ 2

Assess bleeding risk (VTE-BLEED)

High Risk ≥ 2

PE Likely (> 4)

Presumptive VTE Treatment with heparin:
- Most patients can receive VTE monotherapy.
- Select patients may require lower intensity heparin.

Consider CT PE or LE DVT scan (DVU2501) if CT cannot be performed.

*Meets COVID Protocol for VTE:
- Pt. is not in end of life or comfort care management.
- PE CT or DVT scan would change management.
- Pt. would convert to AC.
- Pt. does not already have DVT or PE from another study or other indications.

Follow-up for ICU Patients:
- Once out of ICU, ensure standard therapeutic dose AC 1-2 mos.
- Refer for outpatient CT PE to determine if full course of VTE indicated.

No Anticoagulation on D/C unless Modified Wells Score Changes

Thrombo Prophylaxis

CT PE Protocol or LE DVT (DVU2501) if CT cannot be performed

Precise with CT PE Protocol or LE DVT (DVU2501) if CT cannot be performed

Yes

No

- VTE

No change in management

Modified Wells Score for Assessment of Clinical Likelihood for Pulmonary Embolism

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical signs and symptoms of DVT (objectively measured calf swelling and pain with palpation in the deep vein region)</td>
<td>3</td>
</tr>
<tr>
<td>An alternative diagnosis is less likely than PE</td>
<td>3</td>
</tr>
<tr>
<td>Heart rate &gt; 100 beats per minute</td>
<td>1.5</td>
</tr>
<tr>
<td>Immobilization or surgery in the previous four weeks</td>
<td>1.5</td>
</tr>
<tr>
<td>Previous DVT or PE</td>
<td>1.5</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>1</td>
</tr>
<tr>
<td>Malignancy (on treatment, treated in the past six months, or palliative care)</td>
<td>1</td>
</tr>
</tbody>
</table>

VTE-BLEED Score

<table>
<thead>
<tr>
<th>Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer</td>
<td>2</td>
</tr>
<tr>
<td>Male with uncontrolled arterial hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Anemia</td>
<td>1</td>
</tr>
<tr>
<td>History of bleeding</td>
<td>1</td>
</tr>
<tr>
<td>Age ≥ 60 years</td>
<td>1</td>
</tr>
<tr>
<td>Renal dysfunction</td>
<td>1</td>
</tr>
<tr>
<td>Other factors that contribute to bleeding:</td>
<td></td>
</tr>
<tr>
<td>- Thrombocytopenia</td>
<td></td>
</tr>
<tr>
<td>- Cirrhosis</td>
<td></td>
</tr>
<tr>
<td>- Other anti-thrombotic use</td>
<td></td>
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</tbody>
</table>
COVID-19 Algorithm for DVT Assessment

Revision Date: 4/1/2020, 7:51PM
Questions regarding the algorithm can be directed to DVT-Scan-COVID@med.umich.edu, which will be reviewed daily.

Wells Score for Likelihood Estimation of Lower Extremity Deep Venous Thrombosis

<table>
<thead>
<tr>
<th>Clinical Characteristic</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (patient receiving treatment for cancer within the previous 6 months or recently receiving palliative treatment)</td>
<td>1</td>
</tr>
<tr>
<td>Paralysis, paresis, or recent casting or immobilization of the lower extremities</td>
<td>1</td>
</tr>
<tr>
<td>Recently bedridden for 3 days or more, or major surgery within the previous 12 weeks requiring general or regional anesthesia</td>
<td>1</td>
</tr>
<tr>
<td>Localized tenderness along the distribution of the deep venous system</td>
<td>1</td>
</tr>
<tr>
<td>Edema, ulcer, fluctuant swelling at least 3 cm larger than that on the asymptomatic side (measured 10 cm below the tibial tuberosity)</td>
<td>1</td>
</tr>
<tr>
<td>Pitting edema confined to the symptomatic leg</td>
<td>1</td>
</tr>
<tr>
<td>Previously documented DVT</td>
<td>1</td>
</tr>
<tr>
<td>Collateral non-muscle superficial veins</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis at least 2xClinic likely as DVT</td>
<td>2</td>
</tr>
</tbody>
</table>

**VTE-BLEED Score**

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**VTE-BLEED Score**

1. **Methods**
   - DVT scan
   - Venous Ultrasound
   - Angiography
   - Venography

2. **Score**
   - Active cancer
   - Male with uncontrolled arterial hypertension
   - Anemia
   - History of bleeding
   - Age 60 years or more
   - Renal dysfunction

3. **Other Factors that contribute to bleeding**
   - Thrombocytopenia
   - Cirrhosis

4. **Other anti-thrombotic use**

5. **Refer for Clinical Follow-up**
   - Virtual Visit with VHP ("CVC Venous Management Clinic")
   - Hematology

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**Critical Ill Patients**

1. **Clinical Suspicion for DVT**
   - Risk Assessment by Wells Score
     - Low Risk (< 2)
     - High Risk (≥ 2)

2. **Assess Bleeding Risk (VTE-BLEED)**
   - Low Risk (< 2)
   - High Risk (≥ 2)

3. **ThromboProphylaxis**
   - Presumptive VTE Treatment with Heparin
     - Most patients can receive VTE prophylaxis
     - Select patients may require lower-intensity heparin

4. **Confirm with DVT Scan**
   - Full dose AC
   - D/C with 3 doses AC

5. **Procedural Considerations**
   - Procedural Considerations
     - DVT scan
     - Venous Ultrasound
     - Angiography
     - Venography

6. **No change in management**

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