# COVID-19 AND RESPIRATORY DISTRESS IN THE ADULT

3/26/2020

# EXPERIENCE THUS FAR

- Data from Wuhan (JAMA Intern Med 2020 Mar13, JAMA 2020 Feb28)
- Risk factors for ARDS and death
  - Age >65
  - Neutrophilia
  - Organ or coagulation dysfunction
  - 5% admitted to the ICU
  - 2.3% required mechanical ventilation
  - 1.4% died

# EUROPE

- Italy; patients who expired
  - Mean age 79
  - 70% men
  - 2.7 mean comorbidities/patient
  - 30% CAD, 35.5% DM, 20.3% cancer, 24.5% afib, 6.8% dementia, 9.6% CVA

# WHAT TO DO

- 1. Suspect
  - Travel, fever, cough, diarrhea, close contacts, local outbreak
- Isolate
  - Airborne or droplet as local protocol dictated; protect staff first!
- Stabilize
  - Oxygen therapy, get IVs,

# OXYGEN THERAPY: AVOID AEROSOLS

- Focus on nasal cannula or mask.
- Up to 6L nasal cannula to keep sats>90.
- Avoid high flow O2, CPAP, or BIPAP unless that is all you have.
  - These have potential to aerosolize the virus! None have an expiratory filter
  - Watch the amount of bag mask ventilation prior to intubation
  - Avoid Nebulizers for the same reason! Use an MDI first and frequently.
- Proceed with intubation early if decompensating; we recommend if they need more than 6L and are a high risk for COVID.
- Once on the ventilator, minimize circuit breaks. Go to the CT scanner on the vent, go to the OR on the vent, etc. Break the circuit only if necessary!

# Respiratory Support Algorithm for Patients with COVID-19

Deterioration

Recovery

**(Consider Early Intubation)**

## Low Flow Nasal Cannula

- Typically set at 1-6 liters/minute (avoid humidification)

## High Flow Nasal Cannula (limited flow rate)

- Titrate $FiO_2$ based on patient's oxygen saturation.
- Avoid very high flow rates.
- Once support reaches 30 liters/minute at 50% $FiO_2$, consider intubation.
- Avoid use of NIV/CPAP.

## Invasive Mechanical Ventilation

- Use lung-protective strategy; target tidal volumes ~6 ml/kg.
- Use high-peep ladder (ARDS network guidelines)
- Permissive hypercapnia may be useful to allow for lung-protective settings.
- Consider early use of APRV.

## Other Considerations

- Prone positioning is a front-line therapy for refractory hypoxemia ($PaO_2/FiO_2$ ratio <150)
- Inhaled Epoprostenol or Nitric Oxide
- VV-ECOM

- **ARDS Ventilator setup for everyone**
- **Set Mode to VC or PC (either is fine, but use what you are comfortable with)**
- Tidal Volume = 6cc/kg of *IDEAL BODY WEIGHT*
- FIO2-100% and dial back to keep it >88%.
- PEEP. Start at 10, use the PEEP ladder to guide you, and don't worry about hypotension. Start pressors early!
- Rate 12-16 per minute and adjust to keep the pH 7.25-7.30. NO HIGHER
- Keep them dry! Avoid excessive fluid resuscitations. Use pressors. If they are obviously dry give fluids, but don't go overboard.
- Get a blood gas as soon as they're settled on the vent (30min), and as often as necessary.
- Permissive hypercapnia is OK; keep the pH 7.25-7.30 NO HIGHER.

# PEEP LADDER

**Lower PEEP/higher FiO2**

| $FiO_2$ | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 | 0.7 |
|---|---|---|---|---|---|---|---|---|
| **PEEP** | 5 | 5 | 8 | 8 | 10 | 10 | 10 | 12 |

| $FiO_2$ | 0.7 | 0.8 | 0.9 | 0.9 | 0.9 | 1.0 |
|---|---|---|---|---|---|---|
| **PEEP** | 14 | 14 | 14 | 16 | 18 | 18-24 |

**Higher PEEP/lower FiO2**

| $FiO_2$ | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 |
|---|---|---|---|---|---|---|---|---|
| **PEEP** | 5 | 8 | 10 | 12 | 14 | 14 | 16 | 16 |

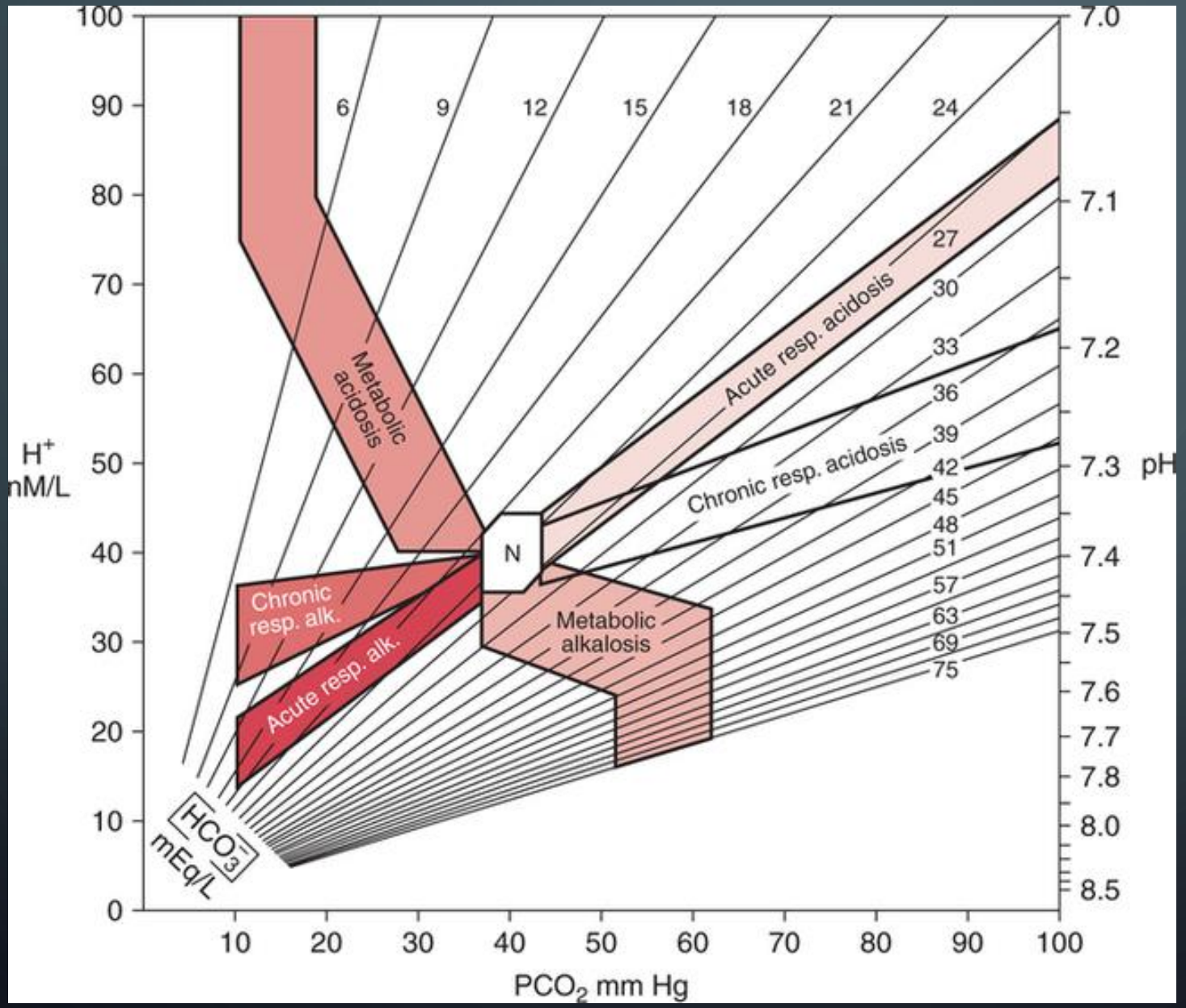
| $FiO_2$ | 0.5 | 0.5-0.8 | 0.8 | 0.9 | 1.0 | 1.0 |
|---|---|---|---|---|---|---|
| **PEEP** | 18 | 20 | 22 | 22 | 22 | 24 |

# FACTT TRIAL FOR FLUID MANAGEMENT

| Measured intravascular pressure (mm Hg) | | | | MAP <60 mm Hg or a need for any vasopressor (except dopamine ≤5 μg/kg/min); consider correctable causes of shock first | MAP ≥60 mm Hg without vasopressors (except dopamine ≤5 μg/kg/min) | | | |
|---|---|---|---|---|---|---|---|---|
| CVP | | PAOP[G] | | | Average urinary output <0.5 ml/kg/hr | | Average urinary output ≥0.5 ml/kg/hr | |
| Conservative strategy | Liberal strategy | Conservative strategy | Liberal strategy | | **Ineffective Circulation** Cardiac index <2.5 liters/min/m² or cold, mottled skin with capillary-refilling time >2 sec | **Effective Circulation** Cardiac index ≥2.5 liters/min/m² or absence of criteria for ineffective circulation | **Ineffective Circulation** Cardiac index <2.5 liters/min/m² or cold, mottled skin with capillary-refilling time >2 sec | **Effective Circulation** Cardiac index ≥2.5 liters/min/m² or absence of criteria for ineffective circulation |
| Range 1 | | | | 1 Vasopressor[F] Fluid bolus[F] | 3 KVO IV Dobutamine[A] Furosemide[B,1,2,4] | 7 KVO IV Furosemide[B,1,2,4] | 11 KVO IV Dobutamine[A] Furosemide[B,1,3,4] | 15 KVO IV Furosemide[B,1,3,4] |
| >13 | >18 | >18 | >24 | | | | | |
| Range 2 | | | | | 4 KVO IV Dobutamine[A] | 8 KVO IV Furosemide[B,1,2,4] | 12 KVO IV Dobutamine[A] | 16 KVO IV Furosemide[B,1,3,4] |
| 9–13 | 15–18 | 13–18 | 19–24 | | | | | |
| Range 3 | | | | 2 Fluid bolus[F] Vasopressor[F] | 5 Fluid bolus[C] | 9 Fluid bolus[C] | 13 Fluid bolus[C] | 17 Liberal KVO IV |
| 4–8 | 10–14 | 8–12 | 14–18 | | | | | 18 Conservative Furosemide[B,1,3,4] |
| Range 4 | | | | | 6 Fluid bolus[C] | 10 Fluid bolus[C] | 14 Fluid bolus[C] | 19 Liberal fluid bolus |
| <4 | <10 | <8 | <14 | | | | | 20 Conservative KVO IV |

| Therapy | Implementation |
|---|---|
| High-flow nasal oxygen | Might prevent or delay the need for intubation |
| Tidal volume | Use 6 mL/kg per predicted bodyweight<br>(can reduce to 4 mL/kg per predicted bodyweight) |
| Plateau airway pressure | Maintain at <30 cm $H_20$ if possible |
| Positive end-expiratory pressure | Consider moderate to high levels if needed |
| Recruitment manoeuvres | Little value |
| Neuromuscular blockade | For ventilator dyssynchrony, increased airway pressure, hypoxaemia |
| Prone positioning | For worsening hypoxaemia, $PaO_2$:$FiO_2$ <100–150 mm Hg |
| Inhaled NO | Use 5–20 ppm |
| Fluid management | Aim for negative fluid balance of 0·5–1·0 L per day |
| Renal replacement therapy | For oliguric renal failure, acid-base management, negative fluid balance |
| Antibiotics | For secondary bacterial infections |
| Glucocorticoids | Not recommended |
| Extracorporeal membrane oxygenation | Use EOLIA trial criteria[3] |

# BLOOD GAS MAP



# SEDATION

- Propofol preferred:
  - Start at –5mcg/kg/min; titrate q5min up to a max of 50mcg/kg/min
  - Check daily triglycerides; hold if >400.
- Fentanyl drips
  - Start at 25mcg/hr, titrate q15-30min to effect
  - Make sure to bolus 25-50mcg liberally; the drip is slow to kick in.
- Versed drip
  - Start at 2mg/hr; titrate q15-30min to effect
  - Bolus 2-4mg with every drip change, does tend to build up in the system
- Vecuronium/rocuronium/pancuronium
  - Bolus dose or start a drip ONCE the patient is sedated, and then use paralytics as much as needed to keep your patient ventilating smoothly (ie your patient has NO coughing or tachypnea on the vent). This saves lives! Use it early and liberally along with deep sedation.

# AREAS OF UNCERTAINTY

- Steroids?
- NSAIDS: general agreement to avoid
- Hydroxychloroquine: no positive data, but currently widely in use

- Questions?