Pulmonary

- **Hypoxia:** Use OR algorithm + a few items incl check ABG, CXR
  
  ddx → ↓FiO₂, hypoventilation, V/Q mismatch, shunt, ↓diffusion
  
  o ↑Vol (crackles, neck veins) → CHF or iatrogenic vol overload → IV furosemide, trial NIPPV, fix rhythm, fix HTN if concurrent; consider cardiac ischemia w/u
  
  o Wheezes → Anaphylaxis → as you would in the OR; also COPD/asthma
    
    - **COPD:** nebs (albuterol pm, ipratropium q4-6h), prednisone 40mg qday x5d, d/w ICU antibiotics: Asthma: continuous albuterol neb, heliox
  
  o Tachycardia → consider PE, Revised Geneva Score, CTA (IV contrast), LE doppler to r/o DVT if CT not avail, start heparin gtt per protocol, RV support
    
    - Tachycardia + Hypotension → r/o tamponade
  
  o ↓BS → PTX, effusion, atelectasis, PNA → u/s or CXR can r/o PTX, effusion
    
    - Lobar atelectasis → Mucus plug → bronch
    
    - Fever, ↑WBC, infiltrate → PNA also r/o resp viruses incl flu.

COVID → PPE, precautions, cultures before abx!

  - **VAP (ventilator associated PNA)** → BCx x2, tracheal aspirate/BAL, empiric abx vancomycin (cover MRSA), cefepime or piperacillin/tazobactam (cover gram- incl PsA)
    
    Rates of co-infection low in COVID
  
  o ↓breathing → r/o Opioid o/d → naloxone 0.04-0.4mg titrate to effect

- **Hypercarbia:** see Opioid o/d, PE, COPD/Asthma (above)
  
  ddx → ↑dead space, VQ mismatch, ↑CO₂ production (fever, MH)
  
  o Other emboli: air, fat, AFE → support RV→ dobutamine or epi if hypotension

COVID Considerations: 1) can you skip CXR and make dx with phys exam (contamination)
2) bronch (aerosolization risk) only if absolutely needed (lung volume loss not just secretions)

- **Primer:** Injured Lungs & ARDS
  
  o Lung Injury → ↓Compliance → ↓TV for same pressure or ↑pressure for same TV
    
    - Lung protection: 1) prevent overstretching stiff lungs (↓TV), 2) prevent pressure injury to lung (↓P_{plateau}, ↓Driving pressure), 3)
prevent opening/closing of alveoli (↑PEEP, recruitment), 4) treat other injuries

- Lung rescue strategies
  - Prone positioning may improve outcomes\(^1\); must involve entire team
  - Early paralysis with NMBD for 48h may be indicated\(^2\)
    Sedation: see Neuro section
  - Conservative fluid tx / diuretics
  - Trial of inhaled pulmonary vasodilator (epoprostenol / iNO) to ↓shunt → stop if no improvement or worsening (does not change mortality)
  - Steroid do not improve outcomes in ARDS and early data cautions against use in COVID
  - Refractory hypoxemia/hypercarbia: see ECMO section

- PPx
  - VAP ppx: HOB>30, sedation interruption/SBT ≥qDay (d/w ICU Consult)
    Stress ulcer ppx, DVT ppx: see Best Practices section

- Team Approach
  - Nurses, Respiratory Therapists, Pharmacists will all assist with management and should be involved in decisions

- Goals of Care: address early and often particularly when considering intubation in patients with ↑age / ↑comorbidities

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\(^1\) N Engl J Med 2013; 368:2159-2168