**Respiratory Therapy Pocket Reference**

**Pulmonary Physiology**

- **P**
  - Major stress measures: tidal volume (TV), minute ventilation (VE), PaCO₂, PaO₂, and PaO₂/FiO₂ ratio.
  - TV: the volume of air exchanged with each breath.
  - VE: the product of TV and respiratory rate (RR).
  - PaCO₂: the partial pressure of carbon dioxide in arterial blood.
  - PaO₂: the partial pressure of oxygen in arterial blood.
  - PaO₂/FiO₂: the ratio of PaO₂ to the inspired oxygen fraction (FiO₂).

**Peak expiratory flow**

- **PEFR**
  - Measures the maximum flow rate at a given point in the respiratory cycle.
  - Used to monitor bronchial reactivity in patients with asthma.

**Minute Vent**

- **V̇**
  - Calculated as VE/RR.
  - Represents the total volume of gas exchanged per minute.

**Compliance**

- **C**
  - Represents the change in volume per unit change in pressure.
  - Used to determine the elasticity of the respiratory system.

**Resistance**

- **R**
  - Represents the opposition to airflow.
  - Measured in units of resistance (ohms).

**Resistance to peak inspiratory flow**

- **Rt (PIP-PaL) inspir flow**
  - Represents the resistance to airflow during inspiration.

**Alveolar Gas Equation**

- For a given PaO₂ and PaCO₂, the alveolar PO₂ can be calculated using the alveolar gas equation:

  \[ \text{PaO}_2 = \text{FiO}_2 \times \text{PaO}_2 \text{(inspired)} - \text{PaCO}_2 \times \frac{1}{\text{RQ}} \]

**Hypoventilation**

- Hypoventilation is a condition in which the alveolar ventilation is insufficient to remove CO₂ effectively.

**Pressure Support (PS)**

- **PS**
  - Represents the pressure added to deliver a specified volume of gas.
  - Used to overcome respiratory efforts and improve ventilator synchrony.

**Volume Control (VC)**

- **VC**
  - Represents the volume of gas delivered per breath.
  - Used to deliver a predetermined volume of gas to the patient.

**Flow**

- Represents the rate at which gas is delivered to the patient.

**Synchronized Intermittent Mandatory Ventilation (SIMV)**

- **SIMV**
  - Represents the volume of gas delivered to the patient during the ventilator’s inspiration cycle.

**Misc Vent Settings**

- **Misc**
  - Represents the miscellaneous settings that can be adjusted during ventilation.

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Normal expiration Palvolar CO₂ is mixed with gas from anatomic and physiologic deadspace measured by integrating exhaled volume. 

**Capnography Method**
- Auscultation & passing a suction catheter
- Obstruction (mucous plug), small/medium circuit problem, ETT kink/occlusion/biting
- Dx = low compliance

**End Expiratory Volume**
- This difference (usually less than 5) can be used to estimate deadspace

**PEEP/Intrinsis**
- Gas trapping: inevitably returns to baseline
- Dx = high resistance
- Must be the best method to assess dynamic gas trapping

**Ventilation**
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**ARDS Management**
- Goal is to set PEEP to match or exceed auto-PEEP box)
- Lower inflection point
- Titrate PEEP to oxygenation is easy and reasonable, though pulmonary mechanics must be utilized, especially if poor oxygenation response
- Despite existence of numerous techniques (below), mean PEEP to maintain oxygenation requirements over past 24hrs

**PARALYSIS**
- Paralysis w/in 48h, x48h, severe ARDS, 24% mortality
- Failure of weaning
- Trial 1999
- CESAR Trial, 2010
- PROSEVA -- 10 mg/hr Cisatracurium ($)
- *No survival data; Caution: pulm vasodilators can cause incr LVEDP; do not use if intrinsic PEEP

**Vent Liberation**
- Must be done prior to extubation
- Lancet 1999
- BMJ, 2003
- Age: 16yr: 5 mL/kg
- 18yr: 6-7 mL/kg
- 20yr: 8-10 mL/kg
- Ventilation = minutes; see Table 1
- If <80mL/kg, return to 40/25 5s
- Caution: can kill a pt. Check with attending and RT

**Management**
- Pulse, BP, SPO2, RR, temperature, SpO2, ICP, ABG
- O2 saturation x 48h
- TSB, albumin, CRP, procalcitonin
- Kallil et al, IDSA Guidelines, 2017
- IDSA guidelines: 80mg/kg or 2nd generation ceftriaxone or other 
mDRD with MSSA + pseudomonal coverage; MRSA tx if risk factors; double cover
- MSSA + pseudomonal coverage; MRSA tx if risk factors; double cover
- Lower inflection point = 10cmH₂O
- PEEP < 10cmH₂O
- Return to 40/25 5s
- Caution: can kill a pt. Check with attending and RT

**ARDS**
- Mortality difference
- ARDS Management
- Ventilator Set-up per ARDS Protocol
- Calcium: 11.0 - 10.0 mmol/L
- pH: 7.35 - 7.45
- Pao₂: 60 - 70 mmHg
- PEEP: 5 - 15 cmH₂O
- Titrate PEEP to oxygenation is easy and reasonable, though pulmonary mechanics must be utilized, especially if poor oxygenation response

**Pseudomonal Infections**
- Identifiable by sputum cultures
- pseudomonas if MDR risk factors; pseudomona if BSI; antimicrobial sensitivity; 72h pnd cultures
- Minimum susceptibility: 
  - β-lactamase sensitive: 
  - β-lactamase resistant: 

**Inhaled Prostacyclin (aka: PGI₂)**
- Uses Vt normalized to functional aerated lung
- Effective than sustained inflation RM
- Paracrine stimulation of pulmonary vasculature
- Risk of bleeding
- NEJM, 2012
- NEJM, 2010
- Lancet
- European Society of Intensive Care Medicine (ESICM) guidelines, 2009
- Prostacyclin: 50mcg/kg/min via PC
- Maintenance dose: 20mcg/kg/min via PC
- Maximum dose: 70mcg/kg/min via PC
- PC more stable and labile and < 20 mmHg w/ CPP > 60 mmHg, 6) No MI in previous ~48hr

**Repro: FACs & PEEP**
- 1) FiO₂ > 60% (true reassurance); Mode: CMV
- > 15 L/min, 4) ~MAP > 60 mmHg (minimal pressors), 5) ICP: non-invasive
- ICP > 30cmH₂O, 24h, 6) High risk of serum lactate > 4mmol/L

**PNEUMONIA**
- Chest X-ray: consolidation, infiltrate, pleural effusion
- NLM: chest X-ray
- BSI: 1) CT chest, 2) WBCs, 3) CRP, 4) temperature
- Use without ICI
- Pathogens, risk factors
- Diagnosis: 
  - Syndrome of inappropriate antidiuretic hormone (SIADH)
- Treatment: 
  - Standard Rx: antibiotics
- Prognosis: 
  - Mortality: > 70%
- Management: 
  - Hydration: 
  - Titrate PEEP to maintain end-exhaled CO₂ around 35-40 mmHg