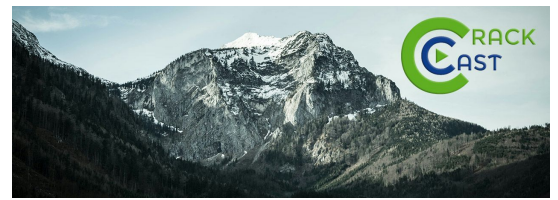


## principles

- spontaneous ventilation:
  - venous return and preload are augmented, pressure gradient between LV and aorta
- Pos. pressure ventilation issues:
  - decreased venous return, dec. Cardiac Output, less pressure gradient LV <--> aorta
  - exacerbates hypotension
- invasive mechanical ventilation:
  - *control variable*
    - Pressure controlled
      - set amount of pressure applied to lungs
      - set inspiratory time
      - Useful to prevent barotrauma or high resp. reserve
        - Asthma, COPD
        - salicylate overdose
      - unable to control volume
    - volume controlled
      - peak insp. pressures vary based on Tidal volume
      - Risky when poor resp. system compliance
      - Useful in volume restricted diseases:
        - ALI
        - ARDS
        - obesity
  - *dual control ventilation*
    - PRVC
  - *Ventilator mode:*
    - Continuous mechanical ventilation (CMV)
      - Assist/control - P or V control.
        - fixed breaths per min, assists fixed vol. breaths with pts triggering breathing.
        - deeply sedated or paralysed pts. \*\*\*standard ED setting\*\*\*\*
    - Intermittent mech. vent. (IMV)
      - SIMV
      - patients with weak, intermittent breaths
      - preset breaths, promotes patient comfort, avoids hypervent.
    - Continuous spont vent. (CSV) \*\*\*\*(all patient determined)\*\*\*\*
      - PSV: awake interactive patients
      - CPAP- set PEEP
        - PEEP: is the maintenance of pos. airway press. AFTER the completion of passive exhalation
          - increases FRC, oxygenation, dec. intrapulm shunt
    - BiPAP- set IPAP and EPAP

## non-invasive techniques

- NIPPV



- CPAP: constant pos, pressuring during the resp. cycle
- BiPAP: alternates between iPAP and ePAP (alveolar recruitment)

## MANAGEMENT:

**NIPPV vs. Invasive:**

- NIPPV can obviate intubation in many "DNR" situations or for reversible conditions

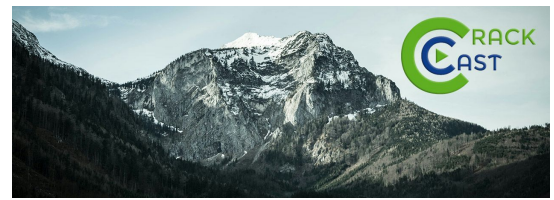
	Ideal pt. popultn.	Contraindications	notes
NIPPV	<ul style="list-style-type: none"> <li>● COPD</li> <li>● cardiogenic pulm edema w. fatigue</li> <li>● hypercapnic acidosis</li> <li>● ?asthma</li> <li>● ?pneumonia</li> </ul>	<ul style="list-style-type: none"> <li>● decreased LOC</li> <li>● no resp. drive</li> <li>● increased secretions</li> <li>● Actively vomiting patient/or about to vomit</li> <li>● hemodynamic instability</li> <li>● facial trauma/deformity</li> <li>● agitated or combative patient</li> </ul>	leads to afterload reduction: causes elevations of intrathoracic pressure and decreases LV ejection pressure; decreases RV preload

**approach to initial vent. settings:**

- systematic questions to talk through:
  - 1) could NIPPV help?
    - CPAP:
      - IPAP at 10 cm H<sub>2</sub>O
      - EPAP at 5 cm H<sub>2</sub>O
      - increase each by 1 cm at a time.
      - max IPAP is 20 cm h<sub>2</sub>O
  - 2) Intubation needed?
    - Mode: A/C
    - tidal Vol: 6-8 ml/kg
    - rate: 12-14 bpm
    - pressure targets < 30 cm h<sub>2</sub>O
    - FiO<sub>2</sub>: @ 1.0, then titrated DOWN to maintain spO<sub>2</sub> > 90%
    - PeeP: at 5 cm h<sub>2</sub>O

**ongoing management:**

- regular titration of settings based on blood gases
- **VBG's good for pH and PcO<sub>2</sub>**
- PIP / peak airway pressures = the amount of airway pressure in the alveoli at end inspiration
- **Must also address analgesia and sedation!**
  - RASS score from -5 <-> +4; ideal emerg level is -2
  - Morphine - has active metabolites that accumulate in the system



- Benzo's - when infused have tissue accumulating properties leading to prolonged delirium and sedation
  - boluses are much better if absolutely needed
- Propofol - better given as an infusion: 0.1mg/kg/min
- Dexmedetomidine - great drug for sedation and for ICU delirium
- \*\*\*Haldol - useful adjunct who are acutely agitated after large doses of other sedatives\*\*
- VAP prevention:
  - Suctioning
  - HOB >30 deg.
  - OG/NG to suction
  - Chlorhexidine mouthwashes

**Complications of PPV:**

- Lung barotrauma and volutrauma
  - max end-inspiratory pressures at 30 cm H2O
  - risk of pneumothorax, pneumomediastinum
- breath stacking in obstructive lung disease leading to hyperinflation
  - decrease resp rate and I:E ratio

**\*\*\*Troubleshooting the ventilator:\*\*\***

- first step: "Disconnect the Ventilator system and Bag with 100% O2"
- Acute diagnoses not to miss:
  - physiologic things:
    - tension pneumothorax
    - acute PE
    - inadequate sedation
  - mechanical things:
    - dislodged tube or mucous plug
    - cuff leak or vent circuit problem

**special clinical circumstances: any existing lung disease:**

"treat them like BABY lungs"

Disease	Acute exac. COPD	Status Asthmaticus	ALI / ARDS
notes	minimize IPEEP: <ul style="list-style-type: none"> <li>● bronchodilators, steroids</li> <li>● long expiratory time, low RR</li> <li>● low TV</li> <li>● "permissive hypercapnia"</li> <li>● I:E of 1:4</li> <li>● deep sedation!</li> </ul>	similar to COPD <ul style="list-style-type: none"> <li>● low RR,</li> <li>● long Exp. times</li> <li>● NO PEEP</li> <li>● low tidal Vol.</li> </ul>	<ul style="list-style-type: none"> <li>● decreased tidal Vol.                             <ul style="list-style-type: none"> <li>○ below 7 ml/kg</li> <li>○</li> </ul> </li> </ul>

