Vent Lecture 1 Introduction to Ventilator Management

- Medical Practice Improvement Project
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Disclosures

- None

Learning Objectives

1. Understand the difference between Ventilation and Oxygenation
2. Learn the criteria for intubation
3. Different Modes of noninvasive positive pressure ventilation
4. Discuss intubation and how to do it safely

What is Ventilation?

1. Bidirectional movement of air through the respiratory tract

2. Only occurs during exhalation = elimination of Carbon Monoxide gas

Examples

BIPAP	SIMV	AC	PRVC	BIVENT (APRV)

All examples of ventilation methods

What is Ventilation?

- What is not a mode of ventilation
  - Nasal cannula
  - CPAP
  - Aervo
  - Hi-Flo Nasal cannula
  - Nonrebreather

- Air only moves in one direction → in and there is not passive time for exhalation

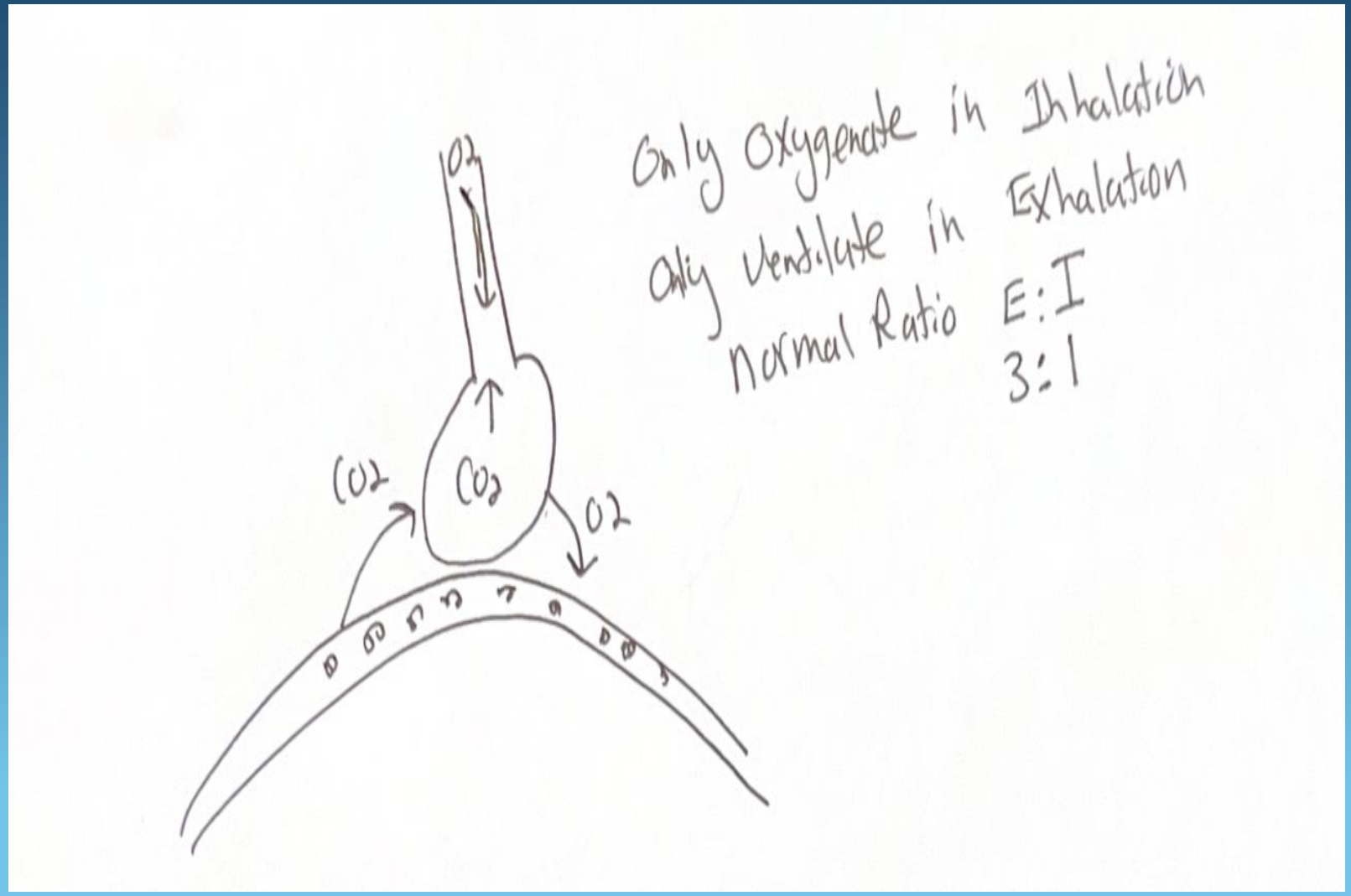
What is Oxygenation?

- This is the exchange of Oxygen with the red cells
- Only occurs during inhalation
- Contact time with the Red Cell and the alveoli cell wall is required
- Red Blood cells are obligate anerobic cells
- They only make ATP with Glycolysis otherwise they would use up all the oxygen that they are delivering
- Life span of RBC cell = 120 days
- Replace about 1% of your red cell mass per day

What Effects Oxygenation and Ventilation?

- PE
- Edema
- Mucus Plugging
- Atalectasis

What Effects Oxygenation and Ventilation?



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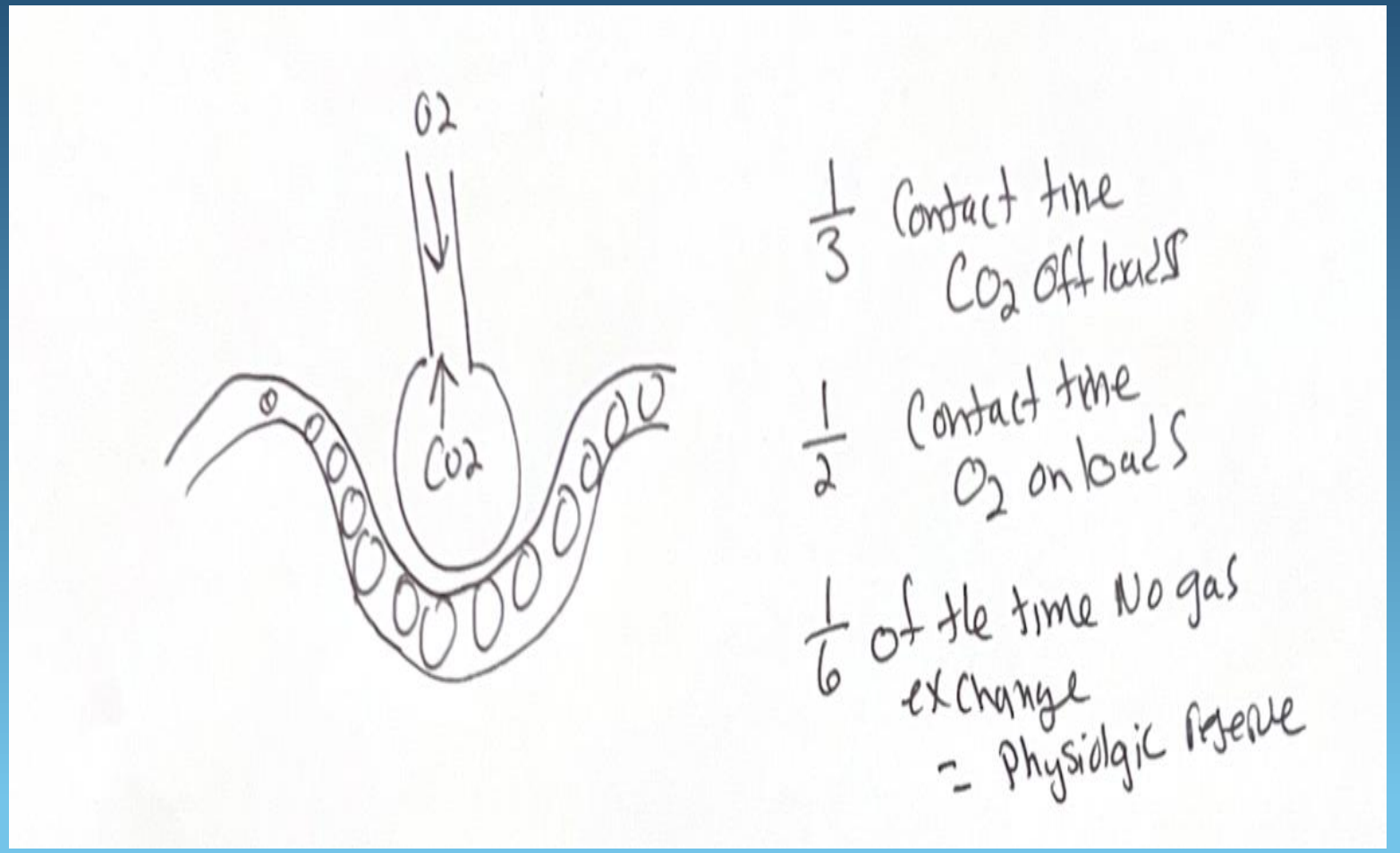

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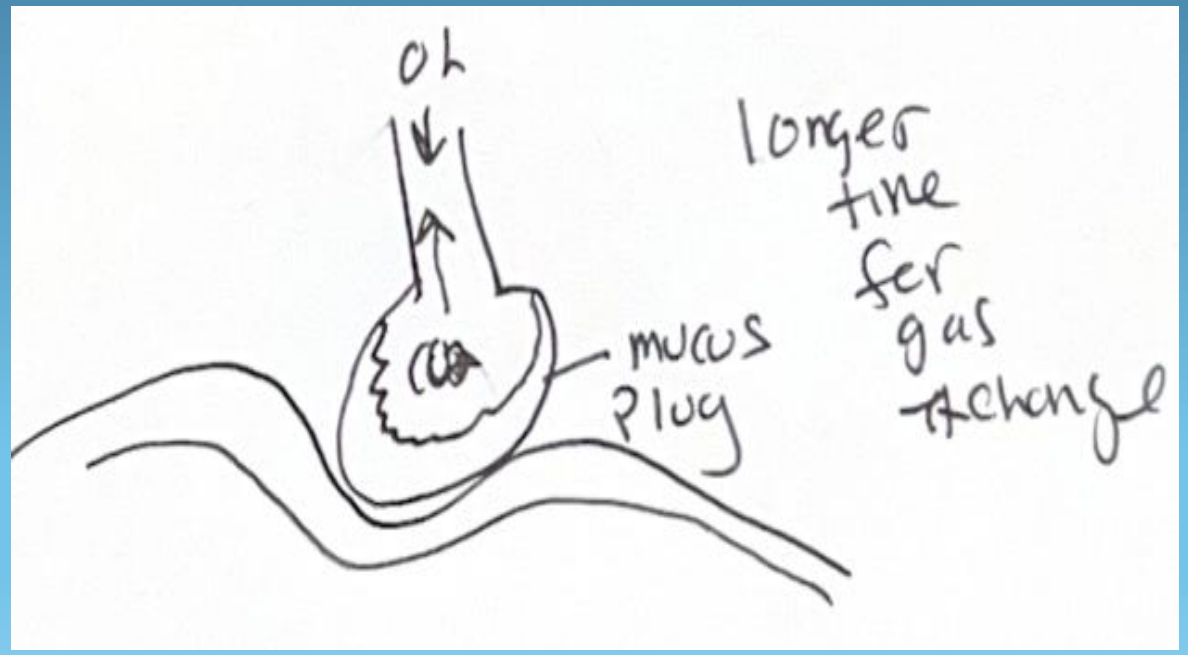
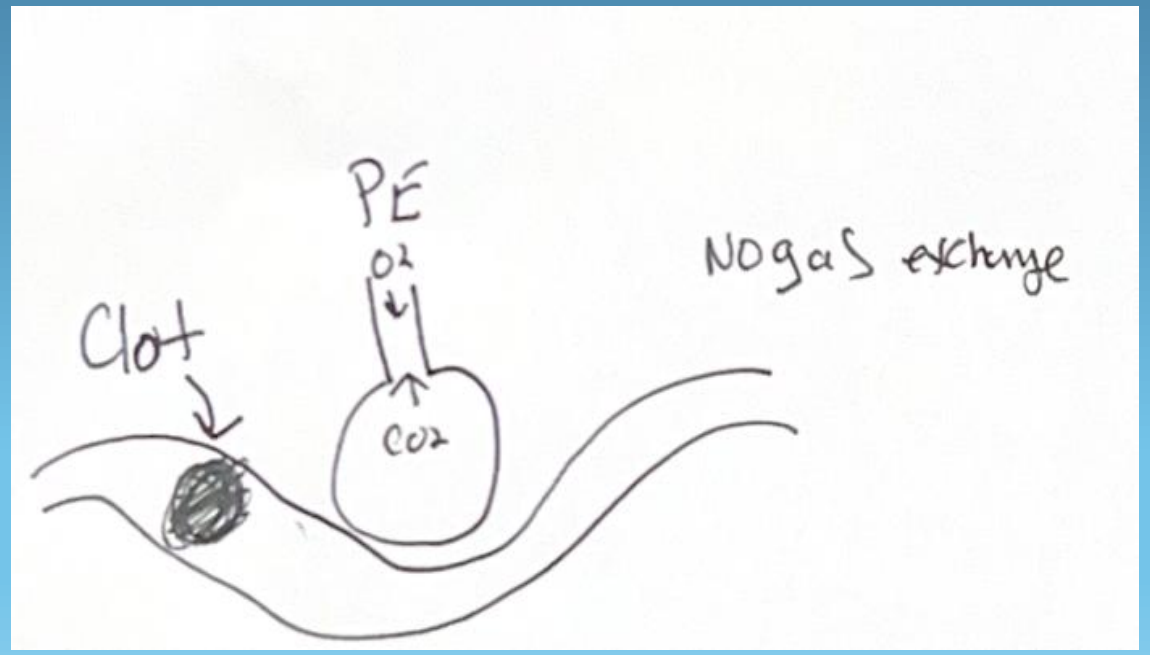
What Effects Oxygenation and Ventilation?





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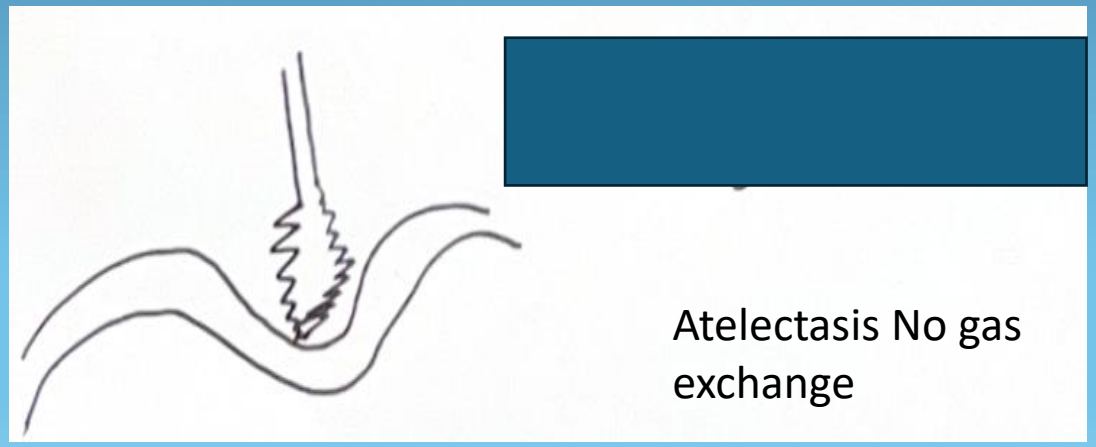
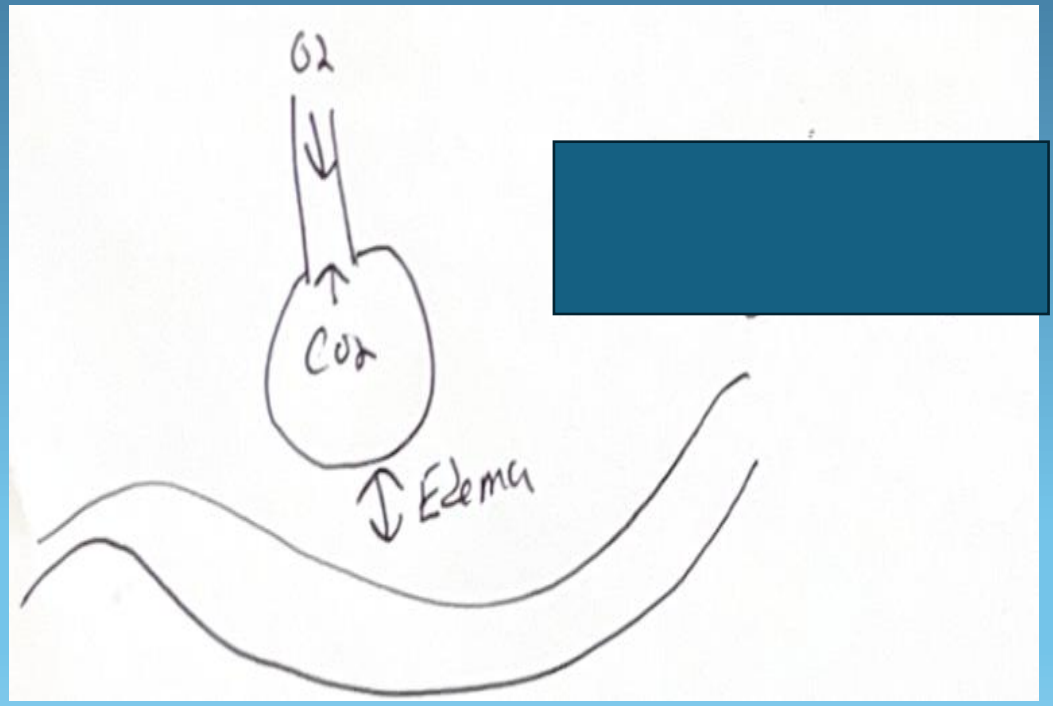


Atelectasis No gas exchange

Interstitial edema it takes longer for the gas to diffuse over the distance
It is to the 4th power of the distance



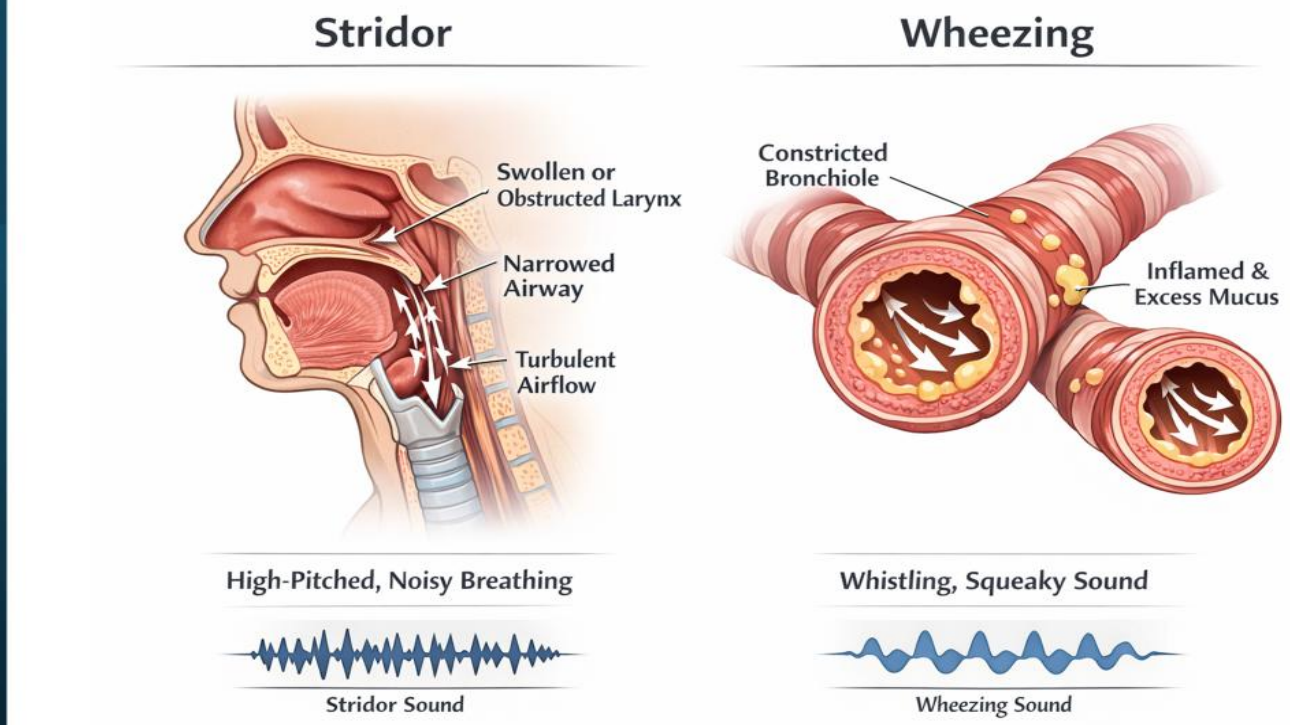
What are the Indications for Intubation?

- Trauma
  - Inability to maintain or Protect the airway
  - Low GCS <8
- Failure to maintain airway patency
  - Obstruction
  - Angioedema
  - Severe facial trauma/mass effect
- Failure to maintain O2 saturation despite support PaO2 less than 60 mmHg
- Cardiac arrest
- PCO2 > 60mmHg and can not ventilate
- Deteriorating clinical condition
- Fatigue→ breathing 40 times and minute and using accessory muscles
- Stridor→ this is an emergency to intubate → imitate airway collapse

Stridor Versus Wheezing

Feature	**Wheezing**	**Stridor**
Definition	High-pitched, musical sound from narrowed **lower airways**	Harsh, vibratory sound from narrowed **upper airway**
Anatomic Location	Bronchi / bronchioles (intrathoracic)	Larynx, trachea, subglottic region (extrathoracic or intrathoracic upper airway)
Primary Phase	**Expiratory > Inspiratory**	**Inspiratory > Expiratory** (can be biphasic)
Common Causes	Asthma, COPD, bronchiolitis, anaphylaxis	Croup, epiglottitis, foreign body, laryngomalacia, vocal cord dysfunction, anaphylaxis
Exam Clues	Diffuse, polyphonic, improves with bronchodilators	Focal, loudest over neck, may have retractions, hoarseness, drooling depending on cause
Clinical Implication	Airflow limitation; often chronic or reversible	**Potential airway emergency** — upper airway obstruction until proven otherwise

Stridor Versus Wheezing



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Safe Intubation

- Most experienced person should perform the intubation or supervise others doing the intubation
- Items needed
  - Suction and Yankauer on, working and available
  - Oral Pharyngeal airway present
  - Bag valve mask and Oxygen supply
  - Bougie available
  - Glide scope/C-MAC
  - ET Tube in different sizes and stylet available (7.0-8.5)
  - RSI Drugs (Etomidate, Ketamine, Rocuronium, Succinyl Choline)

Safe Intubation

- Most important
  - Pre-Oxygenate if possible
  - Be Ready for Aspiration
  - Be Ready for Aspiration ***(Not a typo)***

Place NGT to suction before RSI if possible

Place NGT in stomach and suction out stomach if possible. ***Not always possible***

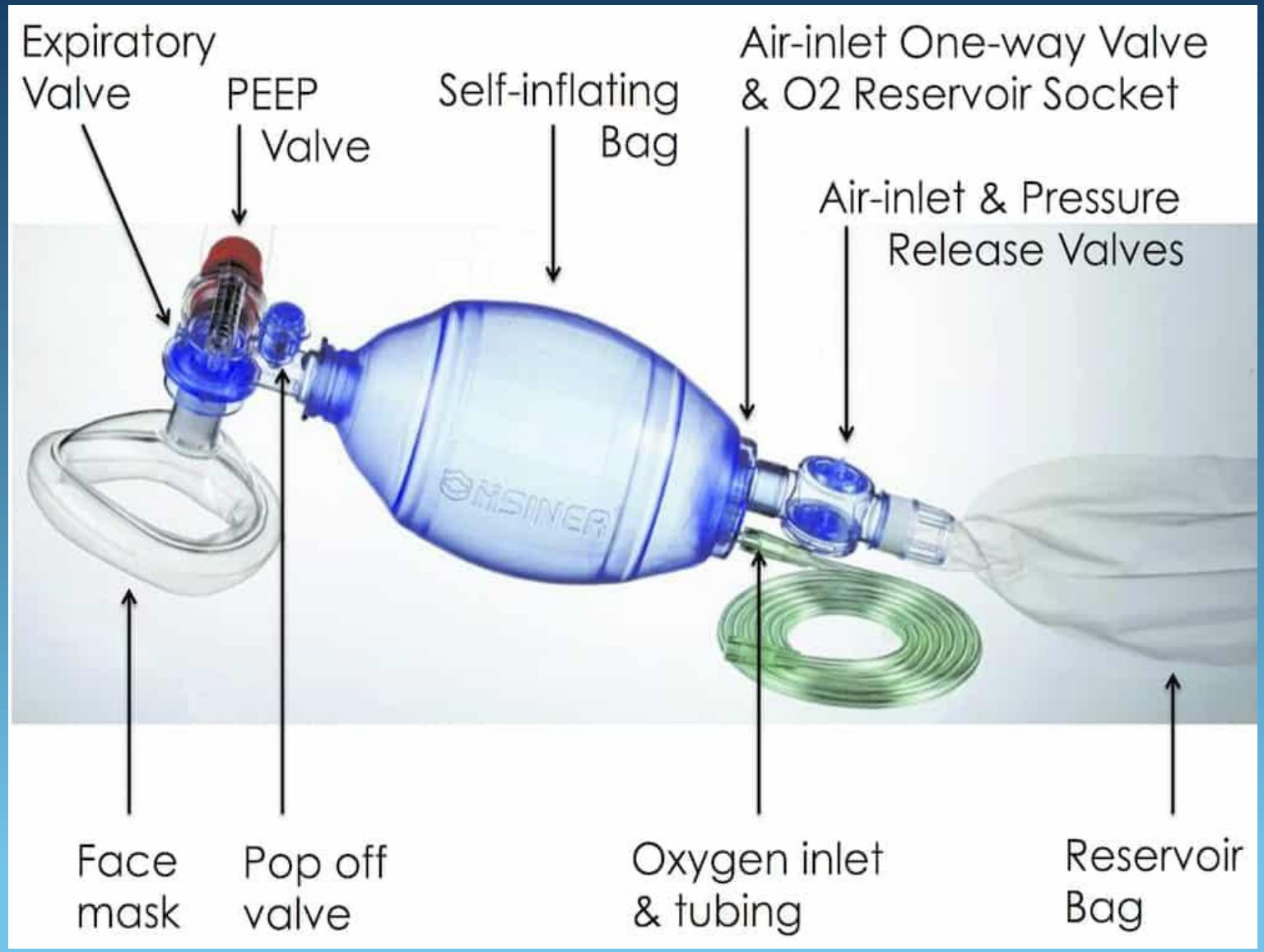
Patient is too unstable and needs airway now.

Intubation

- Make sure you have all your items
- Make sure everyone knows what they are doing
- Make sure you have RSI drugs and identify the person administering them
- Quiet in the room. one person talking. the person intubating
- There is no need for a countdown of the Saturation. It distracts the person intubating. Let them know key intervals. 95%, 90%, 85%
- If missed intubation, be prepared to mask and bag the patient up again

Bag Valve Mask

Need to ensure good seal and chest rise and fall



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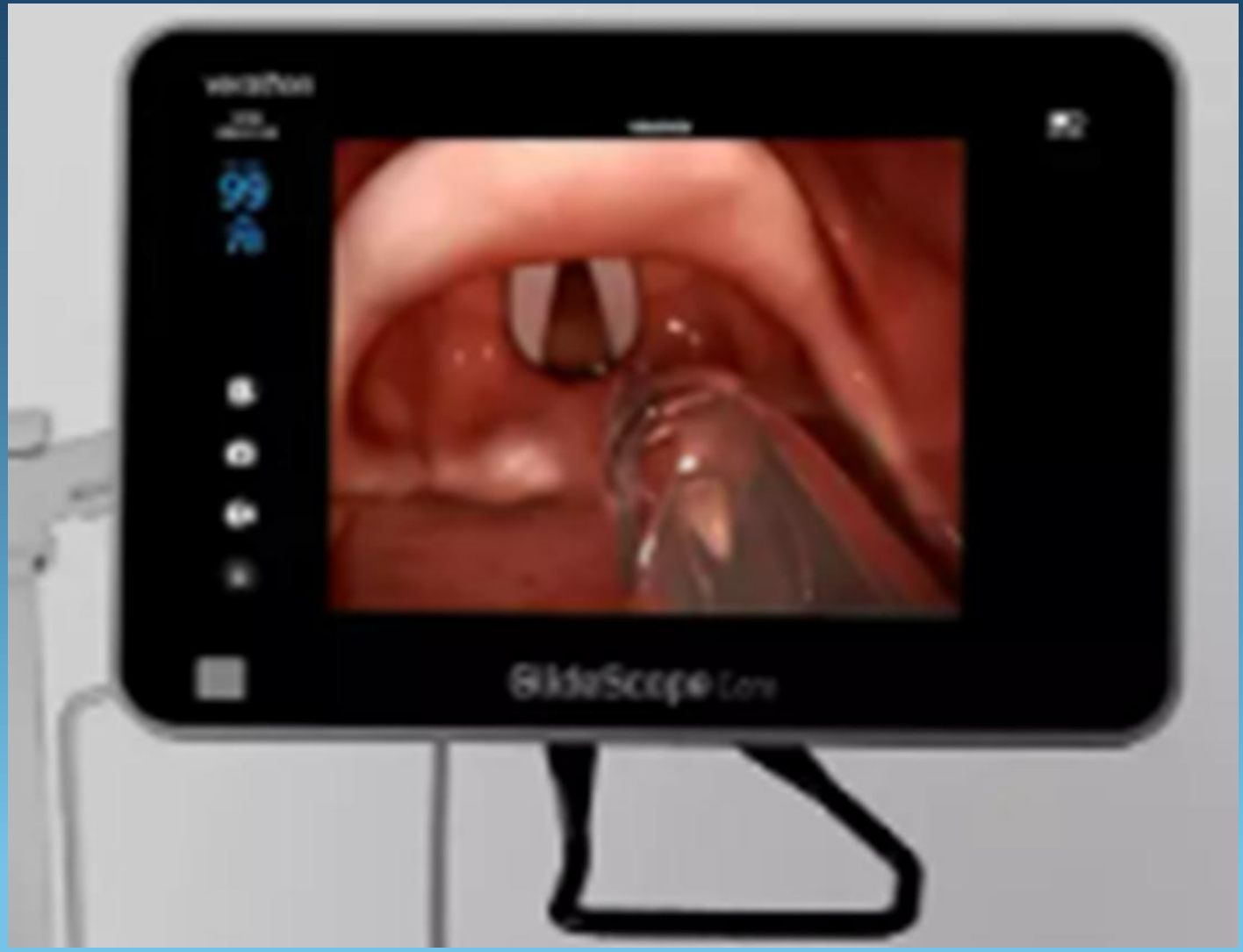
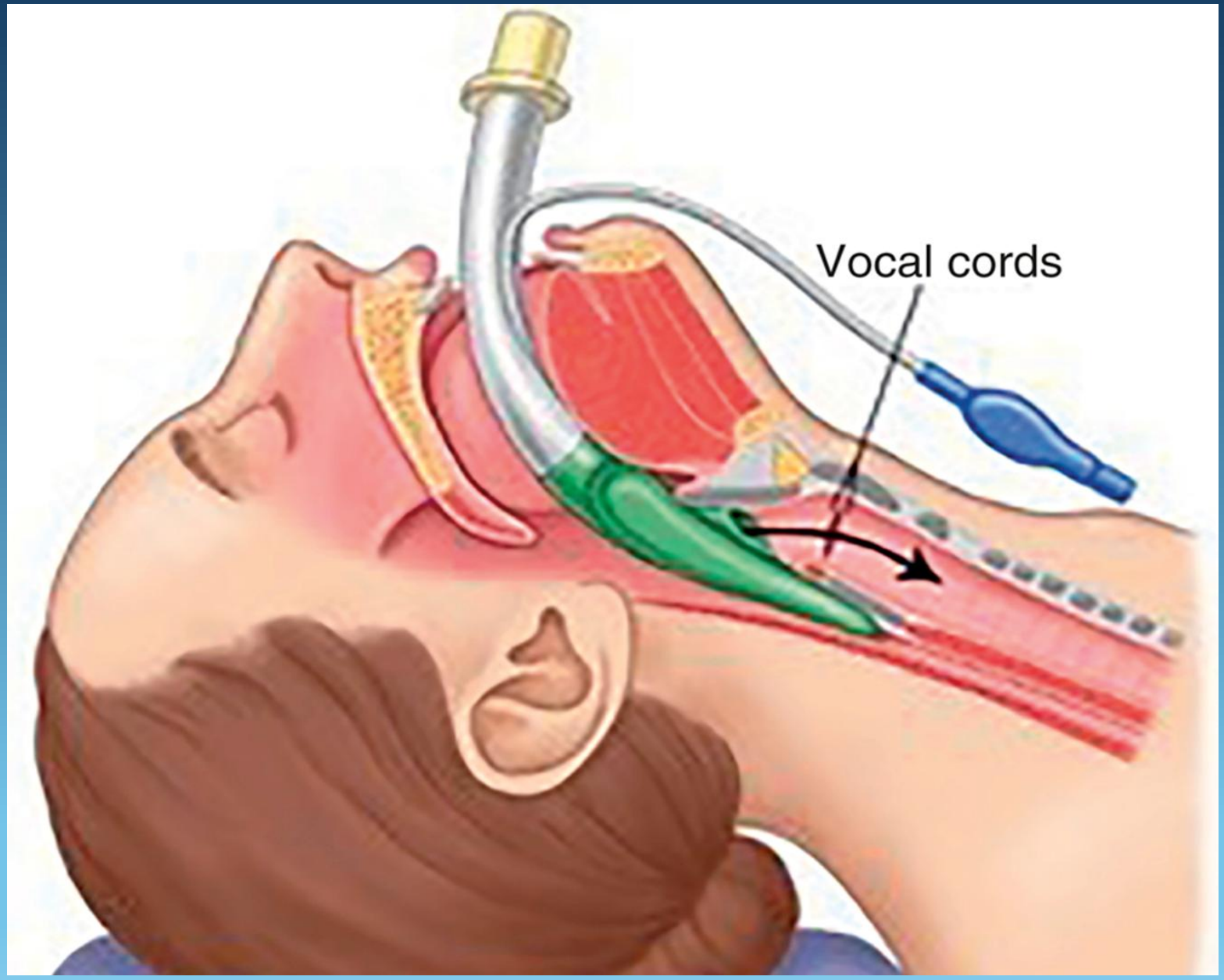
What it should look like

Video laryngoscopy is the standard now.
Not direct laryngoscopy



LMA
Laryngeal Mask Airway
not a protected airway



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Different Modes of Noninvasive Positive Pressure Ventilation

CPAP is not a mode of ventilation

- Continuous Positive Airway Pressure

BiPAP → this is a mode of Noninvasive Positive Airway Positive Pressure Ventilation (NPPV)

- Bilevel Positive Airway Pressure

BIPAP Settings

- Setting the mode

- Rate 10-20 BPM (back up rate) can breathe over this
- FiO2 30%-100%
- Inspiratory Pressure -→ IPAP→ 10-20 cm H2O
- Expiratory Pressure→ EPAP→ = PEEP on vent → 5- 15 cm H2O
- TV is a function of compliance of the lung→ more IPAP the larger the tidal Volume

Minute Ventilation

- Clearing CO_2
  - Minute ventilation is defined as
    - TV in liters x Respiratory Rate (TV*RR)

How to Correct CO2 and PaO2

Oxygenation

- Increased by increasing Fi02
- Mean Airway Pressure
- Peep

Carbon Dioxide Clearance

- Increasing TV
- Increasing Rate
- (Increased Minute Ventilation)

Choosing the Mode

Volume cycled or Pressure Cycled

Discuss more in Vent 2

Look at volume cycled ventilation

Assist control (AC)

Synchronized Intermittent Mandatory Ventilation (SIMV)

How do we set the Ventilator?

Volume control is the same

Tidal Volume (TV) 6-8 ml per kg Ideal body wt (4-6 ml per kg for lung protective strategy

Respiratory rate (RR) 10 -25 BPM

FIO2 30% to 100%

Mode AC or SIMV

Positive end expiratory pressure (peep) 5 cm H20 to 20cm H2O

Pressure support in SIMV only 10 cmH2O to 20 cm H2O

How do we set the Ventilator?

- Starting point usually
- AC or SIMV
- TV 500 ml to 600ml
- FiO2 100%
- Peep 5 cm H2O
- RR 12-16 BPM
- PS for SIMV 10 cm H2O

End of Vent I lecture……

Vent 2 talk about modes and differences in-depth

AC vs SIMV

Feature	Similarities	Differences
Purpose	Both provide mechanical ventilation for inadequate spontaneous breathing.	**AC:** Full support every breath (mandatory + patient-triggered).**SIMV:** Mandatory breaths supported; spontaneous breaths partially supported or unsupported.
Control Variable	Both can be set as Volume or Pressure controlled.	**AC:** Set Vt/Pressure on all breaths.**SIMV:** Set Vt/Pressure only on mandatory breaths.
Triggering	Patient-triggering supported in both.	**AC:** Every triggered breath fully assisted.**SIMV:** Spontaneous breaths not fully assisted (unless PS added).
Work of Breathing	Both reduce WOB compared to spontaneous breathing alone.	**AC:** Lowest WOB.**SIMV:** Higher WOB due to spontaneous effort.
Weaning	Both used in weaning protocols.	**AC:** Less ideal for weaning.**SIMV:** Common for weaning w/ Pressure Support.
Risks	Both can cause alkalosis if MV high.	**AC:** Higher alkalosis risk from high supported rates.**SIMV:** Lower alkalosis risk.

Work Cited

- bag valve mask with peep valve - Search Images
- Airway Evaluation and Management - Laryngeal Mask Airway | Clinical Anesthesia Procedures
- glidescope intubation view - Search Images

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