Ventilatory management of Covid -19 Pneumonia

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TYPE OF OXYGEN DELIVERY DEVICES

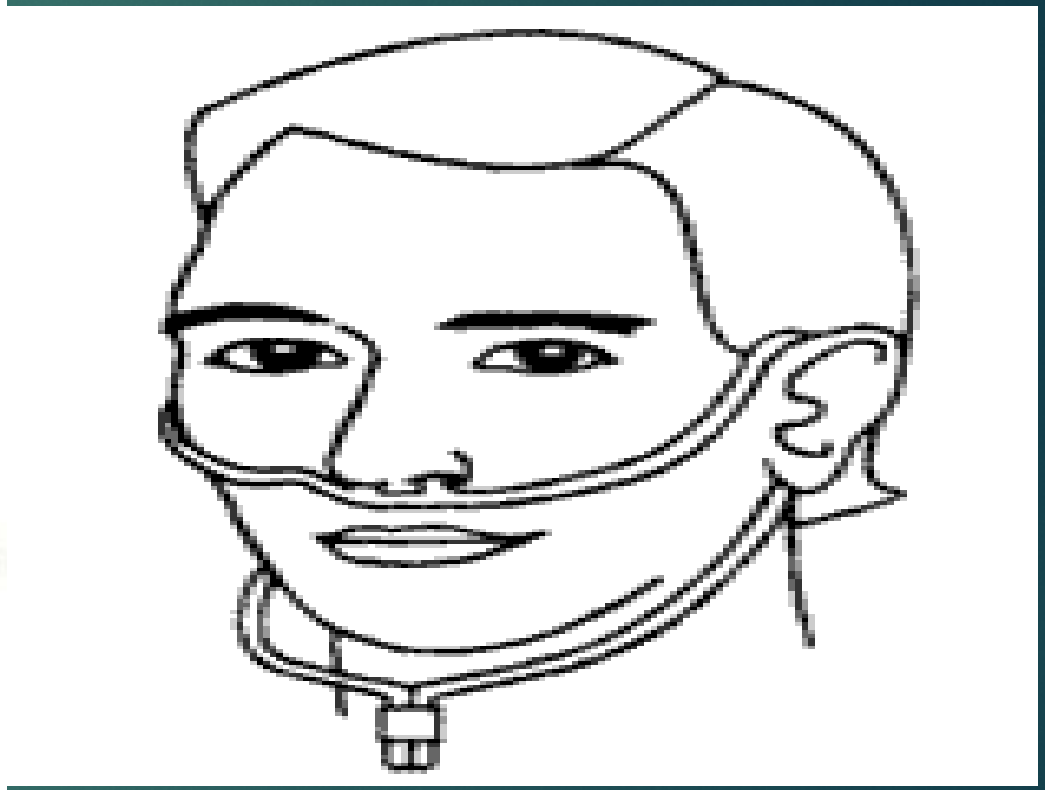
LOW FLOW

- NASAL PRONGS
- SIMPLE FACE MASK
- NON-REBREATHING FACE MASK

HIGH FLOW

- VENTURI MASK
- HFNC

NASAL PRONGS



SIMPLE FACE MASKS

NON REBREATHING MASK

BIPAP

High flow nasal oxygen therapy

HFNC THERAPY

OUTLINE

- WHAT IS HFNC
- PURPOSE AND BENEFITS
- SETUP
- INDICATION AND CONTRAINDICATION

WHAT IS HIGH FLOW NASAL CANNULA

- The high flow nasal cannula is a device used to deliver fixed supplemental oxygen or airflow to a patient or person in need of respiratory help

- High-flow nasal cannula(HFNC)oxygen therapy was introduced , accompanied by heated humidification system to prevent the associated drying of upper airway mucosa and to increase patient comfort.

PURPOSE AND BENEFITS

- Delivery of optimally humidified and warm gases
- Decreased work of breathing
- Decreased body energy expenditure
- Less problems with thickened secretions
- Less problems with nasal irritation/septal damage

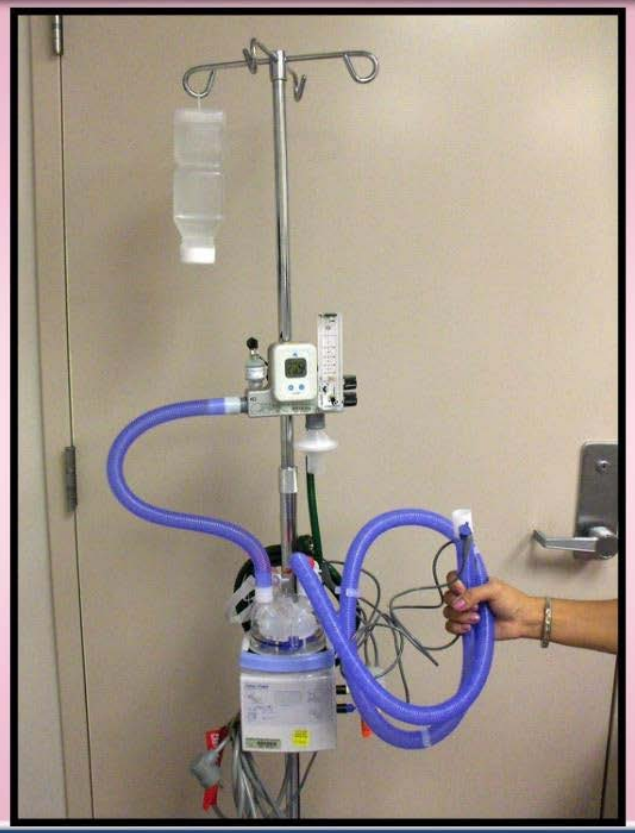
SETUP

1. High-flow nasal cannula
2. Oxymeter
3. Heater/humidifier
4. Continuous high-flow generator with venturi effect


Air-oxygen blender
Flow meter
Active
humidifier
Nasal cannula
Heated inspiratory circuit

LEHIGH VALLEY HEALTH NETWORK

Complete High Flow Oxygen System set up



INDICATIONS

- Respiratory Distress from bronchiolitis , pneumonia ,congestive heart failure etc.
- Respiratory support postextubation and mechanical ventilation
- Weaning therapy from bipap mask
- Apnoea of prematurity

CONTRAINDICATIONS

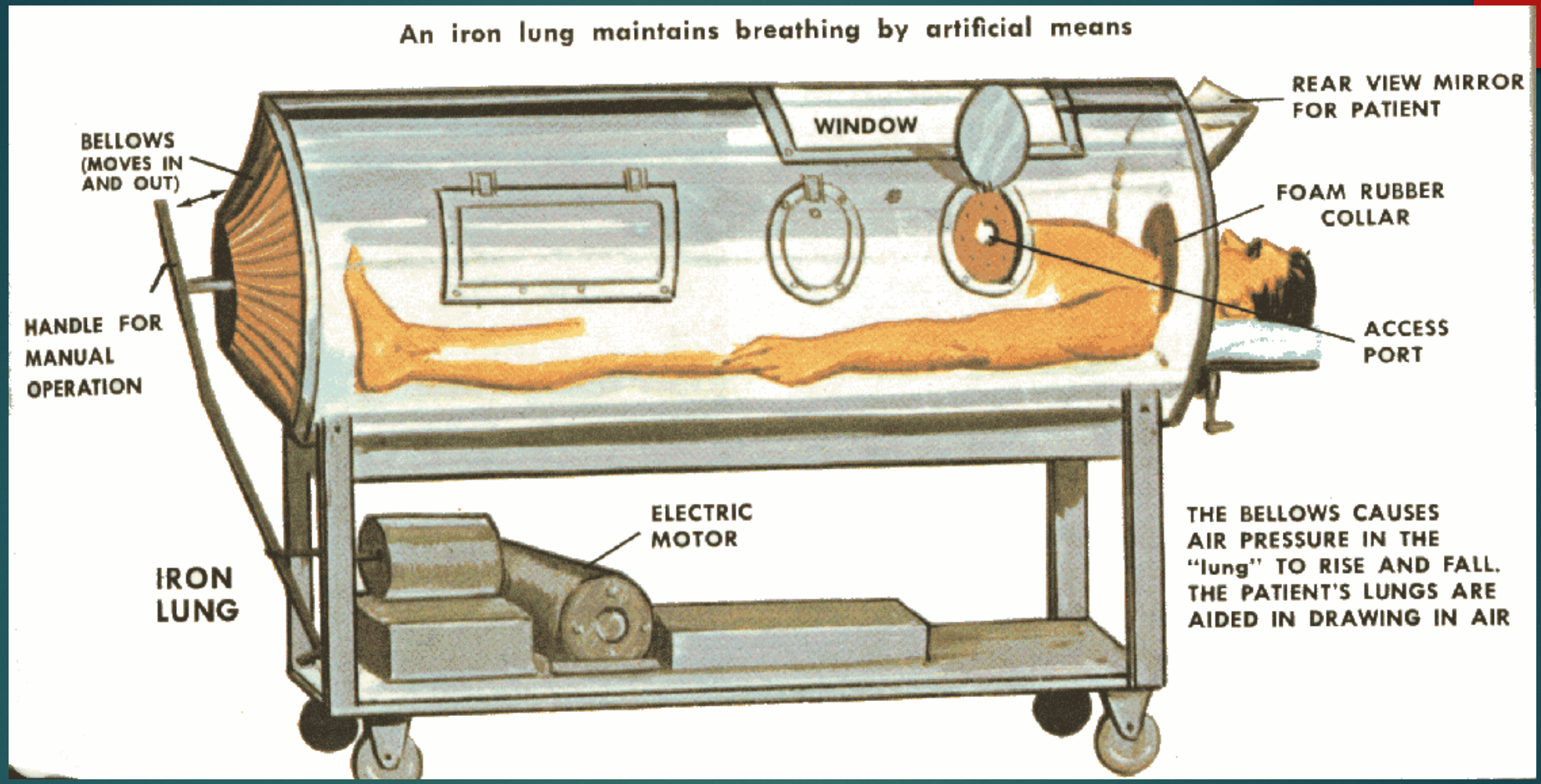
- Blocked nasal passages
- Trauma/surgery to nasopharanyx

NON-INVASIVE VENTILATION

OUTLINE

- Definition
- Indication and contraindications
- Equipment
- Initial settings
- Monitoring


Non-invasive
Negative
Pressure
Ventilation
Non-invasive
Positive
Pressure
Ventilation


An iron lung maintains breathing by artificial means
BELLOWS (MOVES IN AND OUT)
HANDLE FOR MANUAL OPERATION
WINDOW
REAR VIEW MIRROR FOR PATIENT
FOAM RUBBER COLLAR
ACCESS PORT
ELECTRIC MOTOR
IRON LUNG
THE BELLOWS CAUSES AIR PRESSURE IN THE "lung" TO RISE AND FALL. THE PATIENT'S LUNGS ARE AIDED IN DRAWING IN AIR

BIPAP(NON-INVASIVE VENTILATION)

- Bi-level positive airway pressure is a type of non-invasive ventilation to provide positive pressure ventilation supporting patient's spontaneous breathing

- A higher pressure (ipap) for breath in and a lower pressure (epap) for breath out in order to :
  - Decrease work of breathing
  - Improve oxygenation and ventilation

INDICATIONS

- Decompensate obstructive sleep apnoea with hypercapnia
- INCREASE AIRWAY RESISTANCE e.g COPD EXACERBATION
- Acute-on chronic hypercapnic respiratory failure due to chest wall deformity or neuromuscular disease
- Post extubation ventilatory support
- Acute Cardiogenic pulmonary oedema

CONTRAINDICATIONS

- Facial trauma/burns
- Recent facial , upper airway or upper gastrointestinal tract surgery
- Upper airway obstruction
- Inability to protect airway and clear respiratory secretions
- Impaired consciousness(gcs<10)
- Severe confusion/agitation
- Vomiting and risk of aspiration

EQUIPMENT

1. Bipap machine
2. Bipap disposable circuit
3. Low resistance bacterial filter
4. Bipap total face mask ,full face mask or nasal mask plus head strap
5. Disposable humidifier
6. Distilled water

INITIAL SETTINGS

- Bipap is often initiated with an expiratory pap (epap) of approximately 5 cm h2o and inspiratory pap(ipap) of 8 to 10 cm h2o
- These pressure can be titrated up depending upon clinical and physiologic response and patient comfort

MONITORING BIPAP

- Look at patient heart rate , respiratory rate , blood pressure
- Increasing pco2 a bad sign
- Worsening hypoxemia a bad sign

Invasive Mechanical ventilation

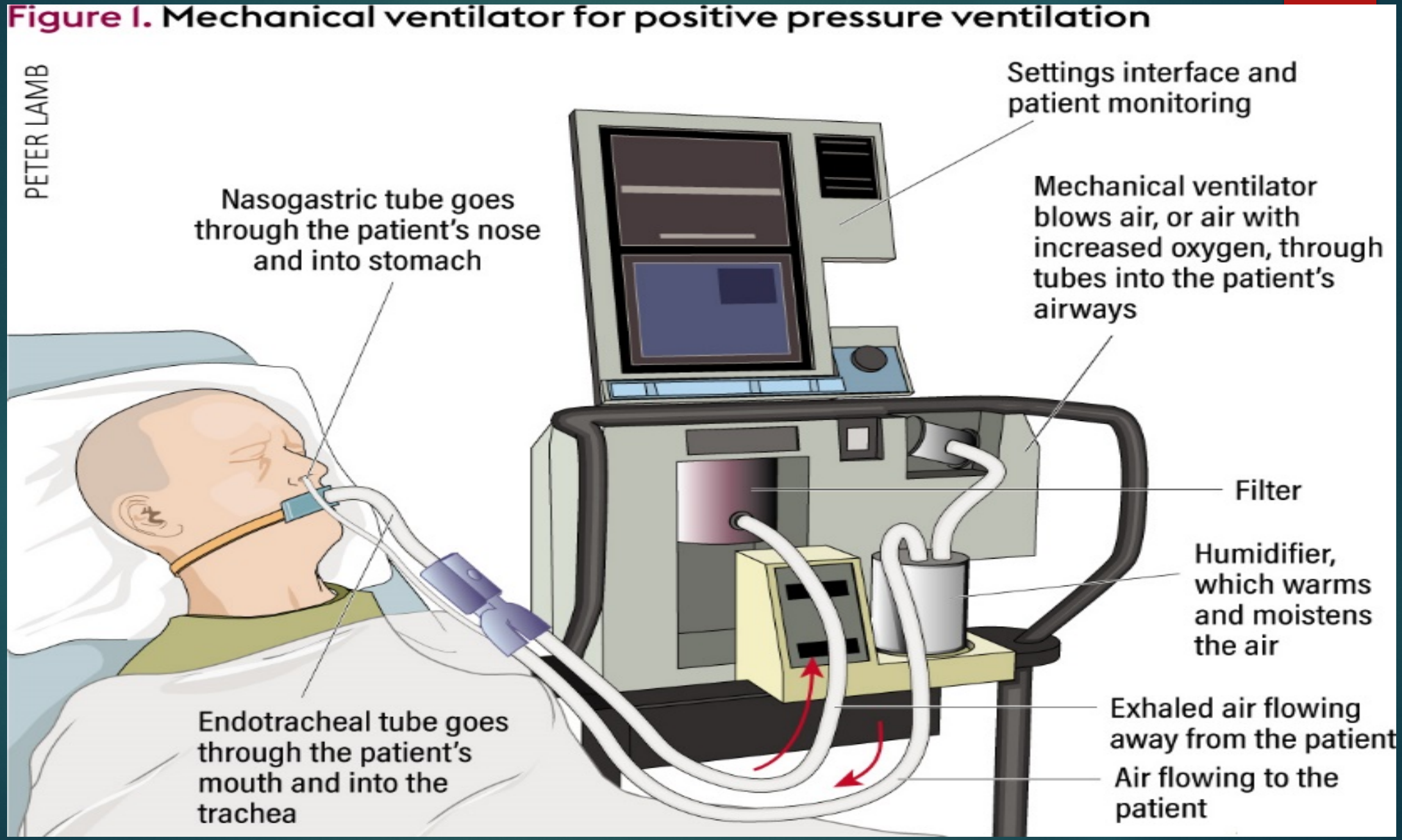
OUTLINE

- **Definition**
- **Purpose**
- **Indications of mechanical ventilation**
- **Modes of ventilation**
- **Complication**

DEFINATION

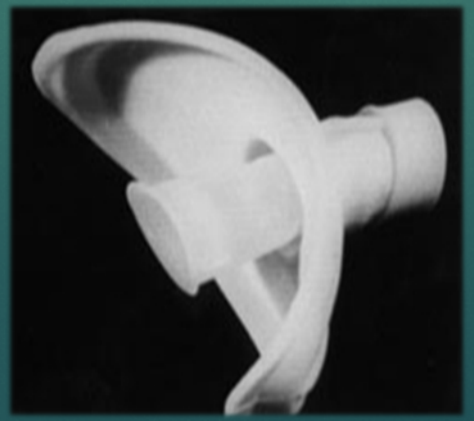
- Invasive mechanical ventilation is implemented once a cuffed tube is inserted into trachea to allow conditioned gas to be delivered to the airways and lungs at pressure above atmospheric pressure
- Ventilatory support that is given through endotracheal intubation or tracheostomy is called as invasive mechanical ventilation.

Figure I. Mechanical ventilator for positive pressure ventilation



Interfaces

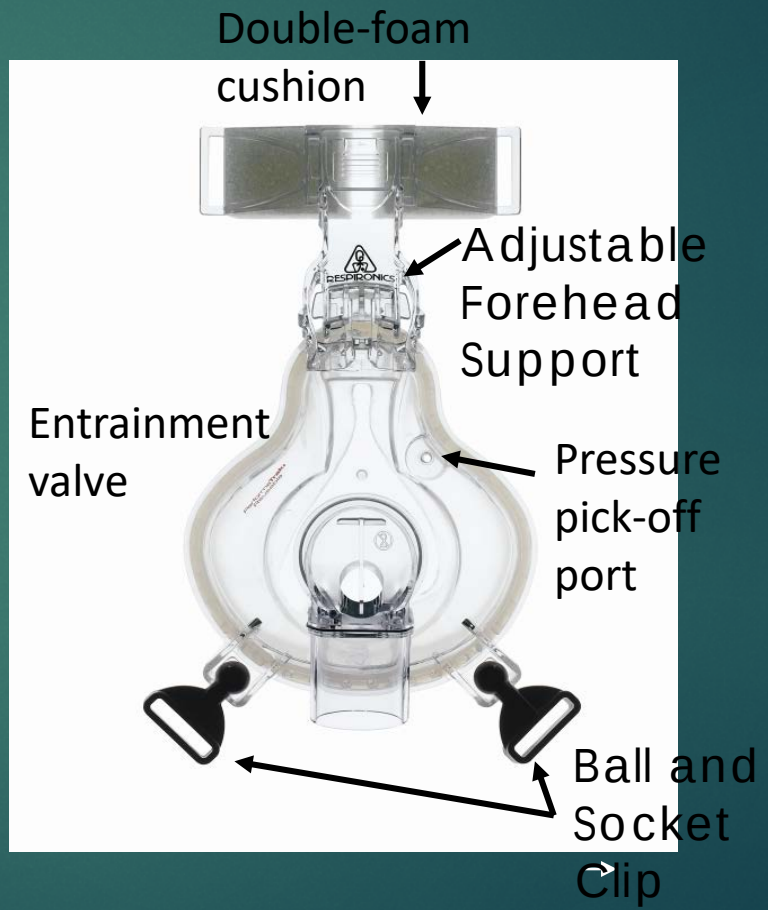
Devices that connect the ventilator‘s tubing to the face allowing pressurized gas to enter into upper airway.



Full Face Masks

- Most often successful in the critically ill patient

Respironics PerformaTrak® Full Face Mask



Ventilators

- Machines
  - NIV
    - .....
  - Critical care ventilators

- Different ventilatory modes, the ability to change trigger sensitivity,
- To vary rise time to the set pressure,
- to adjust the sensing of the end of inspiration are just some of the features of newer ventilators.

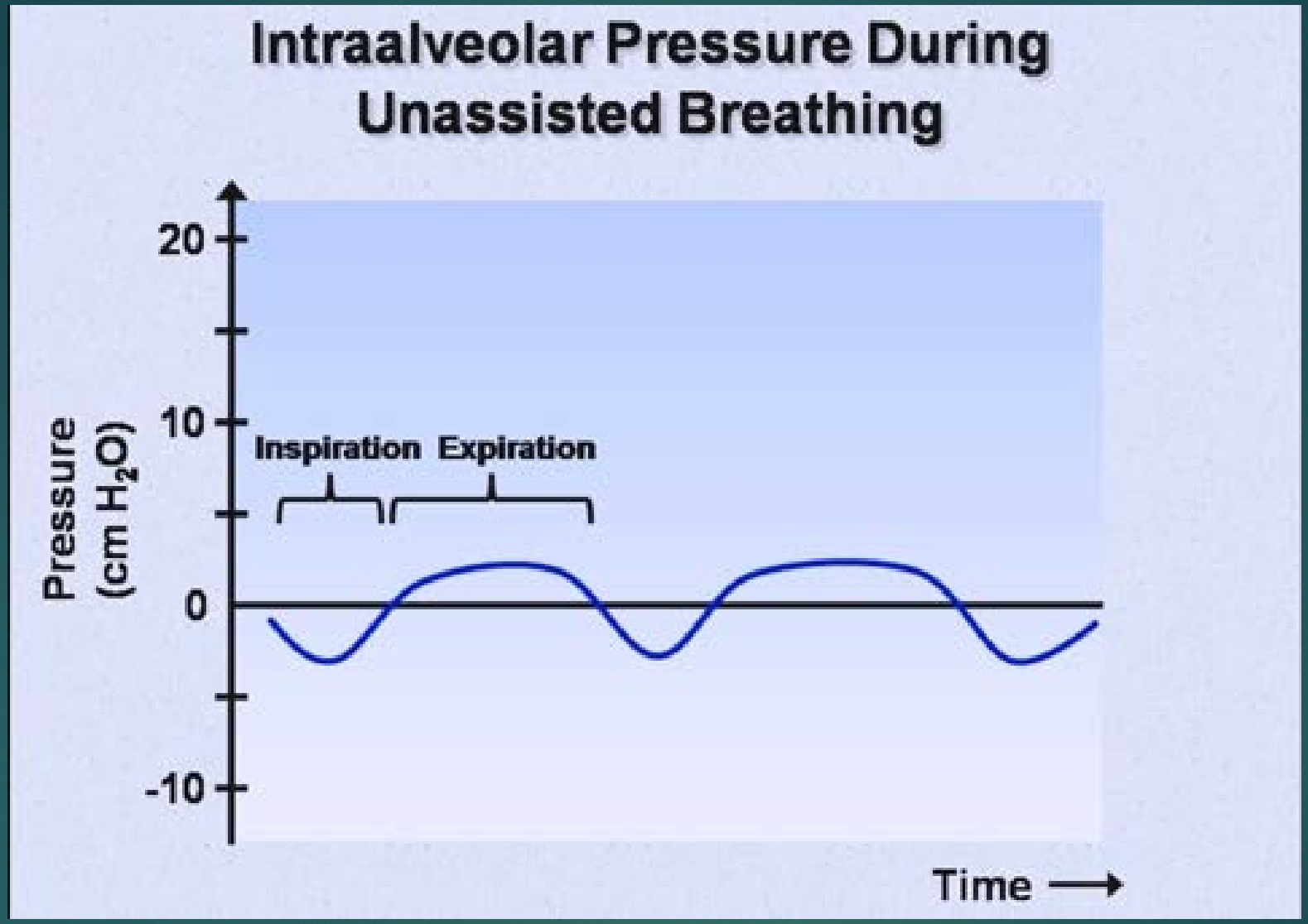
PURPOSE

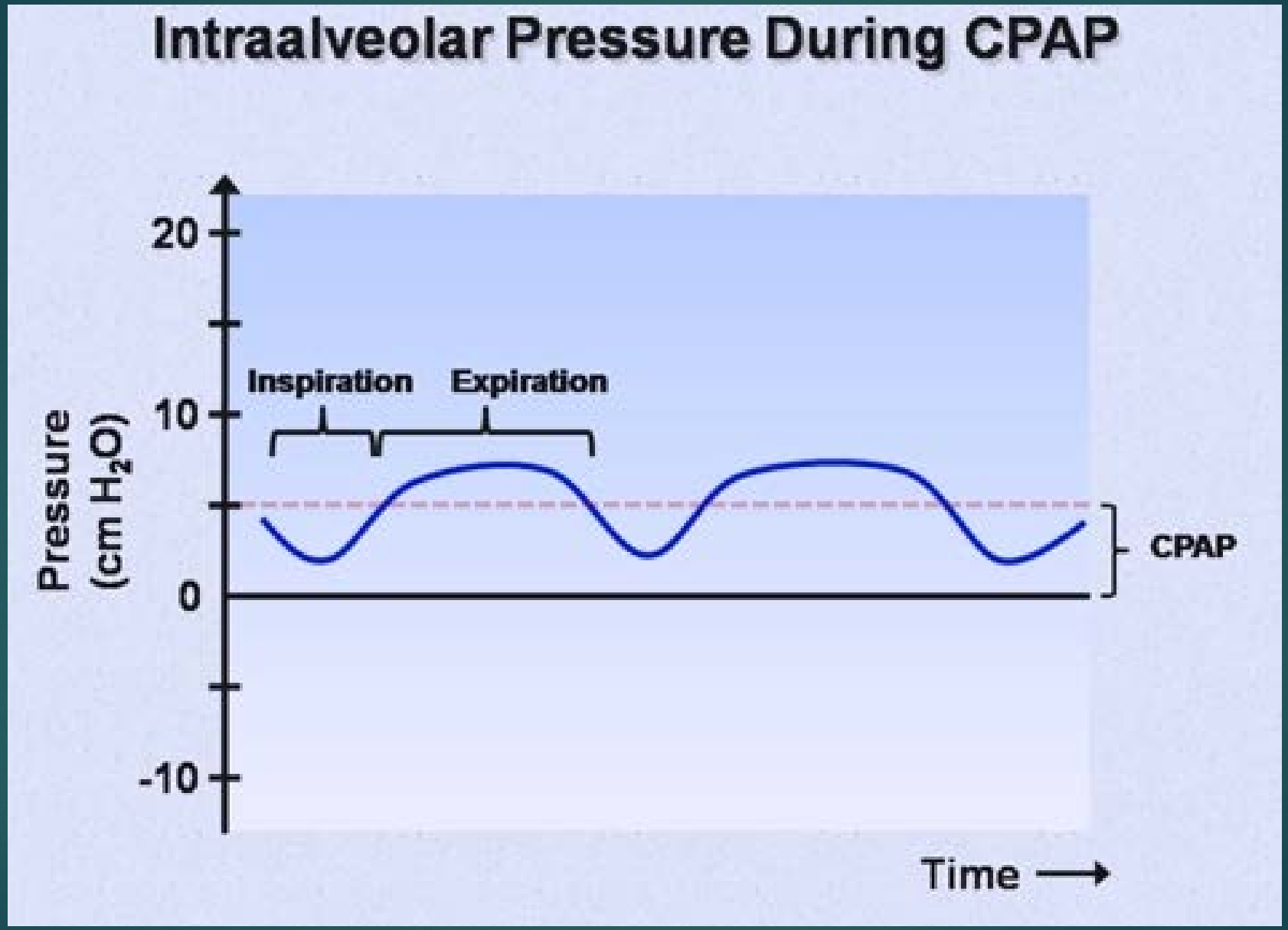
- To maintain gas exchange in case of acute and chronic respiratory failure.
- To maintain ventilator support after CPR.
- To reduce pulmonary vascular resistance.
- To excreate incresed co2 production.
- To give general anesthesia with muscle relaxants.

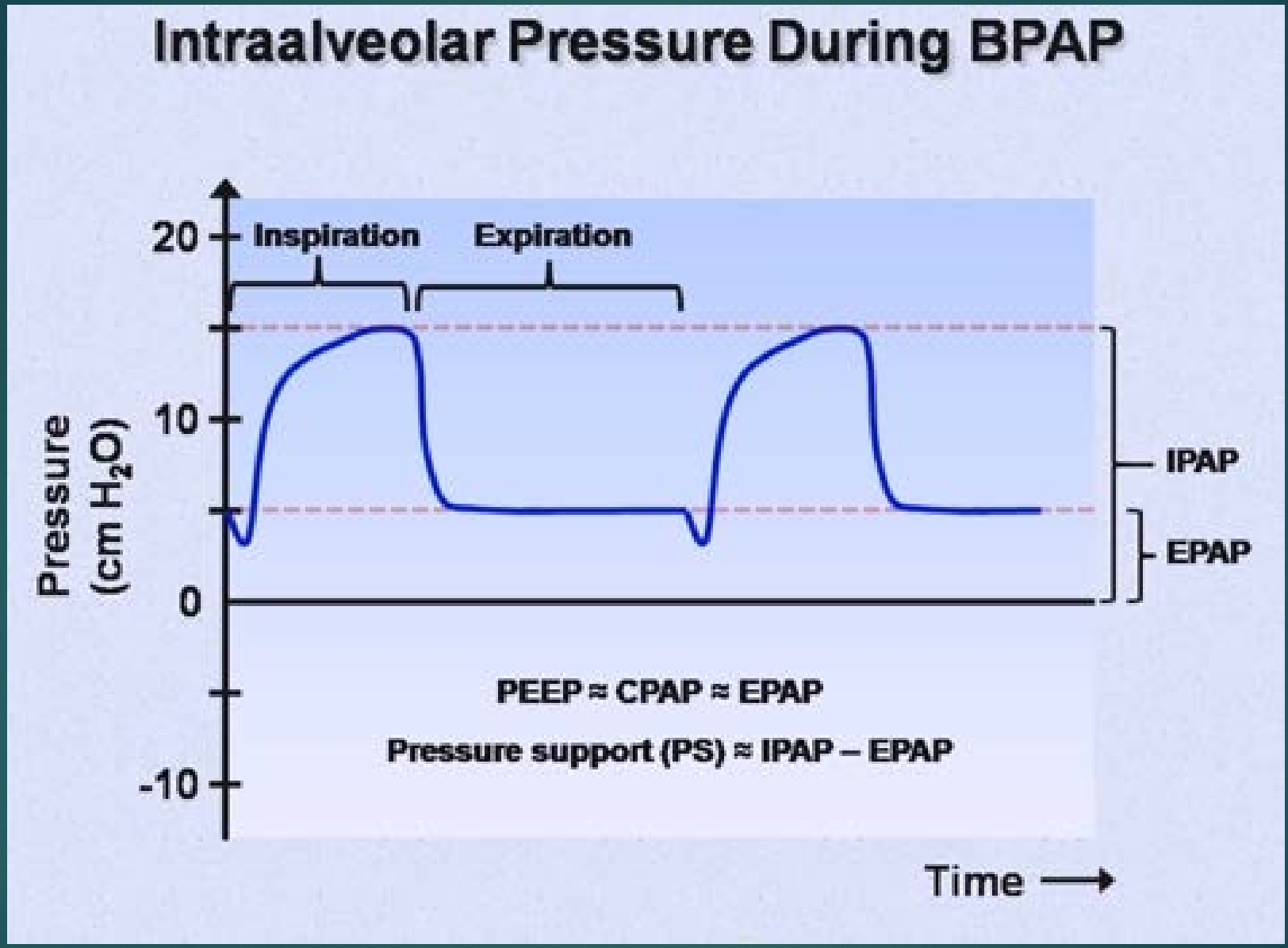
INDICATIONS

- Acute respiratory failure
- Apnea or impeding inability to breath
- Severe hypoxia/hypoxemia
- Respiratory muscle futigue
- Cardiac insufficiency
- Neurological problems

Modes in BIPAP


Intraalveolar Pressure During Unassisted Breathing
20
10
0
-10
Pressure (cm H_2O)
Inspiration
Expiration
Time


Intraalveolar Pressure During CPAP
20
10
0
-10
Pressure
(cm H_2O)
Inspiration
Expiration
CPAP
Time



S mode : spontaneous mode

T mode : Time triggered mode

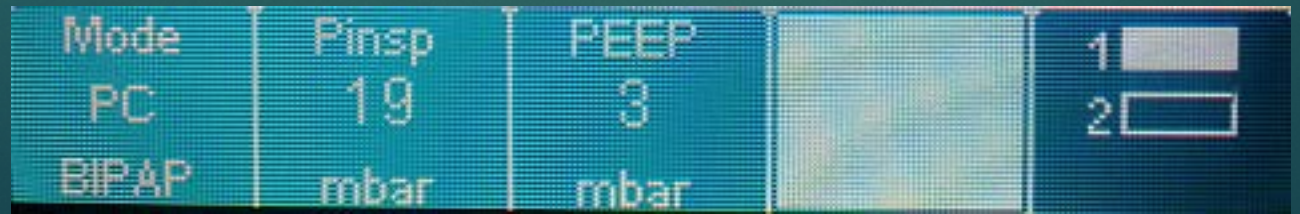
Effects: BPAP

- Increases FRC by preventing end exp collapse
- improves lung compliance
- Put the flow-volume curve in advantageous condition

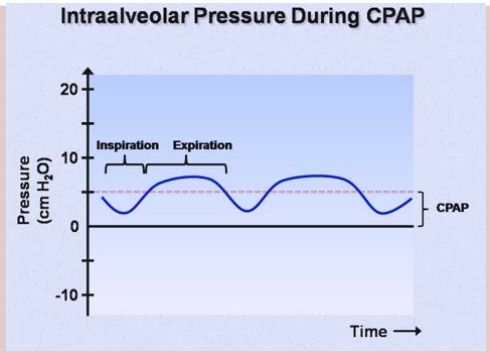
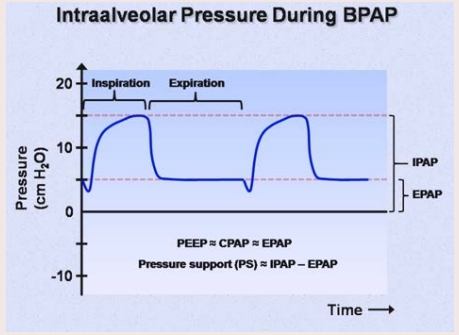
- Improves respiratory muscle fn : reduces dynamic hyperinflation advantage to the diaphragm and intercostals

- Enhances the delivery of bronchodilators to distal bronchial tree

- Improves gas exchange: by alveolar recruitment and corrects hypoxemia



CPAP vs. BPAP - Summary

Mode	Intra-alveolar pressure	Typical settings (cm H2O)	Indication
CPAP		Start : 5 Range : 5-12	Hypoxic failure (e.g. CHF)
BPAP		Start : 10 / 5 Range : 10-20 / 5-12	Hypercapnic failure (e.g. COPD)

Failure of NIV

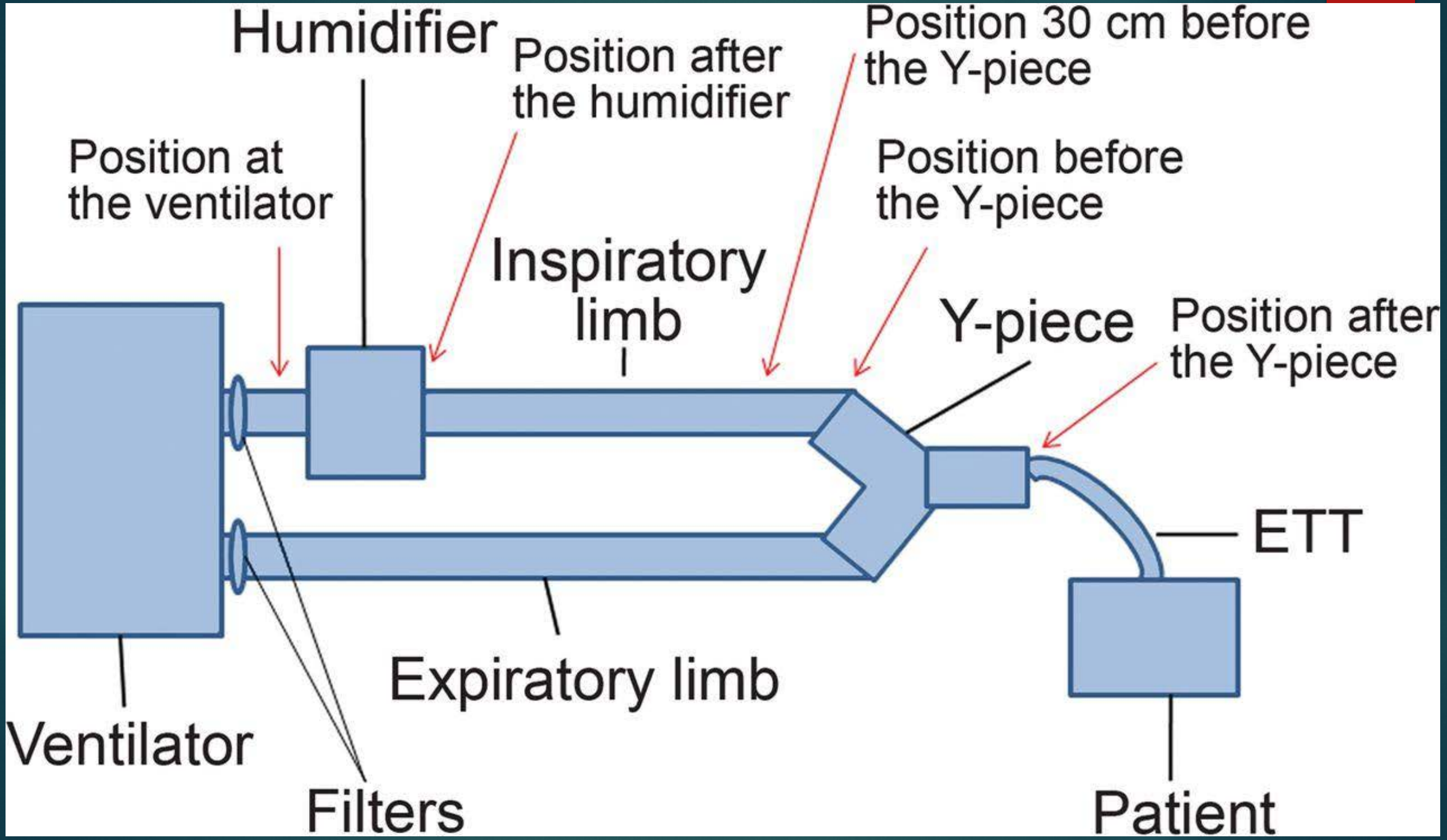
- ✓ Mask intolerance
- ✓ Failure to improve ventilation
- ✓ Claustrophobia
- ✓ Sensation of excessive air pressure
- ✓ Patient-ventilator asynchrony

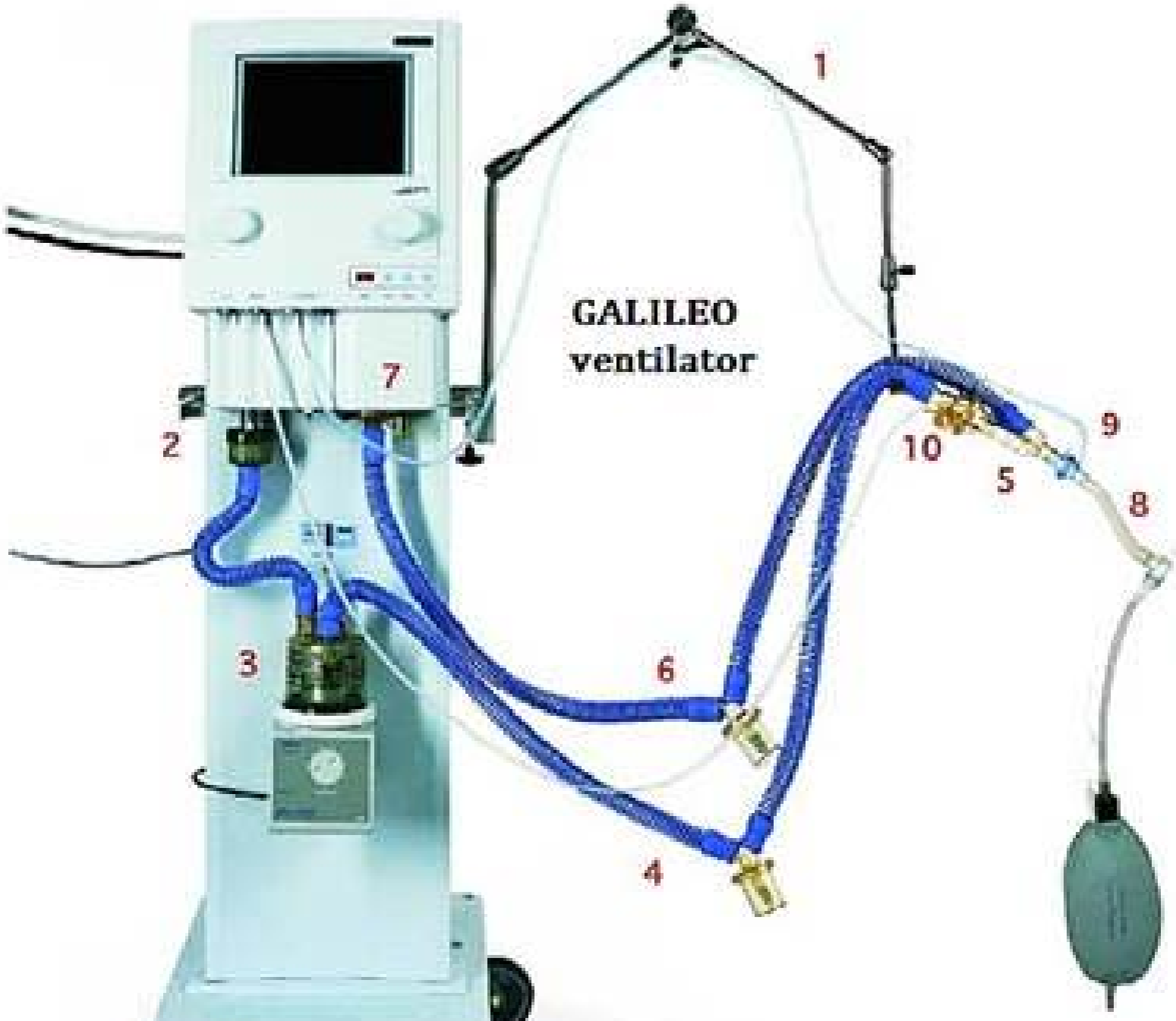
INVASIVE MECHANICAL VENTILATION

MODES OF INVASIVE MECHANICAL VENTILATION

- Modes of Invasive mechanical ventilation are the technique that the ventilator and patient work together to perform the respiratory cycle.

- 1. volume controlled ventilation
- 2. Pressure controlled ventilation
- 3. Pressure Regulated volume controlled ventilation
- 4.synchronised intermittent mandatory ventilation


Humidifier
Position after the humidifier
Position 30 cm before the Y-piece
Position at the ventilator
Position before the Y-piece
Inspiratory limb
Y-piece
Position after the Y-piece
ETT
Expiratory limb
Ventilator
Filters
Patient



1. Support arm
2. Inspiratory port with filter
3. Active humidifier
4. Inspiratory line with watertrap
5. Y-piece
6. Expiratory line with watertrap
7. Expiratory port
8. Flexible connector
9. Proximal flow-pressure sensor
10. Nebuliser

Basic Variables

A. Trigger .....

What causes the breath to begin?

----Patient's effort

B. Limit .....

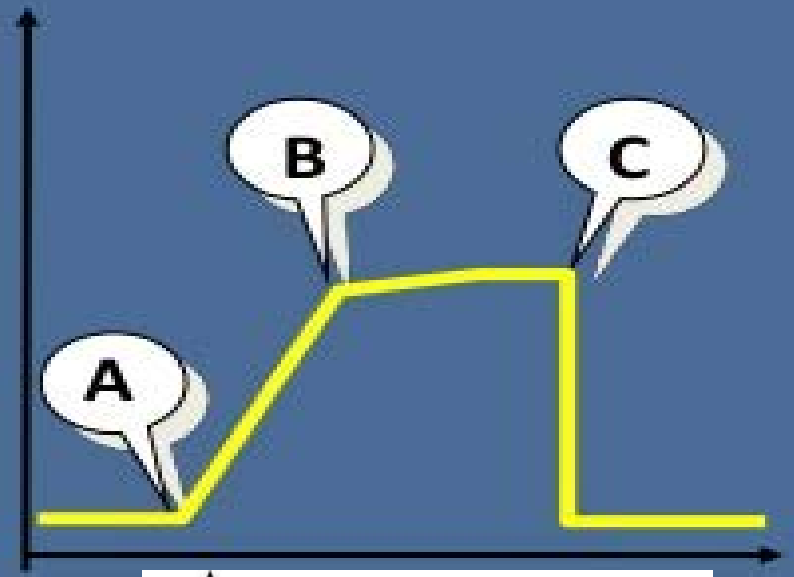
What regulates gas flow during the breath?

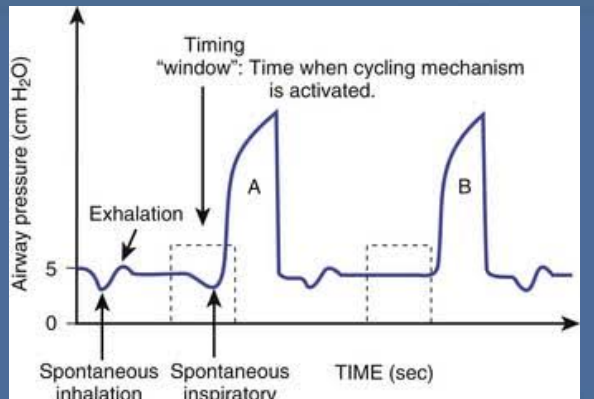
----Volume /Pressure/Time

C. Cycle .....

What causes the breath to end?

----Volume/Pressure/Time/Flow



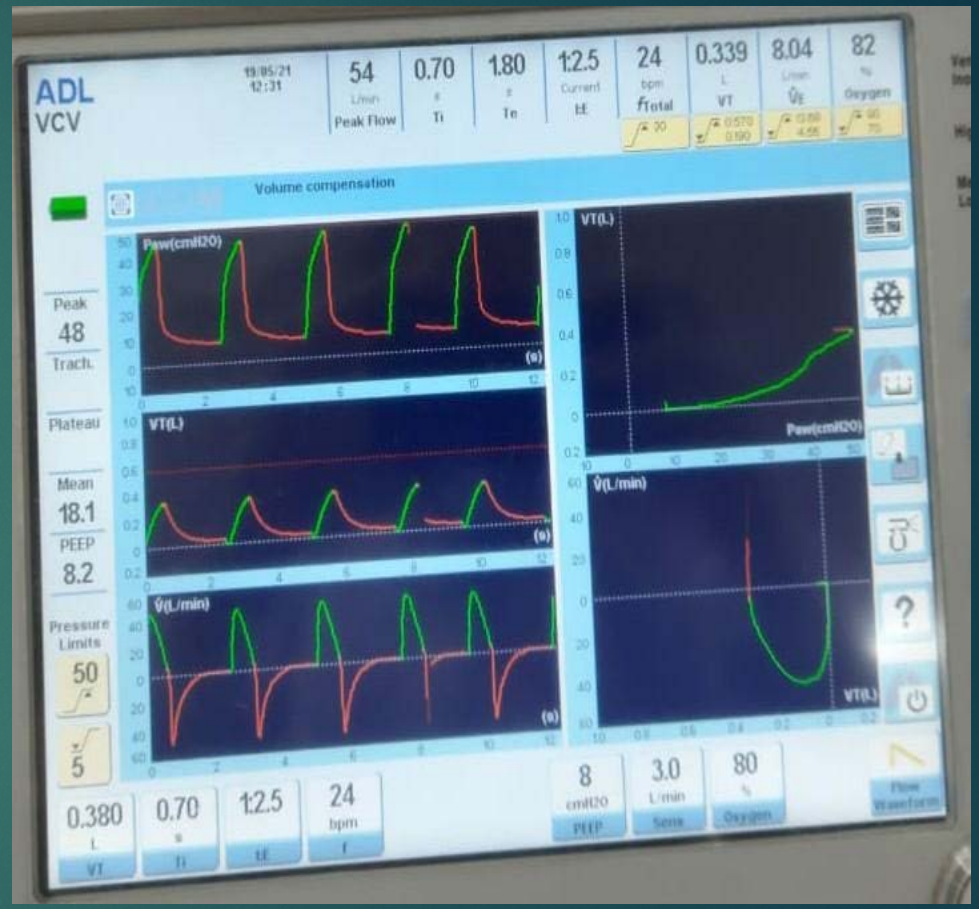


Modes of Ventilation

- Controlled
  - Pressure Control (PC)
  - Volume Control (VC)
- Supported
  - Continuous Positive Airway Pressure (CPAP)
  - Pressure Support (PS)
- Combined
  - SIMV (PC) + PS
  - SIMV (VC) + PS

INITIAL SETTINGS

- RATE-START WITH A RATE THAT IS SOMEWHAT NORMAL:i.e 15 FOR ADOLESCENT/CHILD.20-30 FOR INFANT/SMALL CHILD
- FIO2:100%AND WEAN DOWN
- PEEP:3-5
- TV 8-10 ML/KG ,OR PIP 14-20
- PRESSURE SUPPORT 5-10
- DETERMINE THE MODE : CONTROL EVERY BREATH (A/C) OR SOME (SIMV)



Ventilator alarm settings

- **Low exhaled volume alarm**
- **Low inspiratory pressure alarm**
- **High inspiratory pressure alarm**
- **Apnea alarm**
- **High respiratory rate alarm**
- **High and Low FiO2 alarm**

Low exhaled volume alarm

- Set at 100 mL lower than the expired mechanical tidal volume
- Triggered if patient does not exhale adequate tidal volume
- Detect a system leak or circuit disconnection

Low inspiratory pressure alarm

- Set at 10-15 cm H2O below the observed peak inspiratory pressure
- Complements the low exhaled volume alarm
- Detect system leak and circuit disconnection

High inspiratory pressure alarm

- Set at 10-15 cm H2O higher than observed peak inspiratory pressure
- Cause –
  - Water in the ventilatory circuit
  - Kinking or biting of endotracheal tube
  - Secretions in the airway
  - Bronchospasm
  - Tension pneumothorax
  - Decrease in lung compliance
  - Increased airway resistance
  - coughing

Apnea alarm

- Set with a 15 to 20 sec time delay and less time delay with a higher respiratory rate
- Ventilator provides full ventilatory support until the alarm condition no-longer exists

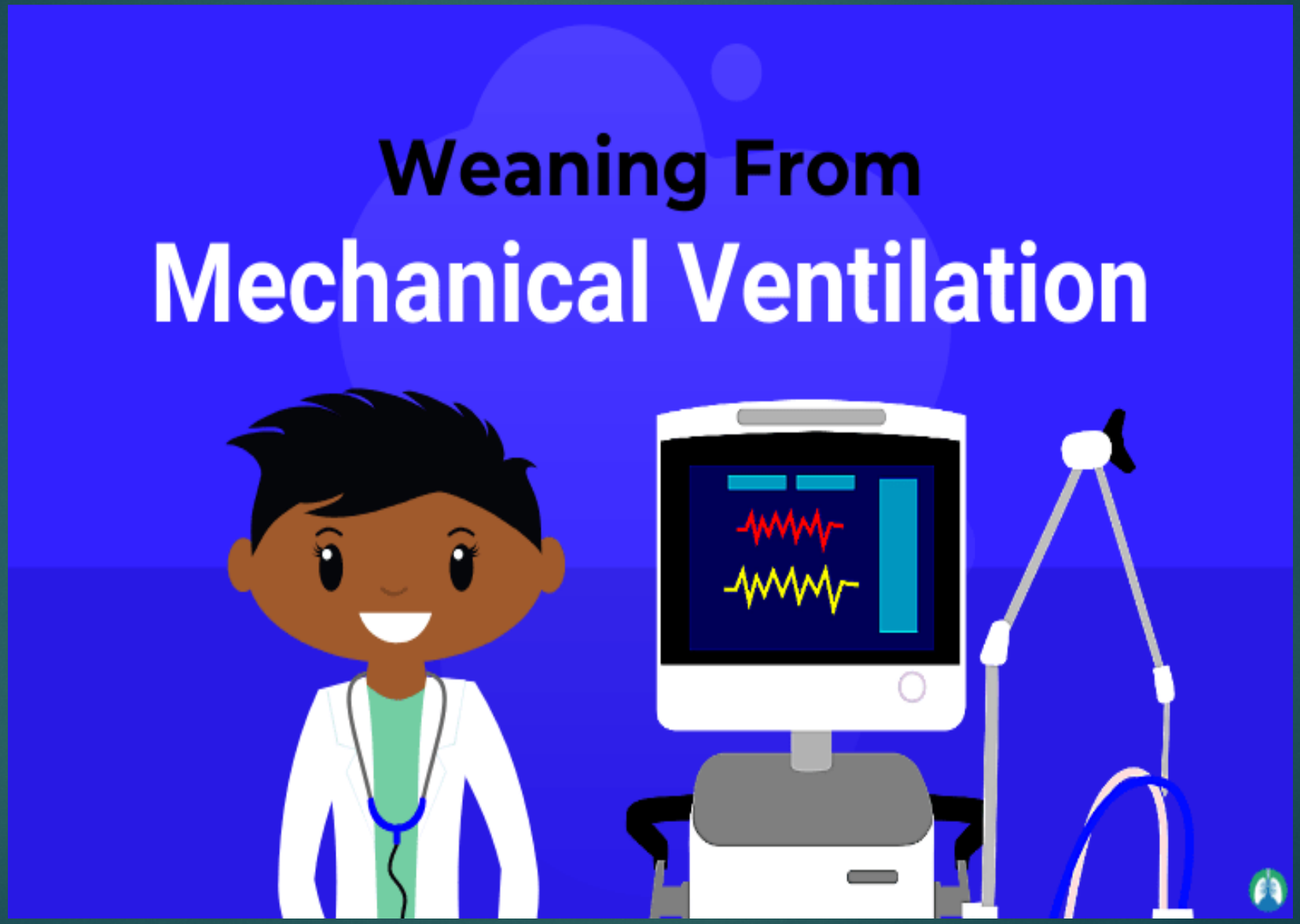
COMPLICATIONS

1) Airway complications
- Aspiration
- Decrease clearance of secretion
- VAP

2) Mechanical complications
- Barotrauma

3) Physiological complications
- Depressed cardiac function and hypotension

4) Artifical airway complications
- Tube kinked or pluged
- Cuff failure
- Tracheal stenosis
- Laryngeal edema


Weaning From
Mechanical Ventilation

Readiness To Wean

- Improvement of respiratory failure
- Absence of major organ system failure
- Appropriate level of oxygenation
- Adequate ventilatory status
- Intact airway protective mechanism (needed for extubation)

Extubation

- *Prerequisites to extubation include:*

1) A good cough/gag (to allow the child to protect their airway).

2) NPO about 4 hours prior to extubation (in case the trial of extubation fails and reintubation is required).

3) Minimize sedation.

4) Adequate oxygenation on 40% FiO2 with CPAP (or PEEP) = 4.

5) The availability of someone who can reintubate the patient, if necessary.

6) Equipment available to reintubate the patient, if necessary.

- THANK YOU !