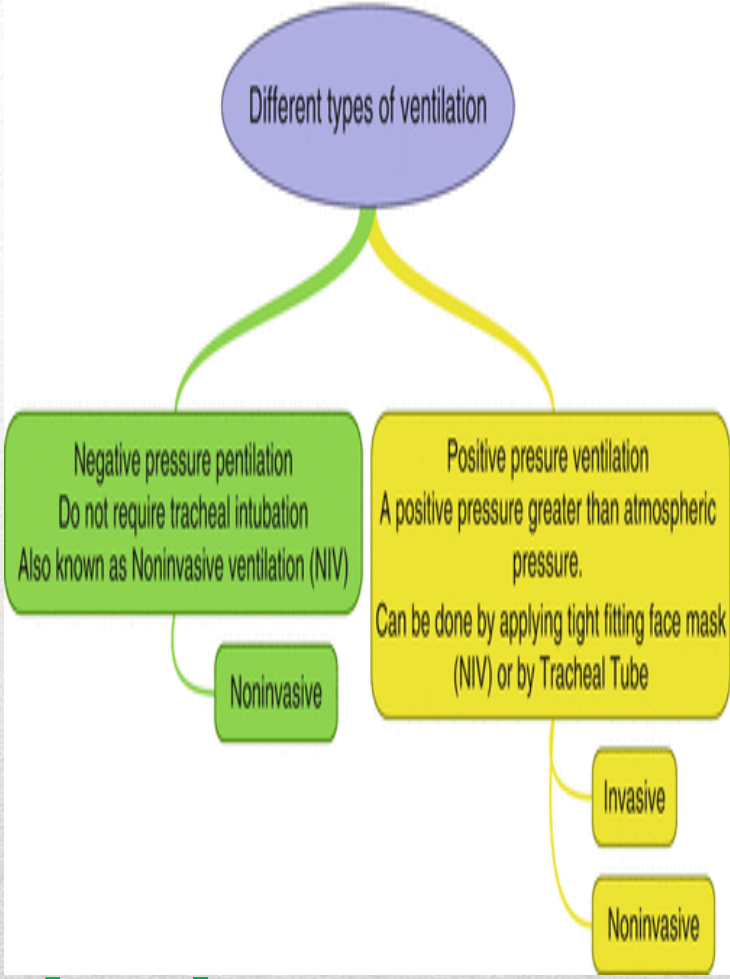

Medical Ventilator
Machine

Definition of Mechanical Ventilation

Is An apparatus which can replace normal mechanism of breathing either by providing intermittent or continuous flow of oxygen or air under pressure.



- Non-invasive ventilation.
- Invasive ventilation.

Non-invasive positive pressure ventilation:

It refers to the delivery of positive pressure ventilation to the lungs using devices without requiring endotracheal intubation.

Types of NIV:-

1. CPAP (Continuous positive airway pressure):

Continuous unchanging positive pressure is applied to the airways during the whole respiratory cycle.

CPAP acts similarly to positive end expiratory pressure (PEEP).

• Usually set at 5-10 cm H2O.

It prevents alveolar collapse → improving oxygenation.

Indicated in hypoxic respiratory failure (e.g., heart failure, cardiogenic pulmonary edema).

Types of mechanical ventilation:

•BiPAP (Bilevel positive airway pressure):

Two different pressures applied (inspiratory positive airway pressure IPAP& expiratory positive airway pressure EPAP) IPAP – EPAP difference act similarly to pressure support on MV

EPAP improves oxygenation.

The difference between IPAP & EPAP improves tidal volume.

Indicated in hypercapnic respiratory failure (e.g., COPD)

to wash co2.

Usually set at (Inspiratory)10-20. Expiratory (5-12) cmH2O Ex: Peep: 5 and Pressure support: 10.

Invasive Mechanical Ventilation

Placement of an endotracheal tube through a patient's mouth or nose into the trachea (the upper part of the airway that leads to the lungs)

1. Controlled mandatory ventilation (CMV).
2. Assist/control mode (A/C).
3. Synchronized intermittent mandatory ventilation (SIMV)
4. Pressure support ventilation (PSV).

Modes of mechanical ventilation:

- Delivers preset volume or pressure regardless of patient's own inspiratory efforts.
- The patient cannot generate spontaneous breaths.
- Used for patients who are heavily sedated and paralyzed.

Controlled mandatory ventilation (CMV)

- Breaths delivered by the ventilator control either volume or pressure. Ventilator delivers the same measured breath every time.
- Breath can be initiated by the patient or the ventilator.

Assist / Control mode (A/C)

- Combination of set patient or ventilator-initiated breaths delivered by the ventilator that control volume or pressure, and the patient's own spontaneous breaths.

Used for patients who are hyperventilating

Synchronized Intermittent Mandatory Ventilation (SIMV)

- **There are no mandatory breaths.**
- **The patient breathe spontaneous and determine respiratory rate, tidal volume and inspiratory time.**

Used for conscious patients and spontaneous breathing trials before MV weaning

Pressure support ventilation (PSV)

Mechanical Ventilation Pulmonary System:

- Barotrauma and pneumothorax due to high pressures lead to alveolar rupture
- ETT displacement or extubation Tracheal damage
- Oxygen toxicity Acid-Base Disturbances
- Aspiration
- Infection Ventilator Dependence

Complications of Mechanical Ventilation

Cardiovascular:

- Decreased venous return and cardiac output due to application of positive pressure to lungs
- Hypotension Fluid retention.

Neurovascular

- Increased ICP
- Decreased cerebral perfusion pressure

Renal:

- Decreased urinary output Fluid retention

GIT system:

- Stress ulcers and GIT bleeding May develop paralytic ileus

Conjunctivitis, Impaired communication

•Stress ulcers and GIT bleeding May develop paralytic ileus
•Inadequate nutrition common - Constipation