Mechanical ventilation .



.Mechanical Ventilation

Ventilators are specially designed pumps that can support the ventilatory function of the respiratory system and improve oxygenation through application of high oxygen content gas and positive pressure.



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Indication of mechanical ventilation :

- 1- Cardiac or respiratory arrest
- 2- Tachypnea or bradypnea with respiratory fatigue or impending arrest
- 3- Acute respiratory acidosis
- 4- Refractory hypoxemia 1.0)
- 5- Inability to protect the airway associated with depressed levels of consciousness
- 6- Shock associated with excessive respiratory work
- 7- Inability to clear secretions with impaired gas exchange or excessive respiratory work

Mode of mechanical ventilation :

1- Assist Control Mode Ventilation (ACMV) An inspiratory cycle is initiated either by the patient's inspiratory effort or, if no patient effort is detect within a specified time window, by a timer signal within the ventilator. Advantage :

- Timer backup
- Patient-vent
- Synchrony
- Patient controls
- minute ventilation
 Disadvantage :
- Not useful for weaning
- Potential for dangerous respiratory alkalosis



2- Synchronized Intermittent Mandatory Ventilation (SIMV)

the patient is allowed to breathe spontaneously, i.e., without ventilator assist, between delivered ventilator breaths.

Advantage :

- Timer backup
- Useful for weaning-

Disadvantage :Potential dysynchrony



3- Continuous Positive Airway Pressure (CPAP) Positive pressure applied at the end of expiration .

Advantage : - Helps prevent atelectasis.

Disadvantage : - No backup



4- Pressure-Control Ventilation (PCV)

During the inspiratory phase, a given pressure is imposed at the airway opening, and the pressure remains at this user-specified level throughout inspiration.

Advantage :

- System pressures regulated
- Useful for barotrauma treatment
- Timer backup

Disadvantage :

- Requires heavy sedation
- Not useful for weaning



5- Pressure-Support Ventilation (PSV)

patients receive ventilator assist only when the ventilator detects an inspiratory effort .

Advantage : - Good for weaning.

Disadvantage : - No timer backup



6- Positive end expiratory pressure (PEEP): Positive pressure applied at the end of expiration during ventilator breath.

Advantage :

- Improve oxygenation .

Complication :

- Decreased venous return
- Barotrauma
- Increased intracranial pressure

Criteria for institution of ventilatory support :

Parameter	Ventilation indicated	Normal range
Pulmonary function studies :	> 35	10 - 20
- Respiratory rate (b/m)	< 5	5-7
- Tidal volume (ml/kg body wt)	< 15	65 - 75
- Vital capacity (ml/kg body wt)	< 20	75 - 100
- Maximum inspiratory force (cm H2o)		
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ABG :	< 7.25	7.35 - 7.45
- PH	< 60	75 - 100
- PaO2 (mmHg)	< 50	35 - 45
- PaCO2 (mmHg)		
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Common Ventilator settings / Parameter / Controls :



Common Ventilator settings / Parameter / Controls :

1- Fraction of inspired oxygen (FIO 2):

The percent of oxygen concentration that the Pt is receiving from the ventilator . (Between 21 % & 100 %)

2- Tidal volume (VT):

Is the volume of gas delivered to a Pt during a ventilator breath (usual volume selected is between 5 - 15 ml / kg body wt).

3- Respiratory rate (F) :

Is the number of breaths the ventilator will deliver / minute ($10\ \text{-}16\ \text{b/m}$) .

4- Minute volume (VE):

Is the volume of expired air in one minute

Complication of M.V:

1- High pressure :

- Increase secretion, Kinked ventilator tubing or ETT, water in the ventilator tubing.

2- Low Pressure :

A leak in the in the system from (a cuff leak , a hole in the tubing)

- 3- pneumonia
- 4- Tooth avulsion



Cont...

upper airway and nasal trauma 5-6- Gastrointestinal effect : stress ulceration and GI bleeding. pharyngeal laceration–Oral - $^{\vee}$ Hypoxemia - $^{\wedge}$ Glottic edema - 9





Nursing care of patient on MV :

Assessment:



1- Assess the patient at least hourly for the following :

- Vital signs : Regularly monitor the vital signs .

- Respiratory statues

* Respiratory rate should be counted for a full minute & compared with the set ventilatory rate.

* Inspect both sides of chest during the machine breath to determine symmetry of chest movement .

* Listen for breath sounds .

* ABG & pulse oximatery (to evaluate oxygenation statues & acid base balance).

* Assess the need for suctioning

CONT...

- Cardiovascular statues :

- * Continuous cardiac monitoring should be initiated .
- * CVP measurement

- Renal status :

- * Monitor fluid & electrolyte balance
- * Daily weight .
- * I & O measurement.

- Neurological statues :

* Assess the LOC, change in arousability or behavior.

CONT...

- Gastrointestinal statues :

* Gastric secretion should be closely monitoring for bleeding .

* Listen for bowel sound .

* Perform nutritional assessment.

- Monitor for signs for complication :

* Monitor for decrease cardiac output evidence by decrease BP & pulse .

* Monitor for signs of pneumothorax .

CONT...

2- Assess the ventilator parameter at a least for hourly :* Mode of ventilation*FiO2

- * Tidal volume
- * Minute ventilation
- * Respiratory rate
- * PEEP level if in use
- 3- Assess the tracheostomy or ETT :
- * Assess the tissue around the ETT
- * Check the tape regularly to make sure it is not soiled .
- * Check the ETT position through marking the point at wish the tube exits the mouth or nose

:Criteria for weaning from M.V

- 1- Awake, alert and cooperative.
- 2- Correction of metabolic and electrolyte disorder.
- 3- RR < 30/min.
- 4- No effect of sedation/neuromuscular blockade.
- 5- Minimal secretions
- 6- Nutrition status good.
- 7- Intact cough reflex.
- 8- Intact gag reflex.

9- Functional respiratory muscles with a ability to support a strong and effective cough

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