MECHANICAL VENTILATION

Mechanical ventilation 00:00:13

- It is Breath delivered by the machine
- It is Respiratory therapy which is given to support & control Oxygenation & Ventilation

Modes of mechanical ventilation 00:01:23

- Mechanical Breath can be Triggered by:-
  1. Machine (Controlled breath)
  2. Time
  3. Patient (Spontaneous breath)
- Mechanical Breath cycled between inspiration & Expiration based on:-
  1. Time cycled
  2. Flow cycled
     - Mostly, it is Time cycled except (PSV). PSV is flow cycled
- Control of Mechanical Breath can be:-
  1. Volume control
  2. Pressure control
- Mechanical Breath depends on PEEP

Volume control	Pressure control
• Tidal volume is fixed • Pressure can vary	• Pressure is fixed • Tidal Volume can vary
Less comfortable for patient	More comfortable for patient
Uneven filling of Alveoli with gases	Even filling of Alveoli with gases

Conventional modes 00:05:12

1. Assist control mode
   - Volume control
   - Pressure control
2. Synchronized intermittent minute ventilation
   - Volume control
   - Pressure control
3. Pressure support ventilation (PSV)

Assist control mode

- Each and every Breath is either controlled by the Ventilator (or) Assisted by the ventilator
- Fixed Tidal volume is present
- Ventilator setting

	Settings
Tidal volume	6 – 8ml/ Kg Body weight
Respiratory rate	14 -18 Breaths/minute
PEEP	5cm of H_2O
FiO_2	100 % (1) and ↓ to Non-toxic level of 60%
Inspiratory flow	60 -100 litres/min

- Tidal volume and Respiratory Rate is responsible for Minute ventilation
- PEEP & FiO_2 is responsible for Oxygenation
- PEEP prevents collapse of Alveoli
- In case of High PEEP, there is risk of Barotrauma
- In case of High FiO_2, there is risk of Oxygen toxicity
- Titrate PEEP & FiO_2 for oxygenation
- If we adequate ventilation is not achieved, increase Tidal volume to 10ml/kg Body weight

Normal Values

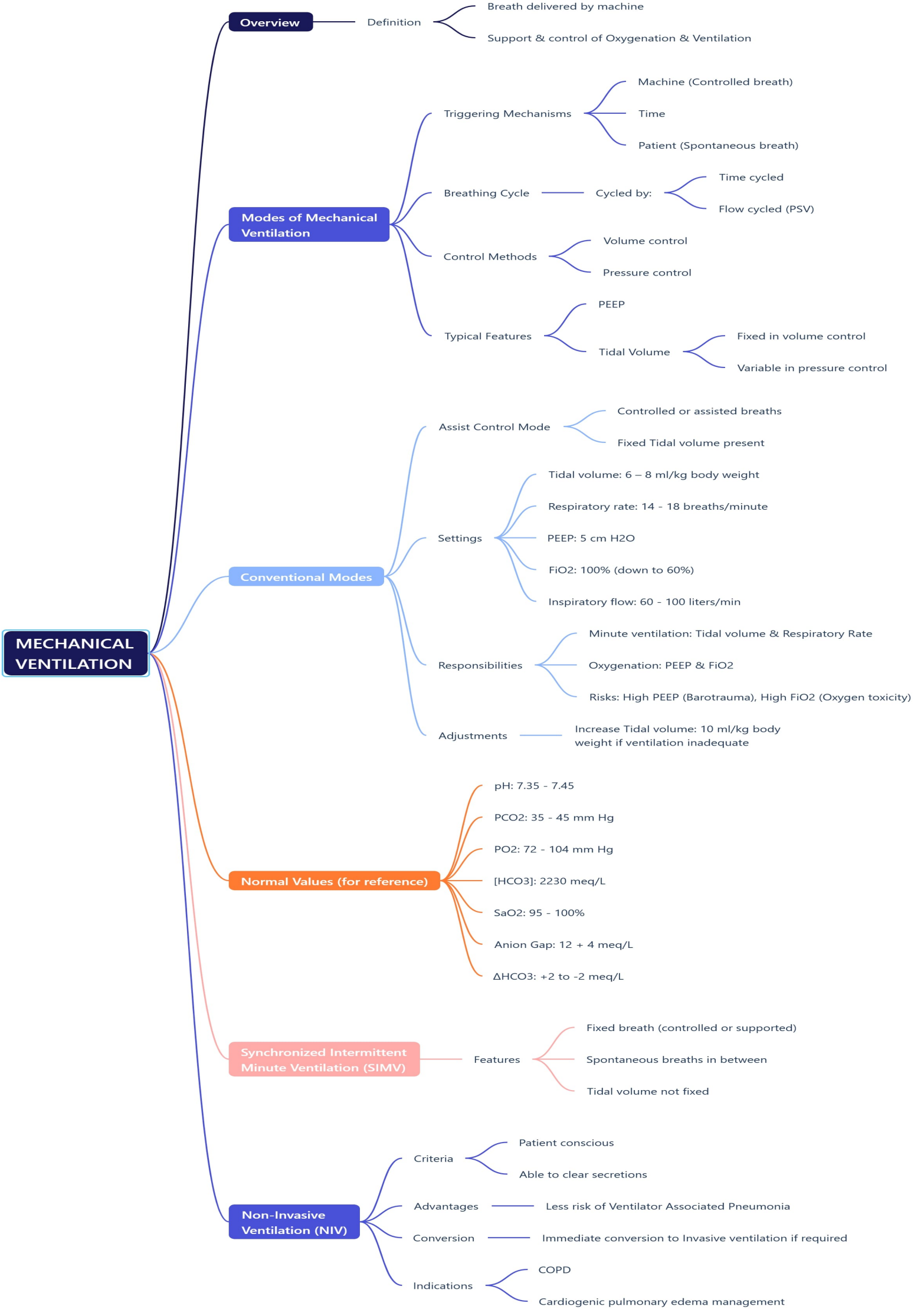
ANALYTE	Normal Value	Units
PH	7.35-7.45	
PCO2	35-45	mm Hg
PO2	72-104	mm Hg
[HCO3]	22-30	meq/L
SaO2	95-100	%
Anion Gap	12+4	meq/L
ΔHCO3	+2 to -2	meq/L

Synchronized intermittent minute ventilation

- Fixed Breath which is either controlled (or) supported by the ventilator
- In Between 2 controlled (or) Supported Breath, Patient can breath spontaneously
- All Breath Tidal volume is not fixed

Non invasive ventilation (NIV) 00:12:31

- In this, Patient's interface is Mask rather than ET tube
- Criteria:-
  1. Patient should be conscious
  2. Patient can clear the secretions
- By Non Invasive ventilation, there is less risk of Ventilator Associated Pneumonia
- If patient is not responding with NIV, then immediately converted into Invasive ventilation
- COPD & Cardiogenic pulmonary edema can be managed by NIV


MECHANICAL VENTILATION
Overview
Definition
Breath delivered by machine
Support & control of Oxygenation & Ventilation
Modes of Mechanical Ventilation
Triggering Mechanisms
Machine (Controlled breath)
Time
Patient (Spontaneous breath)
Breathing Cycle
Cycled by:
Time cycled
Flow cycled (PSV)
Control Methods
Volume control
Pressure control
Typical Features
PEEP
Tidal Volume
Fixed in volume control
Variable in pressure control
Conventional Modes
Assist Control Mode
Controlled or assisted breaths
Fixed Tidal volume present
Settings
Tidal volume: 6 – 8 ml/kg body weight
Respiratory rate: 14 - 18 breaths/minute
PEEP: 5 cm H2O
FiO2: 100% (down to 60%)
Inspiratory flow: 60 - 100 liters/min
Responsibilities
Minute ventilation: Tidal volume & Respiratory Rate
Oxygenation: PEEP & FiO2
Risks: High PEEP (Barotrauma), High FiO2 (Oxygen toxicity)
Adjustments
Increase Tidal volume: 10 ml/kg body weight if ventilation inadequate
Normal Values (for reference)
pH: 7.35 - 7.45
PCO2: 35 - 45 mm Hg
PO2: 72 - 104 mm Hg
[HCO3]: 2230 meq/L
SaO2: 95 - 100%
Anion Gap: 12 + 4 meq/L
ΔHCO3: +2 to -2 meq/L
Synchronized Intermittent Minute Ventilation (SIMV)
Features
Fixed breath (controlled or supported)
Spontaneous breaths in between
Tidal volume not fixed
Non-Invasive Ventilation (NIV)
Criteria
Patient conscious
Able to clear secretions
Advantages
Less risk of Ventilator Associated Pneumonia
Conversion
Immediate conversion to Invasive ventilation if required
Indications
COPD
Cardiogenic pulmonary edema management