



# MECHANICAL VENTILATION

Principles of Management and Weaning

# Patient Settings

Respiratory Rate

FiO<sub>2</sub>

V<sub>t</sub> (tidal volume)

Flow/I time

PEEP

Pressure Support/Pressure Control

# Patient Measurements / Values

- Respiratory Rate
- Exhaled Tidal Volume
- Minute Volume
- Peak Pressure
- Mean Airway Pressure
- I:E Ratio

# Ventilator-Patient Synchrony

Vent-Patient synchrony is an utmost priority!

- I-Time / Inspiratory Flow Rate needs to meet the patient's inspiratory flow demand
- Avoid inverse I:E ratio unless using pressure ventilation
- COPD requires extra time for exhalation
- Ventilator trigger sensitivity should be set for minimal patient effort, without causing autocycle/breath stacking

# Modes of Ventilation

## AC (assist/control)

- RR
- VT
- PEEP
- FIO<sub>2</sub>
- I time

Patient will receive a minimal guaranteed rate and volume. Any spontaneous trigger results in delivery of set volume.

## SIMV (synchronized intermittent mandatory ventilation)

- RR
- VT
- PEEP
- FIO<sub>2</sub>
- I time
- Pressure Support

Patient will receive a minimal guaranteed rate and volume, but some spontaneous triggers will result in the pressure support breath, others will deliver the set volume.

# Modes of Ventilation

Spontaneous (cpap/flowby/pressure support)

- Pressure Support
- PEEP
- FiO<sub>2</sub>

Patient sets own respiratory rate. V<sub>t</sub> is based on set pressure support relative to patient's participation or disease process.

## Pressure Control

- Available in AC, SIMV, APRV, BiLevel
- Utilizes a set pressure instead of set volume
- Pressure is constant, volume is variable based on lung and chest wall compliance
- Useful in restrictive lung disease
- Lung protective strategy for ARDS
- Safe to use from neonate and older

## Managing Oxygenation

### PEEP

- Positive end expiratory pressure
- “backpressure” applied while patient exhales
- Keeps alveoli patent
- Anatomical peep is 3-6cmH<sub>2</sub>O (depending on text)
- 5 is a good place to start
- As a general practice, increase peep when FiO<sub>2</sub> reaches 60
- Watch plateau pressure for over-distension

## Managing CO<sub>2</sub> (ventilation)

### Minute Ventilation

- $RR \times V_t = \text{Minute Ventilation}$
- Minute Volume and PACO<sub>2</sub> are inversely proportional
- Increase minute ventilation to decrease CO<sub>2</sub>
- Decrease minute ventilation to increase CO<sub>2</sub>
- Permissive hypercapnia causes a rightward shift of the oxyhemoglobin dissociation curve, which allows for more oxygen available to tissue, due to a decreased affinity of hemoglobin for O<sub>2</sub>

# How much to I adjust minute volume?

If no changes to v/q matching occur, this sets a good starting point for ventilation changes

Required Minute Volume =	known PaCO <sub>2</sub> x known minute volume
	Desired PaCO <sub>2</sub>



# Weaning from Mechanical Ventilation

## Assess Readiness for Spontaneous Breathing Trial (SBT)

- Has condition been resolved?
- Hemodynamically stable?
- Stop paralytics
- Reduce / discontinue sedation
- Assess neuro status
- RSBI <100
- FiO<sub>2</sub> ≤50%
- PEEP ≤5
- MV < 10 L/min

# Weaning from Mechanical Ventilation

## SBT

- Facility should have a weaning protocol
- Most widely accepted practice:
  - PS 5, PEEP 5
  - Check abgs in 30-60min
  - If patient is unable to maintain adequate minute ventilation on PS 5, increase PS to achieve a tidal volume close to previously set volume
  - Wean PS incrementally as patient tolerates, to a goal of 5

# When to extubate

- Is patient able to protect airway?
- Gag reflex intact?
- Can patient manage oral/pulmonary secretions?
- NIF > 20-30
- RSBI <100
- Oxygenation adequate?
- Is patient hemodynamically stable?
- Availability of a skilled intubator?



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QUESTIONS?

