
# INDIAN SOCIETY OF ANAESTHESIOLOGISTS (ISA)
# MECHANICAL VENTILATION MODULE (BASIC)

## Orientation Course for Clinical Specialists &
## Refresher Course for Anaesthesiologists

# Weaning from Mechanical Ventilation

# Weaning from Mechanical Ventilation

- For Delivering the best possible care to patients on mechanical ventilation

  Take patients off mechanical ventilation as soon as it is safely possible

# Course during Mechanical Ventilation

- Treat acute respiratory failure
- Suspect readiness to wean
- Asses readiness to wean
- Wean from Ventilator
- Extubation

# Weaning from Mechanical ventilation

- First step

  The weaning process starts at the time that the illness that lead to the need of mechanical ventilation has (at least partially) resolved

# Weaning from Mechanical ventilation

- Second step

  Readiness to wean should be suspected early in the course of mechanical ventilation and assessed by objective criteria

# Readiness to wean criteria

- **Satisfactory oxygenation:**

  $PaO_2/FiO_2 > 200$ mmHg with PEEP < 5cm $H_2O$
- **Hemodynamic stability :** no continuous or minimum vasopressor infusion
- **Adequate level of consciousness:** Patient awake or easily aroused

# Readiness to wean criteria

- Adequate cough and secretion management:

  Patient should be able to cough effectively

  Presence of cough reflex in response to endotracheal suction

- Respiratory Physiology criterion

  Rapid shallow breathing index RSBI <100 after 2 minutes of a spontaneous breathing trial

# Rapid shallow breathing index

- RSBSI is sensitive screening test for early detection of readiness to wean
- The RSBI index is the ratio of respiratory rate to TV (Tidal Volume) after 2 minutes of SBT
- RSBI identify patients who can pass SBT
- This does not identify those who actually pass SBT

# Rapid Shallow Breathing Index

- The breathing pattern in respiratory failure is characterized by:
- Low Tidal volumes (shallowness) &
- High respiratory rate (rapidity)
- Examples:
- RR = 25, Vt = 300 ml
  RSBI = 25/.3 = 83; Passed test

- RR = 40, Vt = 200 ml
  RSBI = 40/.2 = 200; Failed test

**Success<105>Failure**

# Weaning from Mechanical ventilation

- Third Step

  Spontaneous Breathing Trial (SBT)

- Once the readiness to wean is confirmed with above mentioned criteria , an SBT should be conducted

- SBT is required to confirm the patients ability to breathe without assistance

# Spontaneous Breathing Trial

- SBT with T piece assistance
- SBT with low level of inspiratory  pressure support or CPAP
- SBT should be performed using the  T-piece method which most accurately simulates the post- extubation physiological conditions

# Duration of SBT

- **30 minutes of SBT Trial**

  This is adequate in identifying a successful or failed SBT

- **Longer up to 120 Minutes Trial**

  May be required in high risk patients as Elderly patients and those with COPD ,heart faliure ,or neuromuscular Disease

# Criteria for successful SBT

- Respiratory rate < 35
- Good tolerance to spontaneous breathing trial
- Heart rare <140 or HR variability of <20%
- SPO2 >90 or PaO2 >60 mmHg on FiO2 <0.4
- Systolic Blood pressure >80 and <180 or <20% change from baseline
- No sign of increased work of breathing or distress

# Sign of increased work of breathing or distress during SBT

- Accessory muscle use
- Paradoxical or asynchronous rib abdominal cage movements
- Intercostal  retractions
- Nasal flaring
- Profuse diaphoresis
- Agitation

# Criteria of failure of SBT

- Clinical Criteria
  - Diaphoresis
  - Nasal flaring
  - Increased respiratory efforts
  - Tachycardia (increased in Heart rate >40)
  - Cardiac arrhythmias
  - Hypotension
  - Apnea

# Criteria of failure of SBT

- Gas exchange criteria
- Increase of  $PCO_2$ >10 mm of Hg
- Decrease in arterial pH <7.32
- Decline in arterial pH>0.07
- $PaO_2$ <60 with an $FiO_2$ >.40 ($PaO_2/FiO_2$ <150)
- Fall in $SpO_2$ >5%

# Fourth Step
# Extubation readiness:

- Extubation should be considered if patients meet the following criteria

➢ Breathing spontaneously

➢ RASS 0 to -1

➢ Able to follow commands

➢ Intact cough and able to protect airway

➢ Requiring airway suctioning for secretion < q2h

# Extubation readiness:

- Other considerations include:

➢ FiO2 < 40% at the time of extubation

➢ Optimization of volume status prior to extubation

# ICU Extubation

- Confirm patient meets criteria for extubation
- Don appropriate PPE
- Minimize staff: Only respiratory therapist and/or provider should be in the room
- Place patient on 1.0 FiO2 on the ventilator and ensure non-rebreather mask ready with flow “OFF”
- Place bed pad or towel on patient chest and ensure yankauer suction “ON” and readily available. Consider placing a plastic drape on top of patient to prevent exposure to any coughing that may occur.
- Secure NGT or feeding tube to nose.

# ICU Extubation

- Suction mouth and loosen tape securing ETT to patient
- Turn all gas flows to “OFF” (may still have some O2 flow as safety mechanism for most machines) and extubate the patient
- Immediately discard of ETT, chuck or towel, and drape
- Immediately place non-rebreather on patient, then turn oxygen flow to 10-15L/min. Ensure patient is oxygenating and ventilating
- All providers will sanitize/change gloves while maintaining base layer PPE. **Do not allow anyone into the room for at least 47 minutes after extubation to facilitate 99% of aerosolized virus removal by negative pressure room** (assumes ACH of 6/hr)

# Weaning and Ventilatory strategy if patients fails SBT

- Restart ventilation to provide Near total rest
  - Assist-control ventilation (volume or pressure targeted)
  - Daily SBT for discontinuation assessment

  OR
- Partial ventilatory support
  - PSV
  - Gradual withdrawal possible
  - Prevents prolonged muscle inactivity

- Non-invasive ventilation or HFNCO2 after extubation in those at risk of weaning failure

Underlying condition has
Resolved or improved

**Daily screening of RS function**

Not Ready

MV and
Daily screening

Ready

**SBT**

T-piece or PSV 7
30min is enough

Tolerated

**Extubate**
**If awake, good cough**

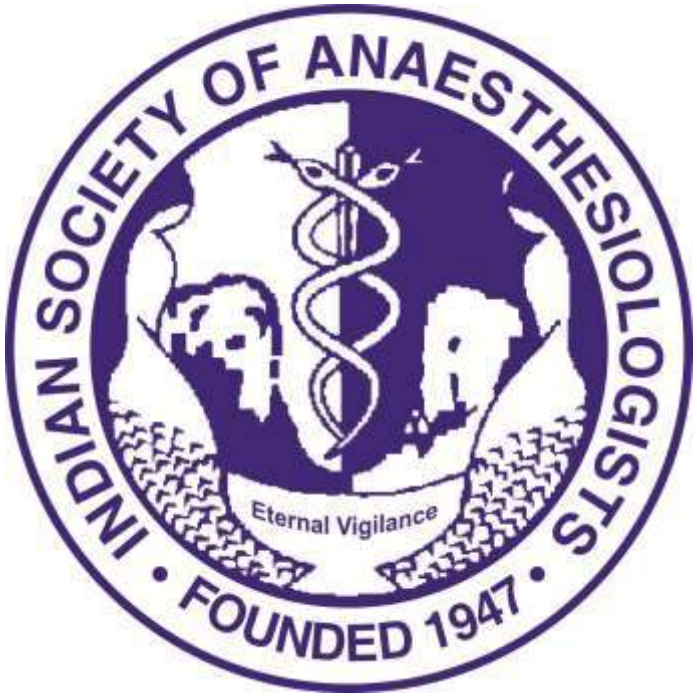
Not tolerated

**Gradual Withdrawal**

Once-daily T-piece
PSV

# Factors that can prolong weaning

| Decreased Drive | Muscle weakness | Impaired N-M transmission |
|---|---|---|
| Drug overdose | Electrolyte derangement | Critical illness neuropathy |
| Brain-stem lesion | Malnutrition | N-m blockers |
| Sleep deprivation | Myopathy | Aminoglycosides |
| Hypothyroidism | Hyperinflation | GB syndrome |
| Starvation / malnutrition | Drugs, steroids | Myaesthenia |
| Metabolic alkalosis | Sepsis | Phrenic nerve injury |
| | | Spinal cord lesion |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