Discontinuation and Weaning from Mechanical Ventilation

Chapter 20
Mechanical Ventilation

• Employed when:
  – the ability to support ventilatory demands is outweighed by a disease process
  – Respiratory drive is inadequate to maintain ventilation because of disease or medications

• Once the need has been resolved, ventilation can be discontinued
Clinical Responsibility:
1. recognize when ventilatory assistance is no longer needed
2. provide appropriate level of assistance until that happens
Weaning Techniques

• About 80% of patients do not require a slow withdrawal process
  – Usually on ventilator < one week
• The rest of patients require a complex and lengthy weaning process
• Successful discontinuation relies on the following facts:
  – Some patient’s require ventilatory support during weaning
  – Oxygen and PEEP may be required to support oxygenation
  – Some patient’s may require maintenance of the artificial airway
  – Many patients require more than one of the preceding therapies
• The ventilator should be discontinued as soon as possible to avoid the risks of mechanical ventilation
• Premature withdrawal can result in
  – Ventilatory muscle fatigue
  – Compromised gas exchange
  – Loss of airway protection
  – Higher mortality rate

Decision to wean depends on:
• Patient’s recovery from the problems that imposed the need for mechanical ventilation
• Patient’s overall clinical condition and psychological state
Reducing Ventilator Support

- SIMV
- Pressure Support
- T-piece Weaning
A patient who appears to be ready for discontinuation of ventilatory support is being weaned with SIMV. The data below indicate the patient's progress. No PSV or CPAP is used to support the spontaneous breaths. (See pg. 446) Do you think the patient is being managed correctly during the weaning process? If not what would you recommend?

The patient’s spontaneous rate has risen progressively as the spontaneous Vt has decreased. Without any further information these two finding strongly suggest that the patient's WOB has dramatically increased as the mandatory SIMV rate has decreased. To assist the patient, return the SIMV rate to a higher level, such as 4/min. In addition add PSV and the use of low levels of CPAP is appropriate. The patient probably needs to rest for the night on full ventilatory support.
Closed Loop Modes for Ventilator Discontinuation

- ATC
- Volume targeted PSV
- Automode or VPS/VPC
- MMV
- Knowledge based weaning systems
Criteria for Weaning

1. The problem that caused the patient to require ventilation must have been resolved
2. Certain measurable criteria should be assessed to help establish a patient's readiness for discontinuation of ventilation
3. A spontaneous breathing trial should be performed to firmly establish readiness for weaning
Evidence Based Weaning

1. Pathology of ventilator dependence
2. Assessment of readiness using evaluation criteria
3. Assessment during spontaneous breathing
4. Removal of the artificial airway
5. SBT failure
6. Maintaining ventilation with SBT failure
Evidence Based Weaning

7. Anesthesia and sedation strategies
8. Weaning protocols
9. Role of tracheostomy in weaning
10. Long-term care facilities
11. Clinician familiarity with LTC facilities
12. Weaning in long term ventilation units
Ventilator discontinuation is best accomplished when expert, caring staff members work with willing, cooperative patients.
Weaning Criteria

When the patient is stable, breathing spontaneously, alert and cooperative an assessment of ventilatory mechanics, gas exchange values may be performed.

No single value is uniformly successful in predicting “weanability” and uncomplicated extubation.
Weaning Parameters

- VC
- Ve
- Vt
- F
- f/Vt
- Ventilatory pattern
- Pimax
- P 0.1
- WOB
- Oxygen cost of breathing
- Dynamic compliance
- Vd/Vt
- CROP index
- PaO2
- PEEP
- PaO2/FiO2
- PaO2/PAO2
- P(A-a) O2
- %Qs/Qt
Which of the following patients has an RSBI that suggests it is time to begin weaning from ventilatory support?

Patient 1: Vt=0.4L; f=10

Patient 2: Vt=.25L; f=30

Patient 1 10/0.4=25

Patient 2 30/0.25=120
Spontaneous Breathing Trial

- Typically conducted basic assessment findings suggest that the patient is ready to be weaned
- The patient is allowed to breathe spontaneously for a few minutes to determine the person’s ability to tolerate the trial (screening phase)
- The ability to tolerate unsupported ventilation by the patient’s:
  - Respiratory pattern
  - Adequacy of gas exchange
  - Hemodynamic stability
  - Subjective comfort
- Considered ready for extubation is the patient tolerates 30-120 minutes of SBT
Airway Removal

• Assessment of airway patency
• Ability to protect airway
• Post extubation complications of:
  – Hoarseness, sore throat, cough
  – Subglottic edema
  – Increased WOB from secretions
  – Airway obstruction
  – Laryngospasm
  – Risk of aspiration
SBT Failure

• Determine the cause of the failure and correct if possible

• Avoid pushing patients to the point of exhaustion – wait 24hrs before reattempting
A 76 year old man with a history of COPD has been on ventilatory support for 4 days since he had a heart attack. The ventilator settings are Vt=700, SIMV 8, FiO2=.5, PEEP/CPAP=5. ABG results are pH 7.37 PaCO2 36, PaO2 78, SpO2 93%. The patient currently meets all criteria for weaning and is placed on a T-piece. Within 10 min he develops restlessness, tachycardia, rapid shallow breathing, and diaphoresis. The SpO2 drops from 93 to 90% and the pulmonary artery wedge pressure rises from 12 to 17mmHg. The patient does not complain of chest pain and has no dysrhythmias. What do you think is responsible for the failed weaning attempt.

One possible cause relates to cardiac function (increased left ventricular preload and a shift in blood volume to the central veins which may lead to dysfunction) Try administration of diuretics in an effort to treat the cardiac problem.
Nonrespiratory Complications

- Cardiac factors
- Acid-base status
- Metabolic factors
- Pharmacological agents
- Nutritional status
- Psychological factors
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<th>Long Term Care Facilities</th>
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| • A person should not be considered ventilator dependent until 3 months have passed and all weaning attempts have failed | • Ethical considerations  
• Economic issues |