

# Nursing essays - weaning patient ventilation



## **Weaning Patient Ventilation**

### **Introduction**

The indications of mechanical ventilation are many. The main idea is patients are put to artificial ventilation to satisfy their bodies demand for oxygen and removal of carbon dioxide, since they cannot do this by themselves.

Mechanical ventilation may be noninvasive through nasal or face masks or invasive through a tracheotomy tube. The time spent on mechanical ventilation varies.

It may be few hours as in cases of heart failure or obstructive airway disease.

It may be for longer time as in cases of head injury or premature babies.

Other patients may stay on artificial ventilation for unknown time as those in comas or with neurological condition where there is paralysis of the respiratory muscles. Being an aided respiration, so weaning and returning to the normal way of respiration has to be tried. However, the question remains when to wean and how to wean (Pruitt, 2006).

### **When to wean a patient from a ventilator**

Frutos-Vivar and Esteban (2003) suggested an evidence-based weaning protocol on three steps. In step 1, on treatment follow up and daily assessment, when the patient's condition improves, there are certain criteria to look for to start the process of weaning. These criteria are A)  $PO_2/F_{IO_2}$  (fraction of inspired oxygen) is 150-300. B) When positive end expiratory pressure is equal to or less than 5 cm/H<sub>2</sub>O and C) patient is awake with stable cardiovascular condition. D) Body temperature is less than 38 degrees C and hemoglobin is at 10 g/dl or more. You can get expert help with your essays right now. Find out more...

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The second step is to give the patient a trial of short period for 30 minutes of spontaneous respiration using either a T-tube or a pressure support ventilation of 7cm/H<sub>2</sub>O. The criteria for trial success are both objective and subjective. Objective criteria are A) gas exchange criteria of SaO<sub>2</sub> greater than 90 percent or PaO<sub>2</sub> greater than 60 percent with F<sub>io2</sub> less than 0.4-0.5 and increase in PCO<sub>2</sub> less than 10 mm Hg or decrease in pH less than 0.1. B) Heart rate should be less than 140 a minute or increased by less than 20 percent from baseline with systolic blood pressure higher than 80-160 mm Hg or change less than 20 percent from baseline.

Subjective signs include no extra work of respiratory or accessory respiratory muscles and absent signs of distress as agitation and increased sweating. If the trial succeeds, in other words the patient shows good tolerance to spontaneous respiration, the attending staff can wean the patient. If, on the other hand, the patient shows poor tolerance, the trial is to be repeated every 24 hours until good tolerance occurs, this is known as gradual weaning (Frutos-Vivar and Esteban, 2003).

### **How to wean a patient from mechanical ventilation**

Weaning can be either gradual as discussed earlier or rapid. Rapid weaning is indicated in cases with no pulmonary or neurological disorders that mandate mechanical weaning. This is best illustrated in cases of postoperative indication as advised by the anesthetic consultant (Pruitt, 2006).

Pruitt, 2006 suggested a 12-point protocol for rapid weaning. First, the ventilator settings are those ordered by the anesthetic consultant,

- 2) get arterial blood gases every 20 minutes, and always compare the results with readings of pulse oximetry and end tidal CO<sub>2</sub> values.
- 3) The patient observation sheet should include A- level of consciousness, B- temperature, and hemoglobin level. C- Gas exchange criteria and respiratory rate. All values discussed before apply for the timing of rapid weaning with slight variations among medical centers.
- 4) Decrease intermittent mandatory ventilation (IMV) rate by two breaths/minute when the patient is awake and alert, responding appropriately, and assisting the ventilator. The patient SpO<sub>2</sub> is greater than 92%, ETCO<sub>2</sub> (end tidal CO<sub>2</sub>) is less than 40 mm Hg, and hemodynamic values are acceptable. Acceptable hemodynamic values are heart rate less than 120 a minute with no serious arrhythmias.
- 5) Blood pressure is greater than 100 mm Hg systolic. In open-heart surgery, cardiac index, greater than two liters/minute/m<sup>2</sup> without intraaortic balloon pump therapy, and chest tube drainage less than 100 ml/hour. If the patient is stable 15 to 30 minutes after the IMV rate is changed, continue decreasing the IMV rate by two breaths a minute every 15 to 30 minutes. Continue as long as the patient's SpO<sub>2</sub> stays above 92%, his ETCO<sub>2</sub> is less than 40 mm Hg, and hemodynamic values are acceptable. Stop when the IMV rate equals two breaths a minute.
- 6) adjust the FIO<sub>2</sub> to 0.4 in increments of 0.05 to 0.1 as long as the patient's SpO<sub>2</sub> is above 92%.

- 7) If the patient is receiving positive end-expiratory pressure (PEEP) of more than five cm H<sub>2</sub>O, decrease PEEP by five cm H<sub>2</sub>O every 30 minutes until PEEP is equal to five cm H<sub>2</sub>O, as long as the patient SpO<sub>2</sub> is above 92%.

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- 8) Get an arterial blood gas analysis as needed and report the anesthesia consultant if the patient SpO<sub>2</sub> falls below 92% or ETCO<sub>2</sub> rises above 40 mm Hg or if he shows any signs of agitation or distress.
- 9) Discontinue weaning if the patient cannot maintain acceptable hemodynamic, neurological, or respiratory parameters. Return to previous ventilator settings and notify the anesthetist.
- 10) When the IMV rate equals two breaths a minute, get an arterial blood gas analysis, and correlate the results with the patient's SpO<sub>2</sub> and ETCO<sub>2</sub> values. Get pulmonary function tests; the patient's tidal volume should be greater than 5 cc/kg, spontaneous respiratory rate between 8 and 30 breaths/minute, vital capacity greater than 15 cc/kg, minute ventilation less than 10 liters/minute, and maximal inspiratory pressure less than -20 cm H<sub>2</sub>O. If readiness to wean criteria, haemodynamic, and lung mechanics criteria are met, place the patient on a T-tube at the current FIO<sub>2</sub> and perform a spontaneous breathing trial.
- 11) Get an arterial blood gas (ABG) analysis if the patient tolerates the spontaneous breathing trial for 30 minutes (as evidenced by the

patient ability to stay on the T-piece with acceptable neurological, hemodynamic, and respiratory parameters).

- 12) If the ABG results are in the acceptable criteria range, the patient will be extubated. Place the patient on supplemental oxygen at 5 to 6 liters/minute via nasal cannula (passive ventilation) to keep his Spo<sub>2</sub> over 92%.

### **References**

Pruitt, B. (2006). Weaning patients from mechanical ventilation. *Nursing*, 36 (9), 36-41.

Frutos-Vivar, F. and Esteban, A (2003). When to wean from a ventilator: An evidence-based strategy. *Cleveland Clinic Journal of Medicine*, 70 (5), 389-400.