VETAMAC VAPORS

Vetamac Vapors Vol. XIV • Issue 3 • Fall 2017

A Guide to Short Term Mechanical Ventilation

By: Michelle McConnell, LVT, VTS(Anesthesia)

Ventilation of the lung is defined as the mass movement of gas into and out of the lung. It is essential that the patient has sufficient alveolar ventilation, in other words, that the volume of inspired gas is sufficient to maintain normal partial pressures of arterial oxygen and carbon dioxide. Mechanical ventilation may be provided manually by compressing the reservoir bag intermittently. However, in some cases, a mechanical ventilator is preferred. Because positive pressure is required to force gas into the lungs, this is usually referred to as intermittent positive pressure ventilation (IPPV). This guide is written to use with the Hallowell 2002Pro ventilator. Hallowell Ventilators are pressure controlled and time cycled. Pressure controlled and timed cycled are the most commonly used in veterinary medicine today.

The new Hallowell 2002Pro has a single multiturn flow valve instead of the coarse and fine tune flow valves in previous models. The multiturn flow valve or volume knob can regulate inspiratory flow from 0-100 lpm. This new option allows the anesthetist to adjust the volume easier and more precisely with small patients. Mechanical ventilation uses positive pressure to assist or replace normal breathing by the anesthetist. This may involve a machine (ventilator) or manually. The purpose is to provide respiratory support to an animal that may be compromised due to the administration of analgesics, patient positioning, respiratory disease, or thoracic cavity compromise. Short term mechanical ventilation is used with 100% oxygen for no longer than a 12 to 24-hour period.

Key Words:

Tidal Volume (TV)-amount of gas delivered during one inspiratory phase of ventilation. TV = 10 - 15 ml/kg body weight
Respiratory Rate (RR)-number of breaths the patient receives in one minute. RR = 8 - 12 breaths per minute in an anesthetized patient
Minute Volume (MV)-amount of gas the patient inhales during one-minute MV = TV x RR. Normal minute volume should be 150-250 ml/kg/min4
Peak Inspiratory Pressure (PIP)-the amount of pressure that the delivered gas puts on the airway. Normal pressure = 15 - 20 cm H_2O
Intermittent positive pressure ventilation (IPPV)-Artificial inspirations either manually or mechanically delivered to the patient's airway.
Hypocapnia-Decreased amount of CO_2 in the blood. $ETCO_2$ levels 35 mm Hg or lower
Hypercapnia-Increased CO_2 in the blood. $ETCO_2$ levels 60 mm Hg or higher
Ventilation-perfusion inequality (V/Q mismatch)-A defect were ventilation and perfusion are not matched
Compliance-The ability of the lung to fill or expand
Atelectasis-collapse of the alveoli
Functional residual capacity (FRC)-is the amount of air left in the lungs after expiration
Positive End Expiratory Pressure (PEEP)-A pressure remaining in the airway at the end of expiration
Capnography-End tidal CO_2 monitoring
"Bucking"-This occurs when the patient is breathing against or around the ventilator

Risks of using a Ventilator:

Barotrauma can happen if the pressure is set too high causing pneumothorax or pneumomediastinum.
Hyperventilation or hypoventilation can occur from over ventilating or under ventilating the patient respectively.
Venous return could be decreased from mechanical ventilating causing a decrease in cardiac output resulting in decreased blood pressure and tissue prefusion.

Ventilating the Patient: Use the pediatric bellows for patients up to 30 pounds. The pediatric bellows and housing is 0-300ml. For patients 25-220 pounds use the large bellows. The large bellows and housing is 300-1600ml. For patients 200-440 pounds use the 1600-3000 bellows and housing.

1. Plug in ventilator electric power cord
2. Attach oxygen to ventilator using the O_2 demand Wye valve splitter
3. Close pop-off valve
4. Replace reservoir bag with ventilator output tubing
5. Attach scavenger tubing to ventilator exhaust port
6. Insert Airway Pressure Sampling Tee and tubing in between anesthetic machine and system tubing
7. Set Maximum Working Pressure Limit to 30 cmH_2O
8. Turn Volume dial to the decrease side of the range
9. Turn on ventilator and set Rate to 10-12 BPM
10. Increase or decrease Volume as needed. Start with a 10 ml/kg (5 ml/#) tidal volume
11. Monitor pressure manometer. Set pressure between 12 – 20 cmH_2O Do not exceed 20 cmH_2O max
12. Monitor patient end tidal CO_2. $ETCO_2$ Should be maintained between 35-45 mmHg

Turning the Ventilator off: It is not recommended to just turn the ventilator off. The patient should be weaned off allowing the patients CO_2 to build up to kick start the respiratory response. The ventilator respiratory rate and flow rate should be decreased. A rise in the $ETCO_2$ should happen. Once the patient starts spontaneous respirations the ventilator can be turned off. Make sure to disconnect the ventilator, add the reservoir bag, and open the pop off valve. Careful close monitoring of the patient should be continued until the patient's respiratory rate returns to normal and the endotracheal tube is removed.

It is recommended to have your ventilator tested for quality assurance once a year. Vetamac can provide this service onsite along with anesthesia machine service. *Works Sited: Anesthesia for Veterinary Technicians, Bryant*

Meet Our Team

Michelle McConnell, LVT, VTS(Anesthesia)
Senior Service Technician/Sales Associate

Michelle McConnell graduated from Bel-Rea Institute of Animal Technology in Denver, Colorado in 2002. She obtained her Veterinary Technician Specialty in Anesthesia in 2007 while teaching at Kansas State University. Since 2007, Michelle has worked at specialty animal hospitals in South Florida. Michelle joined Vetamac in September 2011 as a service technician/sales associate in southeast Florida.
Michelle is a member of the National Association of Veterinary Technicians in America and the Academy of Veterinary Technician Anesthetists.

Michelle and her husband, Bryan, reside in South Florida with their daughter, Violet, born in December 2015, a very hyper golden retriever named Mango, and a cat named Michigan. Michelle's hobbies include reading and participating in a monthly book club, going to the beach, going out to dinner with friends, competing in marathons and triathlons, and traveling.

We Have the Best Team to Better Serve You!