

Capnography in Veterinary Medicine

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December 2002

What information does it give you?

The capnograph provides information about the amount of carbon dioxide exhaled and inhaled. This allows evaluation of respiratory depression and any rebreathing. Evaluation of the curves produced by this monitor allows detection of leaks in the breathing system, bronchospasm, apnea and numerous other more subtle problems with respiration.

Remember that delivery of CO₂ to the lungs requires blood flow. One of the earliest and most sensitive signs of cardiovascular collapse or cardiac arrest is an abrupt decrease in end tidal CO₂. As a pneumothorax progresses you will see rising end tidal CO₂ and increasing arterial-end tidal CO₂ gradient – you need to analyze arterial blood for this.

Disadvantages:

Increased equipment dead space occurs with insertion of the sampling connector. Also the increased potential for leaks in the breathing system, dealing with any sampled gas removed from the breathing system, and possible spread of contamination with reusable sampling connectors.

Mainstream or sidestream?:

A mainstream (non-diverting) gas monitor passes respiratory gas through a wide-bore chamber with two windows and analysis happens right there by the attached heated sensor. Advantages of the mainstream gas monitor include fast response, no scavenging of sampled gases required, and use of fewer disposable items. Disadvantages of this system include weight of the sensor, increased potential for leaks or disconnects in system, condensed water or secretions interfere with sensor, sensor is more vulnerable to damage, longer warm-up time.

A sidestream (diverting) gas monitor uses a pump to pull gas from the breathing system to the sensor, which is located in the monitor. Advantages of this system include faster warm-up, lightweight patient interface, several respiratory gases can be measured at once, monitor can be remote from patient (e.g. MRI), and sampling from non-intubated patients is possible. Disadvantages include obstruction of sampling tubing with water, blood or secretions; delay in response; dealing with sampled gas; use of more disposable items; needs calibration gas source.

Patients that benefit:

Those patients with pre-existing respiratory disease and those undergoing procedures that may change respiratory function. This includes procedures or patients with: thoracotomy, diaphragmatic hernia, possible pneumothorax, pneumonia, asthma/ heaves, critically ill – sepsis, shock, trauma.

Treatment of hypercarbia:

Elevated levels of CO₂ in end tidal gas or arterial blood always indicates an imbalance between the carbon dioxide produced and its respiratory excretion. You should check your

equipment. Some equipment problems that can cause increased PaCO₂ include channeling or exhaustion of soda lime, as well as missing or stuck one way valves in the breathing system. An increased metabolic rate could cause hypercarbia. Also depression of ventilation and decreased respiratory minute volume.

In an anesthetized patient decrease the anesthetic depth. In a patient with severe elevations of P_aCO₂ (usually > 60 mm Hg) the appropriate treatment is mechanical ventilation.

Rebreathing implies that some or all of the gas that was exhaled with the last breath is inhaled again, this can contribute to hypercarbia. Carbon dioxide is the marker for rebreathing.

Treatment of hypocarbia:

Hyperventilation is defined by hypocarbia. This can be caused by overzealous manual ventilation. Other causes include hypoxia, pain, too light. If you are ventilating for the patient, slow down. If not, consider whether they require analgesics, an increase in anesthetic depth, or treatment of hypoxia.