

## Common misconceptions about monitoring

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If monitoring anesthesia was easy, everyone would like to do it; and that does NOT seem to be the case. What are some of the most important considerations about choosing monitoring equipment and what questions are commonly asked?

### *1. Which is better; monitoring devices or a person who is devoted to watching the patient?*

There is no simple answer to this question, since it will vary from practice to practice. It depends on the experience and knowledge of the person watching the patient and the ability one has to react to a monitoring device. A person who isn't paying attention is worse than a mechanical monitor, but a monitor which warns of impending disaster and isn't observed won't help either.

Although AAHA has mandated the use of mechanical monitors, the guidelines published by the ACVA, specified that either was acceptable. In most cases, probably some combination of an experienced person using monitoring equipment works the best.

### *2. Can you monitor a patient "well" with only a stethoscope?*

The answer to this depends on your definition of monitoring "well".

The palpation of a pulse, examining mucous membrane color, capillary refill time, and observing the respiratory rates provide valuable information. Also listening to the heart and lung sounds, and character of these sounds have been used for many years successfully. But there are a couple of reasons to consider more monitoring.

First, in our current society, it is important to document a patient's condition more exactly. Monitoring the blood pressure, hemoglobin saturation, expired carbon dioxide levels do provide additional information to help guide anesthetic depth and type of supportive care. Also, the complexity and duration of procedures and type of patient undergoing anesthesia is unprecedented in veterinary medicine.

### *3. What is the **most** important thing to monitor during anesthesia?*

You simply cannot choose one thing to monitor, because every variable only tells you one piece of information about an animal. It is as if the animals are a puzzle and each variable we monitor is one piece. Perhaps one day we will have a monitor, which will give a certain score for cardiac output, oxygenation and brain function and add them together to display one "score" which tells us how our patient is doing. But at the present time, we have to try to evaluate cardiovascular function, oxygenation, ventilation and depth of anesthesia (ie, CNS function) separately.

#### 4. What drugs cause problems for monitors?

Many drugs will affect the ability of **noninvasive** monitors to function, since they affect peripheral vessels. For instance, the alpha-2 agonists (xylazine, medetomidine) cause peripheral vasoconstriction, which may prevent the pulse oximeter from finding a peripheral capillary bed.

Ketamine may cause more difficulty for non-invasive blood pressure monitors because it may elevate diastolic pressure; this makes the pulse pressure (difference between systolic and diastolic) smaller. It is unfortunate but true, that these commonly used injectable anesthetics make monitoring more difficult.

#### 5. What are the causes for changes in blood pressure during anesthesia?

Most anesthetic drugs produce cardiovascular depression, which tends to decrease blood pressure. In most cases, this depression is in a dose-dependent manner, which is why turning down the vaporizer (hence decreasing the dose of an inhalant) increases blood pressure. If the animal has “read the book” and is responding in a normal physiological manner as blood pressure decreases, heart rate will tend to increase to compensate. Under anesthesia, these compensatory mechanisms may be blocked. It is possible to see a decrease in heart rate with a decrease in blood pressure. In this case, cardiovascular depression may be more severe and this decrease should be addressed. There are many other causes for a decrease in blood pressure, which may include increasing depth of anesthesia, blood or volume loss, hypothermia or decreased surgical stimulation.

#### 6. Why do I need another monitor besides my pulse oximeter?

Although pulse oximeters are very useful, they only tell you about the patient's hemoglobin saturation. SpO<sub>2</sub> is related to patient oxygenation via the ox hemoglobin dissociation curve. So, by knowing SpO<sub>2</sub>, we can make a pretty good assumption about PaO<sub>2</sub> (at least when the patient is breathing room air). When the pulse oximeter is getting a good reading on a peripheral site, we also know that peripheral perfusion is good, but we **don't** know much about blood pressure. The pulse oximeter reading may be good in a profoundly hypotensive patient. The pulse oximeter also **doesn't** tell you about hypoventilation (ie, build-up of carbon dioxide) which can cause acidosis. The hemoglobin saturation may be excellent even when a severe respiratory acidosis exists.

#### 7. Why can monitoring expired carbon dioxide be helpful?

Most anesthetics produce respiratory depression, which leads to a build up of carbon dioxide. Monitoring expired carbon dioxide therefore provides another clue about depth of anesthesia. ETCO<sub>2</sub> also gives us information about problems within the breathing circuit (eg, exhausted sodasorb, sticking valves, or leaks in machine), and problems with the patient (eg, the intubation of one bronchus, esophageal intubation, or decreased cardiac output). Monitoring expired carbon dioxide doesn't totally eliminate the need for blood gas evaluation, but it does provide another piece of the puzzle.