

# ANESTHESIA FOR NON-ANESTHESIOLOGISTS

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In any discussion of the basic principles of successful anesthesia in general practice, two assumptions are in order. The first is that practitioners are already anesthetizing patients successfully on a routine basis and therefore have a good understanding of and comfort level with anesthetic drugs and combinations. The second is that these practitioners are looking for simple ways to improve their existing protocols rather than desiring to make extensive changes or use completely new drugs. This article will make some simple recommendations to answer a question these practitioners may be asking: “What can I do to make anesthesia safer?”

## Don't treat all patients alike

In a busy practice it is easy to use standard anesthesia and analgesia protocols that treat all patients alike. While it is imperative to perform a complete preoperative evaluation and physical examination on each patient, it is important to treat all abnormalities detected individually. If you find a problem, you must then ask yourself, “Does this procedure really have to be done today?” Clients do have expectations about when a procedure will occur, but when you explain to them that you have their animal's safety in mind, they will usually agree to further diagnostics so that the animal can be safely anesthetized.

It is also wise to pay attention to that “little voice in your head” telling you that something is not right with a patient. We often ignore that voice when we are in a hurry, often with bad results. Anesthesia is one of the areas where you can't afford to be in a hurry but must always be thorough and attentive to detail.

If you have detected an abnormality in the patient—for instance an abnormal lab result or a slight heart murmur—how do you handle it? It may simply be a matter of deleting a drug (such as acepromazine) from your usual regimen or

decreasing the dosage used. Let the patient's condition dictate the amount to give rather than always giving the same dosage; this goes for premedications and induction drugs as well as the amount of inhalant used (*i.e.*, the vaporizer setting).

## The benefit of oxygen

As veterinarians we recognize the benefit of maintaining patients on oxygen with inhalant anesthesia, but we often forget that preoxygenation can make induction safer by preventing the desaturation that can occur immediately after induction. Use of a mask or flow-by oxygen (*i.e.*, from anesthetic tubing placed in front of the animal's nose) for three to five minutes before induction is indicated for any geriatric or sick patient without cardiopulmonary reserves. Oxygen after extubation also increases patient safety, especially if the patient is shivering (which increases metabolic requirements) or has underlying cardiac disease. Upper airway muscle relaxation seems to considerably impair breathing in some pets, especially brachycephalic dogs and cats. You can't just extubate them and walk away; they need to have some flow-by oxygen until they are awake enough and able to maintain saturation. Respiratory depression caused by residual anesthetic drugs can be fatal; the patient may breathe well when stimulated, but when you leave it alone and it relaxes, hypoventilation recurs.

## Premedication and induction: Are fewer drugs safer?

Anesthesia induction is probably the most dangerous time for the patient because of the changes taking place in the cardiopulmonary and central nervous systems. Many veterinarians therefore think that avoiding any premedicants and masking with only one drug is safer than using multiple drugs.

However, this may not be the case; the amount of cardiopulmonary depression produced by high percentages of isoflurane or sevoflurane (which is required for induction with no premedications) may overwhelm the patient. A more balanced approach, such as using some premedications or injectable drugs for intubation and to decrease the percent inhalant needed for maintenance, may be smoother and safer. Wrestling with a big, healthy dog—or even a small, apprehensive dog or cat—can cause the release of catecholamines, which can trigger arrhythmias or cardiovascular collapse.

Another way to make induction safer is to monitor the patient closely through this period. Consider attaching electrocardiograph (ECG) leads and a blood pressure cuff before induction. Not all patients will tolerate this, but many will, especially if they have been premedicated. If a problem occurs during induction, you will see it immediately.

## Maintenance: How much to use?

Currently used inhalants such as isoflurane and sevoflurane allow rapid control of the anesthetic plane, which helps make anesthesia safer. It is important, however, to understand that patients' inhalant requirements vary widely; for example, the vaporizer setting should be decreased with hypothermia, concurrent illness, and other drugs. The patient must be closely monitored and the vaporizer adjusted based on the individual patient; guidelines about setting the vaporizer at X percent for X minutes are just that: guidelines.

Some patients may not tolerate inhalants well, and the percent used must be kept very low: less than 1 minimum alveolar concentration (MAC) for the inhalant (1 MAC = 1.3% isoflurane and 2.3% sevoflurane). In these cases analgesia must be provided by giving other drugs, such as opioids, intermittently or

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as a constant-rate infusion (CRI). Pre-loading the patient with intravenous fluids and using inotropic agents intraoperatively may also be necessary.

Some practitioners may be comfortable with these more advanced techniques, but if not, they should refer these patients to a boarded anesthesiologist for more advanced management. At Texas A&M, we have had patients referred for routine surgical procedures because the anesthetic management of the case was not routine.

## Monitoring: How much is enough?

The purpose of monitoring is to alert the anesthetist to problems before they become serious (*i.e.*, before cardiac arrest occurs). This requires great vigilance as well as accurate interpretation of monitor readings. There are certainly anesthetists who can maintain and monitor patients with no equipment, but in today's litigious society, I would not recommend this approach or consider it a reasonable standard of care. It is also possible for a patient to be fully monitored with a pulse oximeter, ECG, and blood pressure monitor and still suffer an anesthetic death. However, the well-monitored patient generally stands a better chance of not only surviving under anesthesia, but of recovering rapidly and feeling better postoperatively. Monitoring heart and respiratory rate, heart rhythm and depth of respiration, mucous membrane color, and capillary refill time are basics. Blood pressure is tremendously helpful in assessing depth of anesthesia, guiding fluid therapy, and allowing the use of inotropic drugs such as dobutamine. In cases of anesthetic arrest, blood pressure usually declines or is low for a period of time before the arrest occurs, therefore giving the practitioner a warning and time to react to the problem. Since accurate, noninvasive blood pressure monitors are now relatively inexpensive, it seems logical to encourage their use. Maintenance of adequate blood pressure (*i.e.*, systolic blood pressure >90 mm of Hg and mean blood pressure >60 mm of Hg) indicates good tissue perfusion and adequate renal perfusion, which helps prevent postoperative renal failure. If practitioners are determined to improve their

standard of anesthesia, blood pressure monitoring is the place to start.

Pulse oximeters and capnographs (which measure expired CO<sub>2</sub>) can be helpful in evaluating patient oxygenation, peripheral perfusion (SpO<sub>2</sub>), and ventilation (PaCO<sub>2</sub>), and I encourage the use of these monitors as well. However, it is outside the scope of this article to describe the indications and shortcomings of both, and many good references exist.<sup>1</sup>

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## Disaster preparedness

Of course, it doesn't help to monitor the patient if you aren't prepared to treat the problems you encounter. It's essential to have emergency drugs readily available (and to check them frequently for expiration dates) along with appropriately sized syringes and needles. Dosing charts should be easy to read and allow rapid drug preparation (*e.g.*, they should be set up in 5-kg intervals rather than mg/kg, which requires calculation). Emergency drug charts can be laminated and posted in all locations where they might be needed. Another good option is to use an emergency drug calculator program, such as the one from the Colorado State University emergency and critical care website ([www.csuvets.colostate.edu](http://www.csuvets.colostate.edu)), and to print an emergency drug sheet for each patient—or at least each high-risk patient.

## Does fluid administration help for routine anesthetic procedures?

In my opinion, yes. Many if not most patients are dehydrated when they are

hospitalized and after food and water have been withheld for a number of hours. Intravenous fluids have the advantage of requiring an intravenous catheter (which is a safety factor in itself), and they rapidly expand the vascular space, which helps improve tissue and renal perfusion. Especially when nonsteroidal anti-inflammatory drugs (NSAIDs) are used perioperatively, fluids may help prevent renal compromise. Crystalloids, such as lactated Ringer's solution, can be given at 10 ml/kg/hr unless the patient cannot tolerate this fluid volume (*e.g.*, the patient with cardiac disease that is prone to pulmonary edema). Since crystalloids don't remain in the intravascular space very long, use of a colloid such as hetastarch, blood, or plasma may be required for patients that are anemic, hypoproteemic, or not responding to treatment of hypovolemia with crystalloids alone.

There is evidence in people that patients given fluids during short procedures feel better and experience less nausea and headaches than those who don't get fluids.<sup>2</sup> Unfortunately, we can't ask our patients about this, but it seems likely that it would be true for them as well. Subcutaneous fluids are better than none if this is the only route available.

## Take-home thoughts

In summary, I think it is possible to improve anesthetic management of patients without radically changing protocols and procedures by paying close attention to important basics. Make sure you have evaluated the patient thoroughly before anesthesia, tailor the anesthetic protocol for that particular patient, and be prepared for expected and unexpected problems. Careful monitoring and patient support (attention to oxygenation, fluid therapy, patient comfort, and support of body temperature during and after anesthesia) are key ingredients in safe anesthesia.

## References

1. Hartsfield SM. Equipment and monitoring. In: Tranquilli WJ, Thurmon JC, Benson GJ, eds. *Essentials of small animal anesthesia and analgesia*. Philadelphia, Pa: Lippincott Williams and Wilkins, 1999.
2. Maharaj CH, Kallam SR, Malik A, et al. Preoperative intravenous fluid therapy decreases postoperative nausea and pain in high risk patients. *Anesth Analg* 2005;100:675-682.