

# 1

## Patient Evaluation

*Prevention is the Best Medicine!*

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### KEY POINTS:

- A thorough physical exam should be performed on all patients unless it causes undue stress to the patient or is dangerous to the anesthetist.
- An overall impression of health, temperament, and body condition score are important to assess in every patient in order to plan drug protocols and doses.
- The physical exam should focus on the cardiovascular and respiratory systems, most importantly.
- Basic blood work for every patient should include a PCV and TP
- Many other additional tests may be indicated depending on the patient's health status and reasons for anesthesia.

Q. Why is it important to perform a complete patient evaluation?

A. Almost without exception, all anesthetic and analgesic drugs have potential toxic effects on organ systems. For example, the inhalant anesthetics significantly decrease blood pressure and organ perfusion such that an animal with pre-existing renal compromise may suffer irreversible renal damage if inhalants are used without monitoring and support of blood pressure. This damage may be even worse if nonsteroidal anti-inflammatory drugs (NSAIDs) are used prior to or during anesthesia.

A complete patient evaluation allows the veterinarian to identify potential health concerns and temperament issues that will affect how that animal responds to the various anesthetic drugs that may be used. In some cases, it may be important to avoid certain anesthetic or analgesic drugs because of identified health concerns. Often many, if not most, anesthetic drugs can be used in patients with significant health problems, but the dose of those drugs may need to be adjusted to minimize known side effects that may be harmful to that particular patient. To continue with the example provided above, in a patient with renal disease inhalants can still be used to maintain anesthesia,

but the dose of those inhalants should be kept as low as possible to minimize their negative effects on blood pressure and renal perfusion. Keeping the inhalant dose very low can be achieved by adding other anesthetic or analgesic drugs to the anesthetic protocol, as will be covered in depth in later chapters.

Q. Under what circumstances may patient evaluation be less than complete?

A. Occasionally a patient may be simply too aggressive or unhandled to allow for any physical examination to be conducted safely. Some animals, for example birds, may undergo significant stress from excessive handling and will benefit from a more limited physical examination. Even under these circumstances, however, careful observation “from a distance” can provide important information such as body condition (obese, thin, or just right?), haircoat and general appearance of health, posture and gait (normal or abnormal?), respiratory pattern and effort.

Q. What important questions should I ask the owner when taking a history?

A. The owner may volunteer a lot of information in the history that is or isn't relevant to anesthesia. Some questions that should be asked include:

- ✓ Has your pet had anesthesia previously and how was his/her recovery at home? – This may alert you to risks of prolonged effects of sedative or other drugs used in the anesthetic protocol.
- ✓ Are you aware of any problems that your pet had with anesthesia in the past? – Often owners will not know, or will be unsure of, which anesthetic drugs were used previously, but if they recall a specific event (e.g., the vet said he/she had a rough recovery) this can alert you to potential drugs to avoid or to use (e.g., perhaps the rough recovery was because the dog experienced emergence delirium, so this time a longer acting sedative may be indicated).
- ✓ Are you aware of any relatives of your pet that have experienced complications with anesthesia? – For example, herding breeds of dogs may experience prolonged and profound sedation from certain sedatives and opioids.
- ✓ Is your pet allergic to any foods or medications that you know of? – Clearly, known allergies to certain medications would indicate that those medications, or ones that are in the same class, should be avoided. Rarely, dogs will have an allergy to eggs, which would make propofol contra-indicated, as propofol contains egg lecithin.
- ✓ How is your pet's general energy level? Does he/she tire easily or get out of breath quickly during exercise? – Exercise intolerance is a red flag to be on the lookout for cardiovascular or respiratory disease, anemia, or endocrine disease!
- ✓ Are there any recent changes in drinking or urination habits? – Increases in frequency of water intake should put you on the medical hunt for diseases that cause PU/PD, such as renal disease or diabetes.

- ✓ Has there been any weight loss or gain that you've noticed recently? – Again if these cannot be explained by a diet change or lifestyle change, then you should be on the hunt for underlying medical issues that could lead to weight gain or loss (e.g., thyroid disorders).
- ✓ What medications is your pet currently taking? What about nutraceuticals or herbal remedies? – Some medications can directly and significantly impact how the animal responds to anesthetics. For example, ACE inhibitors (e.g., enalapril) can lead to low blood pressure under anesthesia that is unresponsive to most normal interventions.

Q. What are important considerations to look for on initial patient evaluation?

A. The initial patient assessment, before beginning the physical exam, can give you a lot of information. Make a note of the breed, as some breeds warrant special management considerations. Make a note of the animal's temperament: are they quiet, calm, lethargic? If so, then sedative drug doses may need to be reduced. Conversely, are they anxious? Then sedative drugs that provide anxiolysis may be indicated (e.g., acepromazine, midazolam). Are they aggressive and/or dangerous to handle? Then you may need to plan for heavy premedication with drugs that render the animal extremely sedate if not lightly anesthetized. If the dog is athletic and "works for a living" then it may have a normally low resting heart rate, which will be reflected in their heart rate under anesthesia. If that heart rate is normal for them, then you may not need to treat it, even if you consider it bradycardic by most standards.

Also make note of the animal's general appearance of wellbeing. Is their hair coat glossy and clean, or does it have a rough, dry, unkempt, or ungroomed appearance, which may indicate underlying disease, poor nutrition, or lack of self-grooming secondary to disease, stress, or pain.

Lastly, but importantly, assess the animal's body condition. Ideally you will obtain an accurate body weight during your physical, but prior to that, get an impression of whether the animal is close to an ideal weight or not. Obese patients will not breathe well under anesthesia because abdominal and thoracic fat increase the work of breathing and limit thoracic compliance. You should plan to assist ventilation in these patients. Also, drug dose calculations should be adjusted for ideal or lean body weight, otherwise you will be giving a relative overdose of anesthetic drugs. All anesthetic drugs circulate first to organs that receive a high percentage of cardiac output, and because adipose tissue receives very little blood flow, the relative concentration of drugs in the more vascular tissues will be too high if the drug dose is administered based on the obese body weight.

If an animal is too thin, drug doses should be calculated based on the actual body weight. A thin animal, however, may get colder sooner during anesthesia because of the lack of insulating fat.

Q. How should I estimate the patient's ideal weight?

A. Recent studies have reported that ~40% of dogs in the USA and other countries are overweight and between 5–20% are obese [1, 2]. A commonly used body condition scoring system uses a subjective 9-point scale, where 1 is a morbidly thin animal and 9 is a morbidly obese animal, with a spectrum of body conditions ranked on the scale between these extremes [3]. This system is validated for dogs with < 45% body fat, so may not accurately identify dogs that are extremely obese, which is becoming a more common finding.

A subjective but common-sense approach to estimating ideal weight is to consider the species, breed, and age of the animal and assign a body weight that would be typical for that animal *if* it had a body condition score of 5–6 (ideal). For example, a typical adult yellow Labrador of average size *should* weigh approximately 30–33 kg.

Q. What are general considerations for very young or geriatric patients?

A. Very young patients (i.e., less than 5 months of age) have immature liver function [4]. This means that they are slower to metabolize many drugs and are not very efficient at gluconeogenesis, so glucose should be checked and monitored during anesthesia, with supplementation if needed. When glucose falls below 60 g/dl, adding enough dextrose to make a 2.5% (25 mg/ml) solution of dextrose in a balance electrolyte fluid, for example plasmalyte-R, with fluids run at normal anesthetic maintenance rates (see Chapter 9: Fluid Therapy), will maintain normal glucose levels.

Geriatric patients should be carefully screened for diseases common to older animals, such as cardiac, renal, hepatic, CNS, and neoplastic disease. As a general rule, doses of sedative drugs should be tapered down in geriatric animals because of delayed clearance. Anesthetic monitoring should also be vigilant in order to quickly address complications that may compromise organ function, such as hypoxemia, hypotension, hypercapnia, and hypothermia. Underlying arthritis should be considered when positioning the patient for procedures, with attention to padding and positioning joints carefully to minimize patient discomfort or stiffness after recovery from anesthesia.

Q. What are the key organ systems to focus on during my physical examination that are relevant to anesthetic planning?

A. The most important organ systems with respect to anesthesia are the cardiovascular and respiratory systems. This is because so many of the negative effects of anesthetic drugs are cardiac and respiratory. A good grasp of abnormalities in these two systems in any given patient will allow for pre-emptive planning in advance in order to minimize anesthetic risk.

The chapters on anesthetic management for cardiovascular and respiratory disease will provide guidelines for how to plan anesthesia for patients where abnormalities in these organ systems exist. With respect to physical examination, the following checklist may help:

✓ Mucous membrane color should be pink.

- ✓ Mucous membranes should be wet/moist with a capillary refill time of <2 s.
- ✓ Hydration status should appear normal.
- ✓ Heart rate should be “normal” for this species and breed.
- ✓ Are there any murmurs heard? Any arrhythmias?
- ✓ Are there strong peripheral pulses and are they synchronous with the heart beats?
- ✓ Is respiratory effort minimal? Does the animal “work to breathe”?
- ✓ Is there good airflow through both nostrils when the mouth is held shut?
- ✓ Are normal breath sounds heard in all four lung fields?

Q. Are there any other organ systems I should examine?

A. The abdomen should be gently palpated to search for organomegaly or effusion, both of which can signal neoplastic, hepatic, or cardiac disease. A basic evaluation of CNS function should check that the patient has normal mentation, normal visual reflexes, and responds to voice. Check that the mouth can be easily opened so that intubation will be easy. If not (e.g., mandibular myopathy), you may need to be prepared with an endoscope to visualize the larynx or, worst case, for a tracheostomy.

Q. What bloodwork is important for a young, healthy animal?

A. A suggested minimum data base for a healthy animal should be packed cell volume (PCV) and total protein concentration. These tests are inexpensive and easy to perform and provide a lot of information. PCV will alert you to dehydration (if high) or to anemia (if low), which compromises oxygen carrying capacity and oxygen delivery to tissues. A PCV < 25%, if an acute decrease, should be addressed prior to anesthesia with blood products (packed RBCs, whole blood). Total protein concentration also can indicate dehydration (if high) or a chronic inflammatory disease (if high, because of increases in gamma globulins). Low total protein concentration can indicate poor liver function (e.g., portosystemic shunt) and makes the animal more at risk for hypotension because of low plasma oncotic pressure (fluids will not stay in the vascular space). Coagulation factors may also be low if liver function is poor, so the animal will be at a higher risk for surgical blood loss, even in routine procedures such as ovariohysterectomy. Low total protein concentration may also indicate protein loss, for example, from protein-losing nephropathy or GI losses.

In young animals, a baseline blood glucose concentration can be important for making decisions about fluid therapy and glucose support. A reagent test strip, for example Azostix, can provide a rough indication of normal or high blood urea nitrogen concentration, which can clue you in to pre-renal dehydration or renal dysfunction. If high, obtaining a urine specific gravity, also easy to perform, will help determine the animal’s concentrating ability and distinguish between pre-renal and renal azotemia.

Q. When should I consider performing more blood work? What tests are most important for anesthesia?

A. A retrospective evaluation of canine patient pre-anesthetic records was performed in order to determine the necessity of pre-anesthetic blood screening. Pre-anesthetic blood work was deemed to be unnecessary in 84% of these patients, as it did not alter the anesthetic plan. Less than 1% of patients required alterations of the anesthetic plan based upon blood work [5]. It is important to note that the majority of these patients were classified as ASA I or II. In a separate study evaluating geriatric canine patients (>7 years), pre-anesthetic blood work resulted in a new diagnosis of subclinical disease in roughly 30% of patients [6]. The results of these studies suggest that pre-anesthetic hematologic and biochemical screening is of value in detecting subclinical disease, especially among geriatric patients, but may not be necessary in all patients. Any patient with significant uncompensated or compensated systemic disease, a history of trauma, urinary obstruction, sepsis, and so on, should have a full CBC and serum biochemical profile with electrolytes. Again, this helps in stabilizing the patient prior to anesthesia and in making decisions regarding fluid therapy, as well as interpreting and managing complications that may arise under anesthesia (e.g., arrhythmias associated with K<sup>+</sup> disorders).

Q. Are there other diagnostic tests that should be considered?

A. Thoracic radiographs should probably be taken in any patient in which a previously undiagnosed heart murmur is heard or in a patient with a history of heart disease that is/is not being treated with medications, in order to assess heart size and the possible presence of heart failure. Patients with a history of trauma often have abnormalities on thoracic radiographs (e.g., pulmonary contusions, pneumothorax). Any patient in which lower respiratory abnormalities are ausculted on physical exam should have thoracic radiographs.

Echocardiography can be useful in identifying the significance of murmurs and assessing cardiac contractility in patients with cardiac disease. Abdominal radiographs, computed tomography, and ultrasound, while not necessarily pertinent to anesthetic planning, can help identify co-morbidities (e.g., metastases) that can change the overall patient plan.

Patients that are suspected to have clotting disorders based on breed (e.g., von Willebrand disease [vWD] in Dobermans), history of disease, or physical exam (e.g., petechiae) should have a platelet count (part of the CBC), buccal mucosal bleeding time (to check platelet function in an animal with a normal platelet count), or PT/aPTT tests, depending on the signs and signalment, to rule out/rule in a bleeding disorder that may increase surgical bleeding and risk. If vWD is suspected, a von Willebrand factor antigen assay should be obtained from a reference laboratory.

Q. What is ASA status and how do I rank a patient?

**Table 1.1** ASA status categories with descriptions and clinical examples.

Category	Physical status	Examples
I	normal healthy patient	no signs of obvious disease
II	patient with mild systemic disease	compensated cardiac disease, fracture with no shock
III	patient with severe systemic disease	anemia, moderate dehydration, renal or hepatic disease
IV	patient with severe disease that is life-threatening	uncompensated cardiac disease, renal or hepatic failure, sepsis
V	patient that is not expected to live with or without surgery	profound shock, severe multi-organ failure, severe sepsis, severe trauma

WJ Tranquilli, JC Benson, KA Grimm (eds) *Lumb and Jones' Veterinary Anesthesia and Analgesia*, 4th edn. Blackwell Publishing: Ames IA, 2007:Table 2.7.

A. The American Society of Anesthesiologists (ASA) recommends categorizing patients into one of five possible statuses after the patient evaluation has been completed ([www.asahq.org](http://www.asahq.org)) [7]. Table 1.1 summarizes the five categories. Any patient that presents as an emergency is ranked at its appropriate status followed by an E. For example, a dachshund with thoracolumbar disc herniation that is otherwise completely healthy, but that requires an emergency hemi-laminectomy would be an ASA 2E.

## References

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