CANADA WEST
VETERINARY SPECIALISTS

# Plan for Success: Patient Preparation and Pre-Anesthetic Medications

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## Introduction

Provision of pre-anesthetic medication has many benefits for most patients scheduled to receive general anesthesia. These reasons include decreased anxiety/stress of the patient, to facilitate handling for IV catheter placement, to decrease the amount of induction agent and inhalant needed to perform a procedure (thereby improving cardiovascular status), and of course pre-emptive analgesia. Pre-emptive analgesia, the provision of analgesic medication before the pain stimulus occurs, provides a more consistent plane of general anesthesia later on, and also allows us to use less analgesics overall. A neuroleptanalgesic approach is recommended for pre-anesthetic medication. This protocol includes a sedative or tranquillizer along with an opioid. Combining these two types of drugs has synergistic effects, meaning that we can use less of both, resulting in a higher safety margin as well as decreasing stress and providing analgesia to the patient. Pre-anesthetic medications are usually given either IM or IV, avoiding the SQ route since many drugs are not well taken up when administered this way. If the IV route is used, the practitioner needs to be mindful not to cause too much stress or risk injury placing an IV catheter, and also to reduce the sedative dose since more profound and rapid effects of drug administration will be observed. All patients should be monitored closely after pre-anesthetic medication is given, since respiratory depression, bradycardia, hypotension, and vomiting may result.

## How do we prepare the patient?

Appropriate patient preparation depends on a number of factors, including patient history, current status, and the procedure to be performed. This is where it is important to individualize an assessment and workup plan to decide if this patient is low risk or high (ASA I-V), then whether or not specific modifications to the anesthetic plan need to be formulated. Perhaps the most important of all is a complete history and physical examination. Most of our major concerns may be discovered during this part of the process. Is the patient drinking more water? Urinating more? Vomiting? Coughing? Are the mucous membranes pale? Are there notable lung sounds? Do you hear a cardiac murmur and/or arrhythmia? Further workup plans should be based on this cursory exam. i.e. the PU/PD patient should have a urinalysis and CBC/Profile done, the coughing

dog may need thoracic radiographs, the arrhythmia should be assessed with an ECG, etc. Any patient at risk of hemorrhage or hypotension should also have laboratory data collected, including hydration status (PCV/TP) just prior to the procedure, and perhaps also renal and hepatic function. Some may argue that all patients undergoing general anesthesia should have extensive blood work performed, however, this seldom changes our anesthetic plan in the majority of our patients as much as what may be discovered during the preliminary workup prior to that point.

So, this should be decided based on your clinical judgement and index of suspicion that there is an abnormality… In general, young healthy patients scheduled for an elective procedure may be well-assessed with simply a thorough and complete physical exam along with a minimum data base: PCV/TP +/-BG, +/- BUN/Azo (all 4 of these tests together are known as quick assessment tests, QATs).

## Fasting?

Pre-operative fasting is recommended for scheduled elective cases, with fasting duration dependent on gastric emptying time and type of diet. Unfortunately, an absolute time which will decrease the risk of regurgitation and aspiration is difficult to assign, since these factors can vary widely from one individual to another. Commonly recommended fasting times range from 6-12h for solid food, with water either not withheld or for only 2-4h prior to general anesthesia. Dry diets result in higher gastric volumes that take longer to empty the stomach than canned diet, and a 10 hour fast may not have any advantages over a 3 hour fast in preventing gastro-esophageal reflux in patients fed moist food (Savvas et al., 2009 & 2016). In addition, prolonged fasting decreases gastric content pH (increased acidity), which decreases esophageal sphincter pressure, potentially increasing incidence of gastro-esophageal reflux. However, a recent study published by Viskjer & Sjöström in 2017 showed incidence of regurgitation in a patient group who was fed a canned diet within 3 hours of anesthesia. Further studies will be needed before we are able to make an appropriately informed decision about fasting versus feeding preoperatively.

Regurgitation and possible esophagitis leading to esophageal stricture or aspiration of gastric contents followed by pneumonia can be potentially fatal consequences of anesthesia. There is discrepant information regarding the risk of these complications for veterinary patients. Aspiration pneumonia is a possible consequence to regurgitation and aspiration during an anesthetic event. It occurs when gastric contents are inhaled into the airway, potentially resulting in inflammation and infection. A large, multi-center retrospective study found the range of post-anesthetic aspiration pneumonia of 0.04-0.26% depending on the institution, with an overall incidence of 1.7 out of 1000 anesthetic events (Ovbey et. al, 2014). These authors found three anesthetic-specific events relating to the development of aspiration pneumonia: hydromorphone given IV specifically at induction, the use of CRIs containing morphine, lidocaine, ketamine, fentanyl, and/or

propfol during anesthesia, and use of an inotrope or vasopressor during the anesthetic episode. Here, regurgitation or vomiting during or after anesthesia was found to be significantly related to the development of aspiration pneumonia. The risk of developing this type of post-anesthetic complication should not be used as a reason to withhold appropriate analgesia, but instead as a discussion point between veterinary caregiver and client about potential dangers of anesthesia as well as risks and benefits of providing appropriate analgesia. There has been question as to whether or not pharmacological intervention could help prevent these anesthetic sequelae. At present, the ASA does not recommend preoperative use of gastric acid reducing medications and gastrointestinal motility stimulants in human patients without significant risk for aspiration. The efficacy of using these agents is clinically less than desirable anyhow. When considering a canine population, a loading dose of 1 mg/kg of metoclopramide followed by a 1 mg/kg/h CRI reduced the risk of developing GER only by 54% in the 52 dogs undergoing orthopedic surgery (Wilson et. al, 2006). A lower dose of this drug was not found to be effective. Maropitant was found to prevent vomiting in dogs premedicated with acepromazine and hydromorphone, but there was no statistically significant reduction in the development of gastroesophageal reflux (GER) in these patients (Johnson, 2013).

**PREMEDICATION = OPIOID + SEDATIVE!**

## The Sedatives

Phenothiazines (acepromazine): alpha-1 antagonist, dopamine antagonist. Good sedation but no analgesia, non-reversible, long acting (4-12h). Hypotension commonly seen and often responds well to fluid bolus(es). Caution for use in patients who will not tolerate hypotension or fluid boluses, i.e. renal disease, hepatic disease, cardiac valvular regurgitative disease, risk of hemorrhage and/or coagulation/clotting disorders. Additional information: anti-emetic effects, anti-histaminic, reduces MAC inhalant significantly (approx. 30%).

Alpha-2 Agonists (dexmedetomidine): alpha-2 agonist. Profound sedation, but may be over-ridden by high sympathetic drive (i.e. stimulation, pain). This drug is short acting and reversible with atipamazole. Mild analgesia provided, but use additional agents for if procedure is painful or wish to decrease dose of dexmedetomidine required. Initial profound peripheral vasoconstriction with a reflex bradycardia is seen. This response results in a decrease of cardiac output by up to 30-50%, even at low doses. Current recommendations preclude the use of anti-cholinergic drugs in this situation (hypertension with reflex bradycardia), as cardiac index may decrease. Consider patient stability and if stable, benign neglect or partial reversal may be an appropriate. First- or second-degree atrioventricular block may also be seen with use of this drug. Because of the cardiovascular effects, this drug should be used with caution in patients who will not tolerate bradycardia, hypertension, or decreased cardiac output/poor perfusion. This

may include those with renal disease, hepatic disease, cardiac disease, etc. Remember, the high blood pressure seen in these patients is mainly attributable to the intense vasoconstriction, not good perfusion!

Benzodiazepines (midazolam, diazepam): Midazolam is a water-soluble formulation, so may be administered either IM or IV, whereas diazepam is produced in a propylene glycol-containing solution for solubility and thus should only be given IV if possible. These drugs enhance inhibitory neurotransmitter GABA at the GABAa receptor, thereby creating sedation and muscle relaxation without analgesia. Of all of our sedative options, this family of drugs causes the least cardiovascular disturbance. However, it is also important to note that it also provides the least predictable sedation. Young, healthy dogs and cats often simply become disinhibited when given these medications and may even exhibit excitement and/or aggression, so select your patient carefully! Benzodiazepines are competitively reversible using flumazenil. However, be sure to use caution in reversing patients with a seizure history in case you need to re-administer this class of drugs.

## The Opioids

Pure mu agonists (morphine, hydromorphone, oxymorphone, fentanyl, methadone, etc.): This class of drugs is amongst the most important in our tool box for pain management. They provide excellent analgesia, along with side effects such as hypoventilation, panting, constipation, vagally-induced bradycardia. However, their effect directly on the cardiovascular system is minimal. All pure mu agonist opioids have a linear relationship with MAC inhalant sparing, i.e. the more pure mu agonist, the less inhalant you will need to use. Morphine may cause histamine release resulting in hypotension +/- reflex tachycardia, so use cautiously in patients where this is a concern. This issue may be minimized by giving this medication IM for your pre-med and/or diluting the morphine and giving it IV slowly.

Partial mu agonists, kappa antagonist (buprenorphine): long-acting drug (4-8h) with mild to moderate analgesia provided. This drug binds the opioid receptor very tightly, so reversal with an opioid antagonist or deciding to change over to pure mu agonist will be difficult. SLOW onset of action despite route of administration, about 30 minutes. Buprenorphine can be administered oral-transmucosal in cats due to their alkaline salivary pH. Use of this drug in large dogs may be cost prohibitive, and only advisable for mild levels of pain in this species.

Kappa agonist, mu antagonist (butorphanol): Short-acting opioid with good sedation and mild analgesia. This drug is not appropriate for orthopedic or severe pain, as it demonstrates a ceiling effect for both analgesia and respiratory depression.

Transdermal fentanyl patch: many limitations, including cost, potential for human abuse, variable absorption both between patients and within a single patient at various time

points, and prolonged onset time (12-24h). Since the fentanyl is released with heat, it is recommended that these patches be placed only after the procedure to avoid concerns of accidental overdose while using intra- and post-operative external heating devices.

A note on feline drug-related hyperthermia: a multi-factorial moderate, self-limiting hyperthermia (106F, 5h) may be seen in cats administered opioids (hydromorphone, morphine, butorphanol, buprenorphine) as well as ketamine. No morbidity resulting from the hyperthermia has been seen in cats studied. Maximum temperature seems to be inversely proportional to cat temperature at extubation (Posner, 2007 & 2010).

## The Pre-Med Adjuncts

Anti-cholinergics such as atropine and glycopyrrolate should be used on an "as needed" basis instead of a regular part of the protocol. These considerations should include high vagal tone (i.e. chronic vomiting, brachycephalic), a pediatric patient (neonates are dependent on heart rate instead of contractility to maintain blood pressure). If one drug is to be selected, glycopyrrolate has a longer duration of action and does not increase sedation since it can NOT cross the blood brain barrier. However, the current cost of this drug makes in unavailable to many practitioners. Use of anti-cholinergics to mitigate to bradycardia seen with dexmedetomidine administration is controversial (Congdon, 2013).

Maropitant, trade name Cerenia, is a very effective antiemetic. The data on its analgesic effects, however remain equivocal. So, this medication can be used to help prevent vomiting associated with pre-anesthetic medication. Note: it is important to give this medication about 1h prior to pre-meds to achieve these effects. However, prevention of vomiting has not been found to decrease GER in canine patients so concerns about passive regurgitation and possible aspiration should still be taken into consideration with patient management (Johnson, 2013).

NSAIDs should be a part of every anesthetic protocol unless there is a specific contra-indication. These contra-indications include history of gastrointestinal upset and/or ulceration, significant renal/hepatic disease, clotting/coagulation disorders, use of steroids or another NSAID, etc. Inflammatory pain is best managed pre-emptively as despite the route of administration, all NSAIDs have an onset of action time of about 1h. NSAIDs can be given ahead of an anesthetic procedure (i.e. at time of premed) unless there are concerns of dehydration/hypotension, renal disease, or hemorrhage in which case administration of this class of drugs may be best after anesthetic recovery once patient blood pressure and fluid volume has been normalized.

## Summary

Keep in mind that nothing in anesthesia and analgesia is absolute, this is as much art as it is science!

There may be multiple appropriate choices, especially if the patient is healthy. The main goal is to avoid specific CONTRAINDICATIONS when selecting an patient protocol whenever possible. Most anesthetic cases can be performed successfully at your practice with careful attention to detail in order to recognize potential areas of concern and consideration ahead of time, along with proper preparation and planning. In cases where specific work-up, monitoring, or post-procedure care is of concern - referral of a case to an Anesthesiologist may also be an option.

## References and further reading


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