



Practical Small Animal Anesthesia

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Big Picture

Anesthesia Protocols:

- Premedications
- Induction
- Maintenance

Monitoring:

- Temperature
- Pulse
- Respirations
- Machines:
 - ECG
 - Pulse Ox
 - Blood pressure
 - Capnograph

Complications

- Hypothermia
- Hypotension
- Bradycardia
- Tachycardia



Field Anesthesia

Stages Of Anaesthesia

- **Stage I: the stage of analgesia.**
- **Stage II: stage of excitement.**
- **Stage III: surgical anaesthesia.**
- **Stage IV: stage of impending respiratory and circulatory failure.**
(Medullary Paralysis)

Premedications

Reason for use:

- To smooth induction and recover
- Relax, sedate, and provide chemical restraint
- Decrease amount of drug requirements*
- Decrease adverse drug requirements



Premedications - Opioids

- Butorphanol
 - 0.2–0.4 mg/kg IM, IV, SC q 1–4 hr
 - Good sedative for neonates, geriatrics, respiratory cases
 - Short acting - 45-60 mins
 - **Poor pain control**
 - **Kappa-agonist/Mu-antagonist;**

- Butorphanol will block effects of full mu agonists and thus can be used as a partial reversal agent



Premedications - Full Mu Opioids

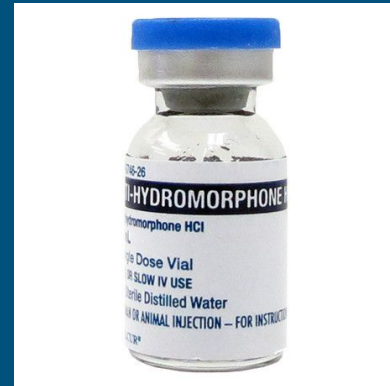
Morphine

- 0.25–0.5 mg/kg SQ, IM, IV q 2–4 h
- Good pain control
- Panting, vomiting, hypersalivating
- Careful with Mast cell tumors
- Full reversal with naloxone, partial reversal with butorphanol



Hydromorphone

- 0.05–0.1 mg/kg IV q 2–4 hr
- Good pain control
- Panting, vomiting, hypersalivating
- More potent, faster acting
- Partially reversed with butorphanol, or naloxone can be titrated to effect



Premedications - Opioids

- Buprenorphine

- At mu receptors, buprenorphine binds with a very tight affinity, contributing to a slow onset (1 hr) and a long duration of analgesic action (up to 24 hours)
- Buprenorphine can block the effects of other mu agonists, depending on dose, because of its high receptor affinity
- Reversal of buprenorphine by naloxone may not be complete and may require higher doses and repeat dosing

Opioids

- Dogs

- 0.01–0.04 mg/kg IM, IV, SC q 4–8 hr
- Mild to moderate pain control
- Can be cost prohibited

- Cats

- 0.01–0.02 mg/kg IM, IV, SC q 4–8 hr
- Moderate to high pain control
- 24 hour product now available

Premedications - Alpha 2 Agonist

- Alpha 2 agonist
 - Sedation, analgesia, anxiolytic
 - **Injectable anesthesia when combined with ketamine**
 - Great in combination with other premeds
- Side effects:
 - Cardiac and respiratory depression
 - Bradycardia***
 - Peripheral hypertension initially then hypotension
 - Difficult catheter placement

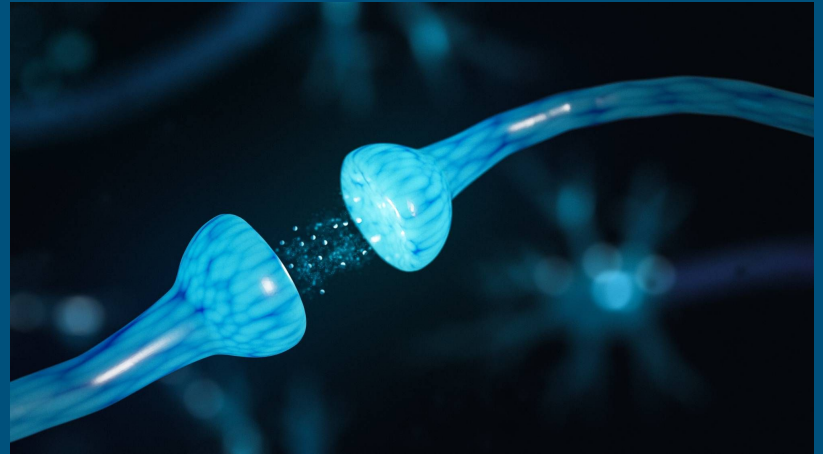
Xylazine: 0.5-2 mg/kg IM/IV

- Great PM that can be used in wide variety of animals
- Can be used to induce vomiting in cats
- Hypersalivation
- **Reversal - Yohimbine (0.1–0.2 mg/kg IV)**
 - Transient CNS excitement
 - Muscle tremors
 - Salivation

Premedications - Alpha 2 Agonist

Dexmedetomidine: 5-10 MICROg/kg SQ/IM/IV

- 150 times more potent than xylazine
 - Primarily for healthy cats and dogs
 - Initial hypertension followed by hypotension is common
 - Can be startled out of sedation with loud noises
 - Don't use in hypovolemic animals
- BRADYCARDIA*
 - **Do not** routinely give atropine with dexmedetomidine
 - **Reversal - atipamezole**
 - Give IM except if emergency then can give IV



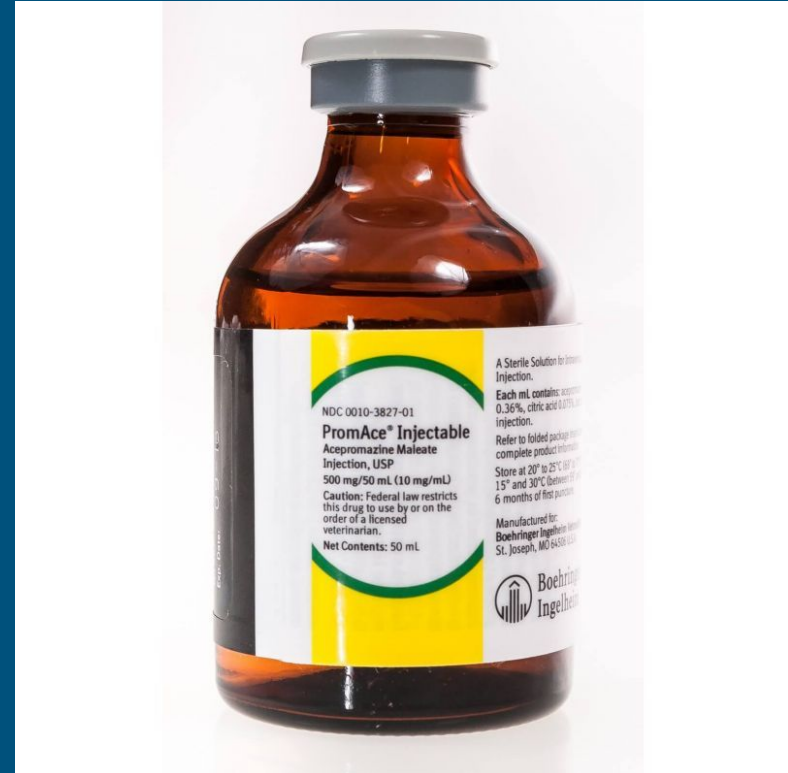
Premedications

- Benzodiazepines
 - Gaba agonists
 - Anti-seizure activity
 - Muscle relaxation
 - Don't use alone - Euphoria
 - Minimal CV activity
 - Good for geriatric, debilitated, or patient with history of seizures
 - Do not use in healthy/anxious cats
 - Midazolam - SQ, IM, IV
 - Diazepam - IV only



Premedications

- Acepromazine “Ace”
 - Central antagonist of dopamine (D2) and histamine (H1) receptors
 - Calming
 - Potentiates other drugs
 - Tranquilization - smoother recovery
 - Vascular relaxation
 - Hypotension***
 - Avoid use with cardiac disease
 - No direct pain control but great in combination with opioids



Premedications

NMDA Dissociative -

- Interrupts neurotransmission of thalamocortical and limbic areas
 - Muscle tone and eye reflexes still present
 - Chemical restraint
 - Poor muscle relaxation
 - Poor recovery
- Examples:
 - Ketamine
 - Telazol (zolazepam and tiletamine)
 - Dissociative plus benzodiazepine
 - More potent than ketamine

Ketamine

- Wide use - almost any animal species
- Wide margin of safety
- Works well when combined for Injectable anesthesia
 - Most commonly combined with alpha-2 agonist and opioid



“Kitty Magic”

- Dexmedetomidine (500 MCG/ml)
- Butorphanol (10mg/ml)
- Ketamine (100mg/ml)

Mix in 1 syringe and give SQ, IM or IV

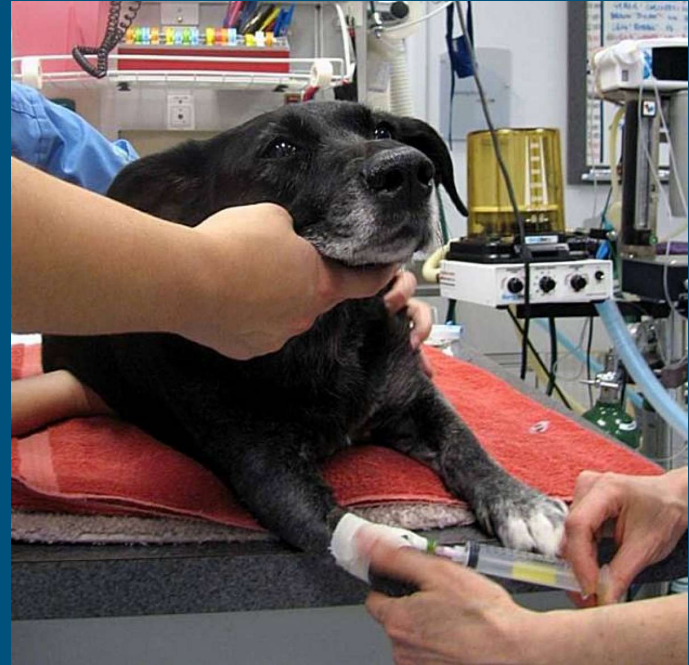
Typical 10lb cat = ~0.1-0.25ml of each

Veterinary anesthesia and analgesia support group “VASG”:

“DKT”(Dexdomitor/Ketamine/Torbugesic). This consists of dexmedetomidine 12.5-15 µg/kg, butorphanol 0.2 mg/kg and ketamine 5 mg/kg given IM. Many short surgical procedures (including OHE, castration, declawing, etc) can be completed without the need for additional induction agents or inhalant agents

Induction

- Propofol
- Telazol (zolazepam and tiletamine)
- Mask Induction
- Ketamine/Valium (diazepam) “Ket/Val”
- Alfaxalone
- Etomidate



Induction

Propofol

- Gaba agonist
 - 4-6 mg/kg IV only
 - Requires an IV catheter
 - Slowly give $\frac{1}{3}$ - $\frac{1}{2}$ dose and let it take effect
 - Monitor respirations and pulse
 - Apnea, cyanosis, bradycardia, hypotension
 - Narrow safety margin
 - Intubate and place on gas immediately
- Fast acting: ~15-45 seconds
 - Short duration: ~3-12 mins
 - Good for:
 - Critical patients
 - History of seizures
 - History of cardiac disease
 - Pregnant bitches
 - Can be used to stop uncontrollable seizures***



Induction

Telazol (zolazepam and tiletamine)

- 0.1ml/10lbs IV (100mg/ml)
- Gag reflex and jaw tone still present
- Usually given IV in dogs
- Works well in cats giving it IM or IV
 - Can be combined with opioid and alpha 2 agonist for injectable anesthesia
- Can result in rougher recoveries
- Avoid in patients with:
 - Cardiac disease
 - Seizures
 - Debilitated

- Blood pressure and heart rate maintained
 - Can be given with atropine if needed



Induction

Mask induction/“gas down induction”

- Common in pocket pets/exotics and birds
- Ideally after premeds in dogs and cats
 - Stressful if no premeds
- Extended excitation phase of anesthesia
- Avoid in patients with:
 - Cardiac disease
 - Seizures
 - Debilitated



Gas Maintenance

Isoflurane/Sevoflurane

- Gaba agonist
- Travels to spinal cord and brain to provide anesthesia/analgesia
- Dose dependent CV and Resp depression
 - Hypotension
- Narrow safety margin
- Tight control with vaporizer



Case Example -

24kg canine presenting for mass removal

- Premed administered intramuscular:
 - Dexmedetomidine 5 mcg/kg; 0.5mcg/ml (0.24ml)
 - Hydromorphone 0.1 mg/kg; 2mg.ml (1.2ml)
 - WAIT 20-30mins
 - Place catheter
- Induction Intravenous:
 - Propofol 4mg/kg (9.6ml)
 - Give $\frac{1}{3}$ - $\frac{1}{2}$ dose IV slow
 - Intubate
- Maintenance
 - Isoflurane



Case Example -

- Once procedure is over, turn off isoflurane and allow for 3-5 minutes of pure oxygen
- Watch for patient to swallow at least 2-3 times before extubating
- Continue to monitor TPR until patient is ambulatory



Special Considerations

- Brachiocephalics
- Cardiac Disease/Murmur
- Seizures
- Geriatric

1. Opioid + Benzodiazepine IM or IV
 - a. Butorphanol and midazolam
2. Pre-oxygenate 5-10 minutes
3. Dose propofol to lowest effect
4. Keep as low as possible on gas
5. Post-oxygenate for 5-10 minutes
6. Delayed extubation





Field Anesthesia

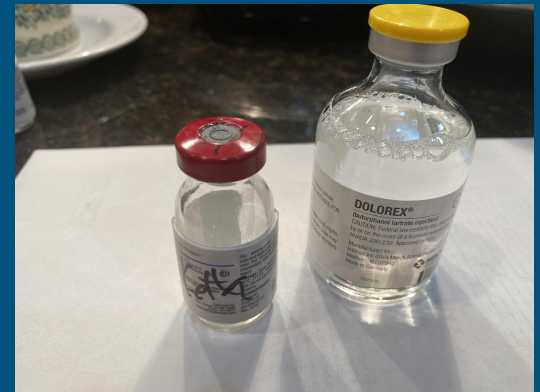
Field Anesthesia - Dr Dickson and Benjamin's protocol

- Give the following IM to a 15-35kg dog
 - 1 ml of Ketamine (50mg/ml)
 - 1 ml of Xylazine 23.3% (233mg/ml)
 - (SQ) 1 ml of Atropine (0.54mg/ml)
 - ~10-15 minutes to take effect
- Provides ~30 minutes of anesthesia



Field Anesthesia - Dr Page's Cocktail!

- Premed:
 - Butorphanol (10mg/ml): 0.1 ml/10 lbs (0.1 ml/4.5 kgs) SQ
- Induction:
 - 10 ml bottle of Ketamine 100mg/ml
 - Add 2.5 ml 100mg/ml Xylazine
 - Ket/Xy mixture: 1 ml/20 lbs (1 ml/9 kg) IM
- Reversal:
 - Yohimbine
 - Small Dog/Cat – 0.25 ml IM
 - Medium Dog – 0.5 ml IM
 - Large Dog – 1 ml IM



Field Anesthesia - Protocol

- Premed SQ
 - Wait 10 minutes
- Induce with Ket/Xy IM
 - Wait 5 minutes - good plane of Anesthesia for 20-35 minutes
- Place tracheal tube in dogs to keep airway open
- Can redose if needed...**WAIT 90 SECONDS** after giving injection ***
 - Cats: 0.1-0.2ml more IM
 - Dogs 0.5 ml more IM



Cat Neuter!

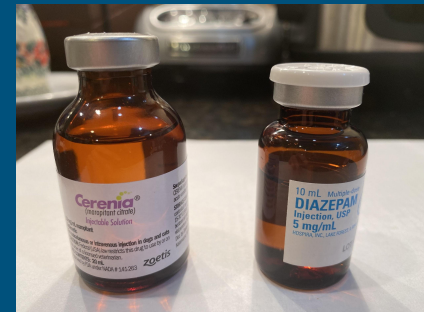
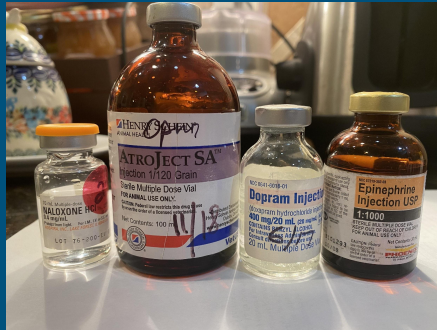
- Ketamine
- DexDormitor
- Butorphanol



- 0.15 ml/ 10 lbs (0.15 ml/ 4.5 kg) of each mixed together and given IM
- Reversal is Antedan - give the same amount of the Dormitor given IM – can use Yohimbine as well.

Emergency drugs to have on hand:

- Atropine (0.54mg/ml)
- Epinephrine (1;100)
- Dopram (20mg/ml)
 - 1 cc IV big dog
 - 0.5 cc IV medium dog
 - 0.25 cc small dog
- Cerenia (Maropitant) – if nauseous
 - 1 cc/10 kg SQ
- Atropine –for drooling/bradycardia
 - 1 cc/ 10 lbs (1 cc/4.5 kg) SQ
- Diazepam – for seizures - (5mg/ml)
 - 1 cc IV big dog
 - 0.5 cc IV medium dog
 - 0.25 cc small dog



Importance of Fluids

- Maintain blood pressure
- **Perfuse tissues/kidneys*****
- 5ml/kg for dogs
- 3ml/kg for cats

Caution:

- Edema
- Pulmonary dysfunction
- Fluid overload

SQ fluids - do not help maintain blood pressure and can contribute to hypothermia unless warmed



Important Considerations

Hypothermia

Hypotension

Bradycardia

Tachycardia



Hypothermia

Typically temperature < 97.0 F/36.0 C

Suppression of the CNS that inhibits body to thermoregulate

Severe temperatures can cause bradycardia

Shift of blood from core to periphery

Metabolism decreases which causes:

- Decreased drug metabolism
- Longer drug effects
- Delayed extubations and recover times

Remember it is much easier to prevent hypothermia than to rewarm an anesthetized, hypothermic patient





Hypotension

1. Turn down gas anesthesia
2. Give fluid bolus
3. Reverse drugs if applicable
4. Administer vasopressin

TABLE 1.

Normal Arterial Blood Pressure Values in Adult Dogs & Cats⁵

BLOOD PRESSURE VALUES	DOGS	CATS
Systolic arterial pressure	90–140 mm Hg	80–140 mm Hg
Diastolic arterial pressure	50–80 mm Hg	55–75 mm Hg
Mean arterial pressure	60–100 mm Hg	60–100 mm Hg

Bradycardia

- HR <100 in cats/small dogs;
- HR <60 in medium-sized dogs
- HR <50 in large dogs.



- Too deep plane of anesthesia
 - Turn down vaporizer
- Drug induced
 - If due to dexmedetomidine -
 - Reverse with atipamezole
 - If another drug or reversal is not improving
 - Give atropine

If the patient's body temperature is <35°C (95 F), it may not respond to administration of atropine

Tachycardia

- HR >220 in cats
- HR > 180 in toy breed dogs
- HR >160 in small-medium dogs
- HR >140 in large dogs.



- Preanesthetic fear and anxiety
 - Predmed to relax
- Plain of anesthesia too light
 - Observe for other signs of anesthetic plane
 - Increase vaporizer if needed
- Drug induced
 - Atropine*** usually maxes out around 200BPM
- Ventricular tachycardia
 - Treat with lidocaine 2%

2–3 mg/kg IV bolus over 5 sec. Total dosage not to exceed 8 mg/kg. Repeat in 2–3 min if first dose unsuccessful; final dose after 2–3 min prn. Use cautiously with patients with concurrent atrioventricular block

SUMMARY



Have a primary protocol with a few variations

Get comfortable with medications and what to expect

Drugs that are reversible preferred

Keep it straightforward and simple



TPR vitally important for any anesthetic procedure

Know how to correct common problems:

Hypothermia

Bradycardia

Tachycardia

Hypotension



Resources

VASG - <http://www.vasg.org/>

AAFP Guidelines

AAHA - Anesthesia and Monitoring Guidelines
for Dogs and Cats



