



# Anesthesia Monitoring

Anne Arundel Veterinary Emergency Clinic

# Pre-Anesthetic Evaluation Prep



- **Laboratory Testing: At least PCV / TP, BUN, & GLU**
- **Intravenous Catheterization (Cephalic Vein Ideal)**
- **Stabilization with intravenous fluids**
- **Blood Transfusion (if necessary)**
- **No food prior to surgery**
- **Water should be pulled prior to pre-medication**
- **Auscultation for heart murmurs, abnormal heart rhythm and lung sounds.**

# Pre-Medication



**A great pre-med can help induction run more smoothly.**

**Most popular is a sedative + an opioid which provides better restraint and pain control.**

**Some pre-medications are given preemptively to avoid complications during the procedure, such as Atropine to prevent bradycardia.**

## **ACEPROMAZINE**

- **Mild Sedation, Anti-arrhythmic**
- **Prior to Induction: 20 mins IV, 30 – 45 minutes IM, 60 mins SQ**
- **Precautions: Hypotension, Decreased Seizure Threshold**
- **Inexpensive**

# Pre-Medication



## **DIAZEPAM or MIDAZOLAM (Controlled)**

- **Minor Tranquilizer, Muscle Relaxant, Controls Seizures**
- **Prior to Induction: IV, IM, SQ (IM irritates tissue more than other routes) Works quickly**
- **Precautions: Cardiopulmonary Depression, May cause excitement phase**

## **MORPHINE (Controlled)**

- **Analgesic (Removes Pain), diminish cough, decrease diarrhea**
- **Given: IM or SQ, IV if in a CRI or given extremely slow**
- **Precautions: Bradycardia, Hypotension, Hypoventilation, Apnea, Vomiting, may elevate cats body temperature**

# Pre-Medication



## **HYDROMORPHONE (Controlled)**

- Analgesic and for chronic coughs
- Prior to Induction: IV 10 minutes, IM & SQ 30 minutes
- Precautions: Bradycardia, Nausea, Vomiting, Panting, Drooling

## **FENTANYL (Controlled)**

- Analgesic and Sedative
- Given: IV Short Onset and Short Duration, Best in CRI
- Precautions: dry mouth, hypoventilation, urinary retention

## **BUPRENORPHINE (Controlled)**

- Analgesic
- Given: IV Short Onset
- Precautions: Panting, drowsiness, and rarely, hypoventilation

# Pre-Medication



## **BUTORPHANOL (TORB) (Controlled)**

- **Anti-tussive, Short Acting Pain Control**
- **Prior to Induction: IV or IM**
- **Precautions: Excitement phase, lack of appetite, Diarrhea, Minimal cardiovascular and respiratory effects**

## **ATROPINE**

- **Anticholinergic : To prevent Bradycardia, prevents drooling**
- **Prior to Induction: IV, IM or SQ**
- **Precautions: Tachycardia, dry mouth, dry eyes, never used in glaucoma patients, excessive drinking**

# Induction



Induction is the administration of a drug or combination of drugs immediately prior to intubation to induce general anesthesia.

## **KETAMINE (Controlled)**

- **Rapid Acting – Within 1 minute IV**
- **Causes unconsciousness and muscle relaxation**
- **Precautions: Tachycardia, Hypertension, hypersalivation, Rough Recovery, Hallucinations**

## **TELAZOL (Controlled – Fridge)**

- **Deep Sedation**
- **IV or IM (Painful IM)**
- **Precautions: Hypersalivation, delirium**

# Induction



## PROPOFOL

- **Rapid Onset & Short Duration (Given to effect)**
- **Produces anesthetic depth long enough to allow intubation**
- **Precautions: Apnea (Holding Breath), Bradycardia, Be careful not to give too quickly**

## ISOFLURANE INHALANT AGENT

- **General Anesthesia (Via ETT)**
- **Patient should be pre-oxygenated for at least 3 minutes prior to induction. Especially brachycephalics and cats.**
- **Precautions: Bradycardia, Hypoventilation, Hypotension**



# Antibiotics



## **CEFAZOLIN**





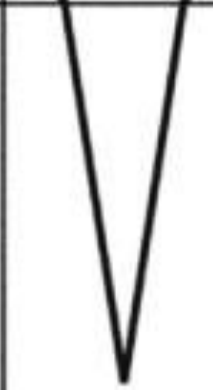



- **IV administration, slowly,**
- **Protection against bacterial infection prior to surgery and every 1 ½ - 2 hours during the procedure.**
- **Precautions: Vomiting, Diarrhea**

## **UNASYN (Ampicillin – Sulbactam)**

- **Antibacterial combination, sometimes called “Injectable Clavamox”**
- **Give slowly over 10 minutes**
- **Precautions: Diarrhea**

# Depth of Anesthesia



| Anesthetic level   | Reaction to surgical stimulation | Muscle tone (jaw)  | Palpebral reflex | Eye and pupil position  | Ventilatory rate       | Heart rate |
|--------------------|----------------------------------|--|------------------|---|------------------------|------------|
| Stage I            | +                                |   | +                |    | N                      | N          |
| Stage II           | +                                |   | +                |    | ↑                      | ↑          |
| Stage III<br>Light | ±                                |  | +                |    | N ↑                    | N ↑        |
| Medium             | -                                |  | -                |   | N ↓<br>Intercostal lag | N ↓        |
| Deep               | -                                |  | -                |  | Abdominal slow shallow | ↓↓         |
| Stage IV           | Ventilatory and cardiac arrest   |  |                  |   |                        |            |

# Oxygenation Parameters



| VARIABLE                    | CANINE   | FELINE   |
|-----------------------------|----------|----------|
| SpO <sub>2</sub> (Pulse Ox) | 95 - 100 | 95 - 100 |
| PaO <sub>2</sub>            | 100      | 100      |

**SpO<sub>2</sub>** is the percentage of oxygen-saturated hemoglobin and indicates how well the lungs are delivering oxygen to the blood.

**Low SpO<sub>2</sub>** may mean a cardiovascular or respiratory problem is present. If a Reading falls lower than 90% hypoxia is occurring. Cyanosis only becomes Apparent after values drop below 85%.

**Pulse Oximetry** measures SpO<sub>2</sub> and heart rate simultaneously. The machine Can fail if tongue is not moist or needs to be repositioned. Adjust this first.

**Mucous Membrane (MM) Color** sometimes can tell you there is a shortage of oxygen in the tissues. Purple/Blue indicate cyanosis.

# Circulation Parameters



| VARIABLE                     | CANINE      | FELINE      |
|------------------------------|-------------|-------------|
| Heart Rate                   | 80 -140     | 100 -180    |
| Systolic Blood Pressure      | 90 - 140    | 90 - 140    |
| Diastolic Blood Pressure     | 60 - 90     | 60 - 90     |
| MAP (Mean Arterial Pressure) | 70 - 90     | 70 - 90     |
| CRT (Capillary Refill Time)  | < 2 Seconds | < 2 Seconds |

**Bradycardia** (Low HR) may indicate patient is too deep. Reassess your isoflurane.

**Tachycardia** (High HR) may indicate patient is too light or painful, or perhaps it can be in response to surgical stimulation. Reassess your isoflurane and pain management.

**Pulse Rate** should be strong and coordinate with heart rate, you can feel for a femoral, carotid or dorsal pedal arteries for a pulse.

**Prolonged CRT** can occur in hypotensive (Low BP) patients or from poor perfusion

# Ventilation Parameters



| VARIABLE                  | CANINE  | FELINE  |
|---------------------------|---------|---------|
| Respiratory Rate          | 8 - 16  | 12 - 24 |
| End Tidal CO <sub>2</sub> | 35 - 45 | 35 - 45 |
| Tidal Volume (ml/kg)      | 10 - 15 | 10 - 15 |
| PaCO <sub>2</sub>         | 35 - 45 | 35 - 45 |

**Hypoventilation** (Low RR) or **Hypercapnia** (High EtCO<sub>2</sub>) may indicate patient is too deep. Reassess your isoflurane.

**Hyperventilation** (High RR) or **Hypocapnia** (Low EtCO<sub>2</sub>) may indicate patient is too light or painful, or perhaps it can be in response to surgical stimulation. Reassess your isoflurane and pain management.

**Manual Ventilation** may be needed throughout various points of the procedure to maintain appropriate ventilation and prevent apnea.

# Other Parameters



| VARIABLE                 | CANINE   | FELINE    |
|--------------------------|----------|-----------|
| Body Temperature         | 98 - 102 | 98 - 102  |
| Hematocrit (HCT)         | 35 - 59  | 28 - 47   |
| Total Protein (TP or TS) | 5 - 8.3  | 5.9 - 8.4 |
| Blood Glucose (BG)       | 90 - 150 | 90 - 150  |

**Hypothermia** (Low Temp) can happen due to anesthesia and precautions should be taken to prevent hypothermia from occurring. Using the Bair Hugger system and Heated Water Blanket will help maintain temperature. Loss in body heat will occur in the first 20 minutes.

**Other Ways to Maintain Temp:** Warming IVF, allowing Bair Hugger to pass around the ETT, covering any exposed limbs with towels and blankets.

**If CRT is prolonged and MM is paler** than it was before the procedure started test a PCV/TS (TP), if low you may need to start a transfusion.

# Post Operative Pain



1. **Continue Pain Management via Constant Rate Infusion**
2. **Sometimes give a SQ NSAID like Carprofen**
3. **Cold Compresses**
4. **Sling Walks when necessary, especially any orthopedic procedures.**
5. **Acepromazine to help relieve anxiety after waking up from surgery.**

**Monitor your patient's pain well after the surgery. If they stand hunched unable to get comfortable, if they are vocal or excessively panting long after the procedure as ended please notify your DVM.**

# Recovery



- **Maintain body temperature**
- **ETT must stay in place until the dog has 2-3 strong swallows, longer for brachycephalic breeds**
- **Deflate the cuff only after you have transported the patient to their cage where they will be extubated. Patients may regurgitate during recovering and we don't want them to aspirate.**
- **Continue to monitor vitals every hour for the next 2-3 hours.**
- **Be sure to clip your patient's nails while they are still sedated**