# Anesthesia Review

- Anesthesia and Analgesia textbook
- McCurnin's Chapter 29: Veterinary Anesthesia

# Anesthesia - Terms

- **Analgesia**: pain relief.
- **General anesthesia**: unconsciousness and insensibility to feeling and pain induced by administration of anesthetic agents (given alone or in combination).
- **Local anesthesia**: loss of sensation in a localized body part or region induced by administration of a drug or other agent without the loss of consciousness.
- **Premedication**: administration of an agent(s) before induction of general anesthesia to: calm/relax the patient, ease induction + recovery, minimize adverse effects, reduce amount of general anesthetic, muscle relaxation, pain control.



# Anesthesia – Terms

- **Sedation**: state of calm or drowsiness.
- **Tranquilization**: state of relaxation and reduced anxiety.
- **Neuroleptanalgesia**: state of profound sedation and analgesia produced by simultaneous administration of an opioid and a tranquilizer.
- **Drug-based anesthetics**: liquid agents injected into the patient (or applied to a specific area – “local”) to induce anesthesia (“general”).
- **Inhalant anesthetic**: liquid agents vaporized in oxygen and administered via an anesthetic breathing system.



# Patient Preparation

- Due to risk of nausea/vomiting caused by anesthetic agents, patients **must be fasted** prior to anesthetic procedures.
- **Dogs and cats**: withhold food for 8 – 12 hours prior, water for 2 – 4 hours. **Note**: Neonates and patients <2kg should NOT be fasted due to risk for hypoglycemia.
- **Full patient history** must be obtained.
- **Complete physical exam** must be performed: note ANY and ALL abnormalities to the veterinarian.
- **Diagnostic testing** (at least CBC/Chem) should be performed.
- **Do not** preemptively write up the anesthetic protocol for a patient. Always consult with the veterinarian.



# Protocol

- Anesthetic protocols will differ by veterinarian and procedure type. Consult before calculating a protocol for your patient.
- **Considerations**:
  - **Estimated length of procedure**
  - **Patient age**: neonates, geriatric
  - **Diagnostic testing results**
  - **Patient's demeanor**: fractious, stoic, anxious
  - **Body condition score (BCS)**: obesity, cachexia
  - **Breed and species**: Sighthounds, brachycephalic
  - **Overall patient health**: high or extreme disease/risk factor such as GDV, head trauma, organ failure, sepsis, internal hemorrhage/rupture



# Common Pre-medications

- **Buprenorphine (Buprenex)**: partial agonist opioid; analgesic and sedative. Effective in cats.
- **Butorphanol (Torbugesic, Torbutrol)**: mixed agonist-antagonist opioid; analgesic, sedative, and cough suppressant. Effective in dogs when combined with Acepromazine.
- **Hydromorphone**: agonist opioid; analgesia. Can cause vomiting, nausea, hypersalivation, shivering.
- **Naloxone**: Reversal agent for opioids – have in stock! NOT given as a pre-med, but rather, to reverse adverse effects of opioids.
- **Acepromazine**: sedation ONLY. Cannot be reversed – use with caution, especially in patients with seizure history. Used as a pre-med only when combined with analgesic medications such as Butorphanol

# Anesthetic Agents

- **Alpha-2 Agonists**:
  - Often used for short, minimal procedures or in **DKT** combination for fractious feline patient induction.
  - Cause sedation, analgesia, and muscle relaxation.
  - Side effects: severe bradycardia, hypotension, cardiac arrhythmia, possible heart block.
- **Examples**:
  - Dexmedetomidine (DexDomitor), reversed with Atipamezole (Antisedan).
  - Xylazine, reversed with Yohimbine.



# Anesthetic Agents

- **Propofol**:
  - Ultra-short-acting IV anesthetic: quick induction, quick recovery.
  - High end dose: 6mg/kg. Do not give entire dose IV: give enough to intubate ("to effect").
  - Can cause transient excitement and apnea.
- **Ketamine-Diazepam ("Ket-Val")**:
  - IV anesthetic combination = 1:1 volume ratio.
  - Give entire dose IV slowly.
  - Quick induction; prolonged recovery.
  - Can cause hypersalivation and muscle tremors.



# Controlled Drugs

- Some pre-meds and anesthetic agents are controlled substances, but NOT all anesthetic drugs are considered controlled drugs. Ex: alpha-2 agonists and Propofol do not needed to be logged.
- The Controlled Substance Log in the hospital MUST include:
  - Date, owner's and patient's names, and address (or identification number), starting volume, ending volume, amount used, and initials/signature of the person who removed the drug from inventory.
- The following veterinary drugs MUST be logged:
  - Hydromorphone, Morphine, Buprenorphine, Butorphanol, Ketamine, Fentanyl, Phenobarbital, Pentobarbital (Euthanasia solution), Diazepam (Valium), Telazol, Hydrocodone.



# Anesthetic Equipment

- **Endotracheal tubes**: placed inside the trachea of an unconscious patient to administer oxygen and inhalant anesthetic to the patient.
- **Laryngoscopes**: facilitate the placement of the endotracheal tube; also allow for full oral cavity and throat exam.
- **Masks**: used to administer oxygen and inhalant anesthetic to patients that are NOT intubated.
- **Anesthetic (Induction) Chambers**: solid, see-through boxes used to induce general anesthesia in fractious patients.
- **Anesthetic Machine**: delivers oxygen and inhalant anesthetic agents to patient (general anesthesia).
  - LEAK TEST the machine every day prior to use!

# Intubation

- Occurs after IV, IM or mask induction: have all supplies ready!
  - **3 ET tubes** (1 of the ideal size, 1 smaller, 1 larger), **roll gauze** to tie in tube, **gauze sponge** to grasp tongue, cuff inflation **syringe** (empty 6ml – 12ml), **laryngoscope** with appropriate sized blade, 0.1ml syringe of **Lidocaine** for feline laryngospasm (NO needle!).
- Size choices:
  - **Cats**: 3.0 – 4.5mm
  - **Most small dogs**: 5.0 – 6.5mm,
  - **Most medium dogs**: 6.5 – 8.0mm,
  - **Most large dogs**: 8.0 – 11.0mm
  - **Brachycephalic** and **obese** patients: Always choose a smaller tube than you would feel is appropriate.



# Intubation

- Intubate gently, do not overinflate the cuff, and verify the tube is not advanced too far past the thoracic inlet.
  - Connect patient to anesthetic machine and turn on gas.
  - Verify proper placement via auscultation of both sides of chest.

- Inflate the cuff
  - Apply steady pressure to the reservoir bag while simultaneously filling the cuff slowly.
  - Stop inflating the cuff when you can no longer hear air escaping from the lungs around the tube.
  - Relieve pressure on the bag and make sure the pop-off valve is open.



# Intubation

- Possible Complications:
  - Patient is waking up.
  - Patient has a low pulse oximetry (hypoxia).
  - Patient is not breathing properly.
- Verify the ET tube is placed properly:
  - Measure the tube to verify it is not advanced too far down into one of the mainstem bronchi (auscultate for breath sounds).
  - Verify the tube is not too thin or too wide in diameter for the patient's throat size.
  - Verify the cuff is appropriately inflated.
  - Verify there is no air leaking from the anesthesia machine tubing into your patient = "leak check".

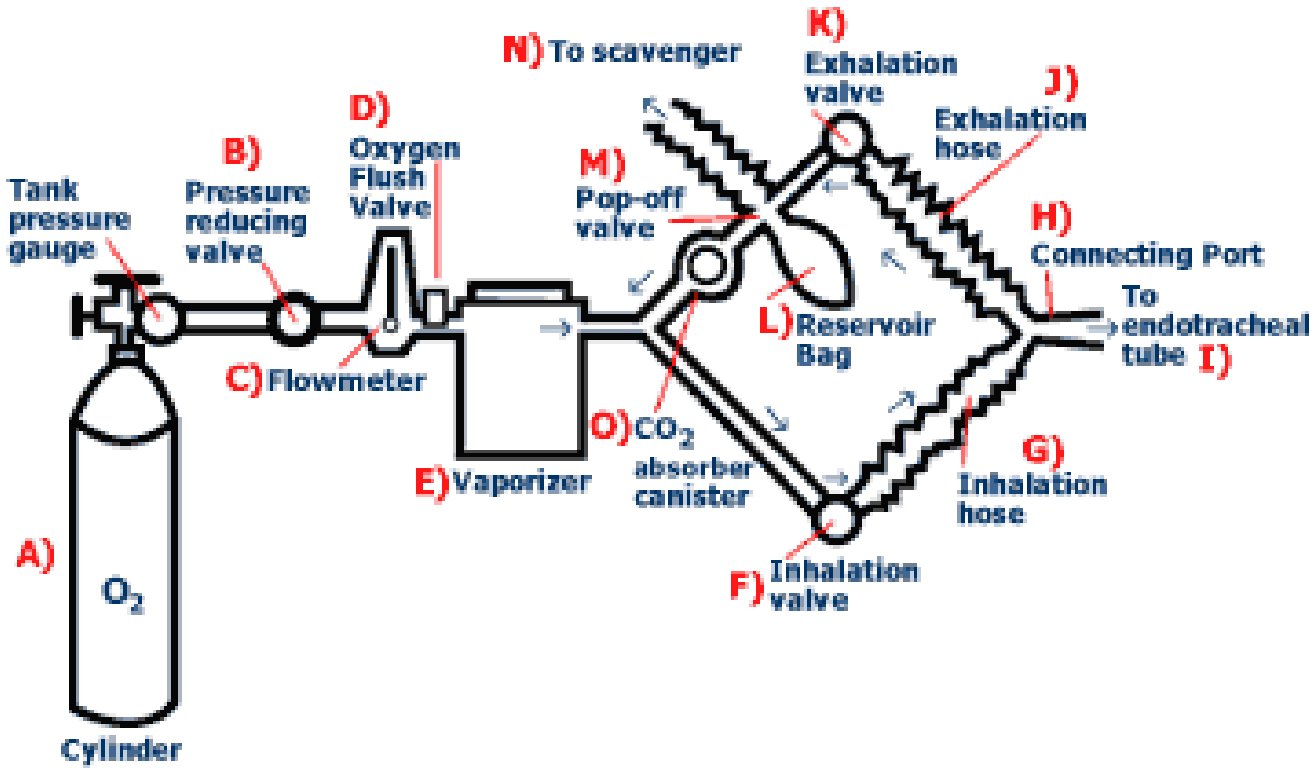


# Anesthetic Machines

- Parts of the machine:
  - **Oxygen supply**: can either be E- or H-tanks, or compressed air
  - **Oxygen flow meter** and **oxygen flush valve**
  - **Anesthetic vaporizer**: usually either Isoflurane or Sevoflurane
  - **Breathing circuit – rebreathing** (patients >7kg) or **non-rebreathing** (patients <7 kg)
  - **Pop-off valve**: keep OPEN unless manually "sighing" for patient
  - **Pressure manometer**: do not go above 20cm while "sighing"
  - **CO2 absorber/granules**
  - **Reservoir bag**: 1L (very small dogs/cats) – 5L (very large dogs)
  - **Scavenging system**: either a charcoal F-air canister (passive) or an outlet pipe into the ceiling or wall of the hospital (active).



# Anesthesia Machine




**Note**: Not all machines will be set up exactly the same way!

# Anesthetic Monitoring

- Most important piece of equipment is the monitoring technician and a stethoscope.
- **Vital Signs**:
  - **HR, RR, MM/CRT, EKG, EtCO2, SPO2, BP, Temp**. – do **NOT** rely on your monitors; always visually and manually check your patient.
  - Many vital signs will be lower or slower than normal due to anesthesia, but should not be dangerously so for extended time.
- **Check reflexes, eye position, and pupil size regularly**: refer to McCurnin's pgs. 1102 – 1112 for tables and ranges.



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