Understanding Your Clinic’s Recipes: High Volume Anesthesia and Analgesia

Emily McCobb DVM  MS DACVAA
Director, Tufts Shelter Medicine Program
Assistant Director, Center for Animals and Public Policy

Cummings School of Veterinary Medicine
Tufts University

PetSmart Charities North American Spay/Neuter Conference
August 15, 2014
Tufts Spay Neuter Teaching

- **JR spay dogs**
  - (low volume, intensely monitored)
- **Senior Surgery Elective**
  - 15 surgeries per day
- **HQ/HV clinic on Fridays**
  - “High volume”: 20-30 surgeries
- **Sunday Community Cats**
  - 60 to 80 cats
- **Pediatric Spay Neuter**
Goals

• Review basic mechanisms of actions
• Review combination protocols
• Review strategies for analgesia
Outline

• Protocols
  – Anesthesia
  – Analgesia
  – Consideration for pediatrics

• Combination Techniques

• Question and Answer
Patient Preparation

• Patient History and Owner Consent
• Fasting times
  – Adults: 6-12 hours
    • Feral Cats
  – Pediatrics
    • Feed small meal the morning of surgery
    • No more than 2 to 4 hours
  – Water is not withheld
Pre-op Physical Exam

- Assess attitude and temperament
- Identify high risk patients
- Accurate weight
  - if not a feral cat
- Cardiovascular fitness
- ABS/ABN
- Minimize stress
Consideration for Pediatrics

• Biggest dangers are hypothermia and hypoglycemia

• Lack fat and glycogen stores

• Susceptible to hypoxemia
Dos for Pediatric Patients

• Minimize surgery and anesthesia time
  – Limited reserves

• Keep them warm!
  – Warm water blankets
  – Hot Dog warmers
  – Bair Huggers

• Hand feed once awake
Protocols

• Drugs
  – Pre-medication
  – Anesthetics
  – Analgesics and other adjuncts

• Combination Protocols and Techniques
“Traditional” Anesthesia v. HQ/HV

- **“Traditional” Anesthesia:**
  - Pre-med, IV induction, intubation, maintenance on gas inhalant

- **Many Volume Settings:**
  - Pre-med and induction in single injection
  - Initial protocol is enough for surgery OR maintenance with TIVA/PIVA OR maintenance with Isoflurane
  - May or may not be intubating
Pre-Medication

- Decrease patient stress and facilitate handling
- Reduce amounts of induction and maintenance agents
- Smooth recovery
- Sometimes incorporated into induction
How to design a “pre-med”

- Sedative
- Analgesic
- +/- Anticholinergic
- +/- Chemical Restraint Agent
Drugs for Pre-Medication

- Analgesics (Opioids)
  - Morphine v. Hydromorphone
  - Butorphanol, buprenorphine

- Sedatives/Tranquilizers
  - Acepromazine
  - Alpha-2 Agonists
  - Benzodiazepines (generally not in HQ/HV)

- Anticholinergics
Analgesics: Opioids

• Used to provide preventative analgesia

• Also provide additional sedation
  – May cause excitement in cats

• Decrease MAC

• Available choices:
  – “pure” and “partial” agonists
Partial agonist/antagonists

• Butorphanol
  – Mu antagonist
  – Kappa agonist
  – Sedation, cough suppression, mild analgesia

• Buprenorphine
  – Partial mu agonist
  – Kappa agonist?
  – Moderate analgesia, minimal sedation
  – Minimal respiratory depression but “sticky”
Butorphanol

• Useful for:
  – Mild to moderate sedation
  – Partial reversal of pure agonists

• Not useful for:
  – Very painful procedures (unless very minimal)
  – More effective synergistically
Buprenorphine (as pre-med)

• Useful for:
  – Mild to moderately painful procedures
  – Stable patients
  – Varied routes: IV, IM, OTM…

• Not as useful for:
  – Sedation
  – Intra-op (slow onset, not titratable)
  – Severe pain
Pure Agonists

- Morphine, Hydromorphone
  - Mu agonists
  - *schedule II narcotics
  - Gold standard for analgesics

- * increased record keeping requirements, not ideal for the high volume setting
Pure opioid agonists

• Adverse effects:
  – Vomiting (non-painful patients)
  – Respiratory depression
  – Bradycardia
  – Ileus, constipation
  – Urinary retention
  – Excitation (cats)
  – Hypothermia, Hyperthermia (cats)
Sedatives and Tranquilizers

- Acepromazine

- Alpha-2 Agonists
  - *Dexmedetomidine*
  - *Xylazine*

- Benzodiazepines?
Acepromazine

- Phenothiazine tranquilizer

**Mechanism of action:**
- Depression of reticular activating system and anti-dopaminergic actions w/i CNS
- Depression of CNS and catecholamines

**Effects:**
- Calm patient
- Antiemetic (anti-dopamine)
Phenothiazines: Acepromazine

• Alter patient mood, calm patient
  – higher dose increases effect time and side effects
  – larger dose may be required in excited animals

• Useful effects:
  – antihistaminic, antiemetic, anxiolytic, sedation and chemical restraint
Acepromazine

• **Cardiopulmonary side effects:**
  – Vasodilation (α-1 adrenergic blockade) and decrease in BP
    • Treatment is IV fluids, phenylephrine, not epinephrine
  – May see reflex tachycardia
  – Dose dependent depression of myocardium and vascular smooth muscle
  – Antiarrhythmic effects
  – Mild respiratory depression
Acepromazine

• **Side effects:**
  – lowers MAC
  – hypotension
  – decrease seizure threshold?
  – splenic enlargement?
  – platelet effects
  – transient decrease in PCV
  – alters thermoregulation
Acepromazine

- Bottle dose is too high!
- Reduce dose by one half when giving IV
- Reduce dose for older patients
- “Big floppy” breeds very sensitive (Collies, Newfies, St. Bernards)
- Boxers very sensitive
Sedation/Chemical Restraint: Alpha-2 agonists

- Xylazine, dexmedetomidine, (medetomidine)
- Mech of Action: stimulate $\alpha$-2 adrenoceptors, causing central nervous system depression and a decrease in catecholamines
Alpha-2 Agonists

• Dose dependant sedation
• Analgesic effects
• Muscle relaxation
• Higher doses needed in excited patients
• Can cause vomiting
  – Especially higher doses
• Reversible (yohimbine, atipamezole)
  – Not always desirable to reverse!
Alpha-2 Agonists

- Very useful in combination with other agents (synergy)
- Profound MAC reduction (40 to 50%)
- **Adverse Effects:**
  - Profound cardiorespiratory depression
  - Vasoconstriction, biphasic blood pressure effect
  - Decrease cardiac output
  - Cardiac Arrhythmias
Anticholinergics

- Glycopyrrolate or Atropine
  - Glycopyrrolate: slower onset, lasts longer
- Mechanism of action:
  - Competitively antagonize acetylcholine
  - Act at parasympathetic postganglionic neuroeffector sites (muscarinic)
    - Sphincters
    - Smooth muscle
- Clinical Use
  - Prevent bradycardia or increase heart rate
  - Dry secretions
Anticholinergics

• Effects:
  – Speed heart rate (low doses cause bradycardia)
    • Raise BP and CO, HR × SV = CO
  – Dry salivary and respiratory secretions
  – Tighten lower esophageal sphincter
  – Decrease GI motility
  – Weakly anti-emetic
  – Pupillary dilation (atropine)
Anticholinergics

• Potential adverse effects:
  – Initial first or second degree AV block
  – Tachyarrhythmias:
    • sinus tachycardia, other untoward arrhythmias, increasing myocardial oxygen consumption
Atropine

• Crosses BBB, may cause CNS effects
• Rapid onset
• Drug of choice for CPR
Glycopyrrolate

• Synthetic, quaternary amine compound
• Does not cross blood brain barrier or placenta
• Slower onset, more gentle, drug of choice for most peri-anesthetic uses
• More potent than atropine

• Recently cost has skyrocketed…
Anticholinergics: Contraindications

- Tachycardia
- Cardiac disease
- Geriatric patients
- Prior administration of alpha-2
Discussion of Anticholinergic Use

- Not used routinely in many clinics
- Glycopyrrolate especially may be cost-prohibitive
Induction Agents

- Ketamine combinations
  - With diazepam/midazolam
  - With dexmedetomidine
  - With propofol

- Telazol

- Propofol

- Coming Soon: Alfaxalone
Dissociatives

- Ketamine and Tiletamine
- Sympathomimetic, analgesic
- Generally given with benzos

- Metabolic differences between cats and dogs

- Appear in many combination protocols
Propofol

- IV only, requires IV cathether
- Cost can be limiting factor
- Benzyl alcohol may be a concern for cats with propofol 28
Maintenance - Inhalant Anesthetics

- **Isoflurane**
  - Frequently used to “top off” protocol if needed

- **Sevoflurane**
  - More rapid induction and recovery
  - Much more expensive
  - Differences unlikely to justify the cost unless total anesthesia times are short
  - Less aversive if masking
Peri-op Analgesic Options

• NSAIDS
  – Carprofen
  – Meloxicam
  – Onsior

• Local Anesthetics

• Opioids: buprenorphine v. tramadol
NSAIDS

• Labeled for use in dogs:
  – Carprofen
  – Meloxicam

• Labeled for use in cats:
  – Meloxicam
  – Onsior
NSAIDS

• Pre-cautions for use in spay/neuter:
  – If unknown health status
  – If dehydrated

• Time of administration-
  -pre-op v. post op?
  -duration of treatment?

Generally single dose in cats
Local Blocks

• Advantages:
  – Lidocaine is inexpensive
  – Technically simple
  – Complete analgesia
  – Minimal risk

• Potential Disadvantages:
  – Short duration of action
  – Adds time
  – May increase bleeding
Local Blocks

- Potentially Useful:
  - Testicular block
  - Incisional block
  - Intraperitoneal
  - “Splash block”
Opioids for the post-op period

- Tramadol?
  - Now a controlled substance
  - Questionable analgesic efficacy in dogs

Tramadol to become Schedule IV controlled substance

You are here: AVMA | AVMA@Work | Animal Health | Tramadol to become Schedule IV controlled substance

Addendum 7/3/2014: Updated to include information on prescribing and recordkeeping requirements.*

Today the Drug Enforcement Administration (DEA) published its decision to schedule tramadol as a Schedule IV controlled substance. The rule becomes effective August 18 of this year. The DEA's action was fairly swift, having published its proposal to schedule tramadol just eight months ago (see blog post from November 2013). Upon conducting its eight-step analysis, the DEA found that relative to Schedule III drugs, tramadol has a low potential for abuse and limited physical dependence, and coupled with tramadol's medical legitimacy, DEA determined Schedule IV to be the most fitting for tramadol.

In its final rule, DEA recognized the use of tramadol and other tramadol-containing products for management of moderate to moderately severe pain. It also defines tramadol as an "opiate" which means DEA believes tramadol is capable of triggering addictions similar to morphine. In veterinary medicine, tramadol has been used in pain control protocols, especially in dogs and cats.

So what does this mean for veterinarians who regularly utilize tramadol in their practices? In some cases, drug-label mandates could cause disruptions in commercial availability. Conversely for tramadol, its scheduling is expected to be helpful from a distribution standpoint, as current differences across state rules have reportedly been logistically challenging for veterinary distributors. In fact, in January of this year, the American Veterinary Distributors Association indicated its support for DEA's consideration to schedule tramadol, in part, because distributors will be able to operate more efficiently and consistently nationwide. The DEA provided for a slightly extended 45-day window of time for drug sponsors to incorporate a "C-IV" on the label, and for distributors to deplete their current stocks of...
Buprenorphine for Post-Op

- widely used in cats and dogs
- preferred dose in cats: 0.02 mg/kg, SQ administration not recommended

Problems with traditional formulation (Buprenorphine HCl):
- duration of action (6-8 hours?)
- COST $$$
Buprenorphine: Sustained Release

• Available from Zoo Pharm (Colorado)
  – 5 ml vials
  – 3 mg/ml
  – Dog dose: 0.03-0.06 mg/kg q. 72 hours
  – Cat dose: 0.12 mg/kg q. 72 hrs

• Concerns:
  – One case report of site reaction in a cat
  – Compounding regulations?
Simbadol

• Longer acting buprenorphine licensed for cats

News

Abbott Announces FDA Approval of Simbadol, First and Only Feline Once-Daily Opioid to Provide 24-Hour Pain Control

— Provides Postsurgical Comfort for Cats and Minimizes Need for Overnight Dosing

ABBOTT PARK, Ill., July 28, 2014 – Abbott’s Animal Health division today announced the U.S. Food and Drug Administration (FDA) has approved Simbadol™ (buprenorphine injection), providing veterinarians with a new option for postsurgical pain control in cats. Simbadol is the first and only FDA-approved opioid analgesic for cats to provide 24-hour pain control in a single dose, minimizing the need for overnight dosing following feline surgery, including both soft tissue and orthopedic procedures.

"With the approval of Simbadol, for the first time veterinarians have a once-daily opioid to provide 24-hour surgical pain control for their feline patients — even through the night," said Robin Downing, DVM, CVPP, CCRP, DAAPM, hospital director of the Windsor Veterinary Clinic and The Downing Center for Animal Pain Management in Windsor, Colorado. "I am enthusiastic about this new option, which demonstrated safety and efficacy in a randomized blinded clinical program in more than 200 cats treated with Simbadol, and expect to use it routinely for my feline surgeries."

Opioids are the cornerstone of effective pain treatment in veterinary medicine.¹ Each year, pain treatments are used in nearly three million feline procedures.²
Simbadol

- Abbott launching - available now
- 1.8 mg/ml
- Licensed for use in the cat
- 0.24 mg/kg every 24 hours, administer 1 hour before surgery

- Utility for HQ/HV??
- Cost?
Sample Protocols

- No one size fits all
- Each protocol must be adapted to particular clinic or setting and veterinarian comfort
- Happy to review
Lerner Clinic

- **Dogs**
  - BAG* or OBAG* IM
  - Induction: ketamine/diazepam or propofol
  - Maintenance: Isoflurane
  - Analgesics: buprenorphine, lidocaine, carprofen

- **Cats**
  - Ketamine/dexmedetomidine/buprenorphine
  - Meloxicam single dose
Pediatric Dog Neuters

- Dexmedetomidine/Butorphanol
- Carprofen if over 12 weeks
- Scrotal castrations or Zeuterin
Community Cat Clinics

- **TKX**
  - Telazol, ketamine, xylazine cocktail
  - Xylazine easier to dose with estimated weight
  - Anesthetic related mortality of 0.23%
  - Doses modified slightly
  - Cats also receive metacam & buprenorphine
    » (Robertson/Levy)

- Also published:
  - Dexmedetomidine, Ketamine, Buprenorphine
    » Harrison et al, 2011, *J. of Feline Medicine and Surgery*
Humane Alliance

- Protocols available on line
- Dogs: Morphine/Ace; ket/midaz
  Also given metacam and buprenorphine

- Cats: MKDM (morphine, ketamine, dexmedetomidine and medetomidine)
  Also given meloxicam and OTM buprenorphine
Other options:

- Telazol/butorphanol with or without dexmedetomidine
  » Ko, 2013

- Quad protocol for cats:
  – Ketamine/midazolam/dexmedetomidine/buprenorphine
To intubate or not to intubate?

• Must always have oxygen and breathing circuit available
• Especially for cats and short surgery times intubation may not be needed and may be harmful
• Down side is increased waste gas exposure
• Dogs generally intubated
Fluid Therapy

• Generally not used for young healthy animals having short anesthesia and surgery
• Useful for longer or dehydrated animals
• Very pregnant animals
• Feral Cats
Post-op/Recovery

- Reverse or not to reverse?
- Likely no need to worry if using a multi-modal protocol
- Make sure beyond duration of dissociative
Questions

emily.mccobb@tufts.edu