Anesthesia & Analgesia
A Case-based Approach

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Director CAVCM
WSAVA Pain Council Member
Overview

- Principles
- Anesthetic risk & risk mitigation strategies
- Demographic – Geriatrics
- Perioperative care
- Patients with co-existing disease
  - Renal
  - Cardiac
- Complications
- Emerging drugs & topics
Anesthesia & Analgesia
A Case-based Approach

Hour 1:
Principles & Geriatric Anesthesia
Basic Principles

• Keep It Simple & Straightforward (KISS)

• There are no “safest” anesthetics/protocols, only safe anesthetists

• Anticipate, predict & prepare
  • Good planning makes all the difference
Anesthesia.. can be scary?

- Anesthesia hesitant owners, DVMs & nurses!
- Unexpected anesthetic deaths, young/healthy patients
- Higher risk patients
  - Geriatric patients
  - Patients with co-morbidities
- "Special” breed considerations?
  - Mastiffs, boxers, sighthounds, savannah & serval cats
Anesthetic Risk

- **1950’s**
  - 1/90 death rate in dogs
    - (Lumb and Jones, 1984)

- **2009**
  - CEPSAF analyzed data from nearly 200,000 cases over 2 years
  - Overall mortality 1/1000 for healthy dogs and cats
  - Greater in sick dogs & cats

- **2011 (Human review)**
  - Overall mortality 1/145 000
  - Range 1/250000-1/1800 (ASA I-IV)
Risk Factors (CEPSAF 2009)

- ASA Physical Status
- Patient Age >12 yrs
- Patient Size Dog > 5 Cat > 2
- Urgency of Procedure 3x - unscheduled 9x - emerg
- Invasiveness & Duration
- Drug Effects Inhalant induction No premed
Duration of Procedure

- Limit most procedures to < 3 hrs
  - Split large dental procedures
- Interaction between operative duration & complications not fully understood
  - Surgical team fatigue
  - Intra-op complications may increase operative time
  - More time for complications to develop (i.e. GER, hypotension, SSI etc.)
  - More complex/difficult surgeries associated with longer operative times
  - Presence of trainees & lack of surgical experience increase operative times
Reducing Anesthetic Risk (human)

- Safety-checking equipment, checklist & record of check
- Directly available anesthetist (expert)
- No change in anesthetist during the operation
- Presence of anesthesia nurse (support)
- Two persons during emergence from anesthesia (support)
- Post operative analgesia

• Requirements
  • Equipment standards & safety features
  • Monitoring
  • Drug labelling
  • SOPs
Our reality?
Strengthen Team & Build Systems

- Anesthesia, collective care improves patient outcomes & safety
  - Delegation, clear expectations
  - No place for egos!
- Systems, SOP’s, checklists
  - Off-load routine tasks from memory
  - Develop standard/preferred protocols
- Educate & develop
  - Dedicated opportunities/time
- Anticipate & predict
  - Good planning
  - Use algorithms & diagnostic aids for problem solving
Checklists & Setup

- Formulary
- Patient work-up
- Pre-anesthetic checklist

<table>
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<th>Drug</th>
<th>Dose (mg/kg)</th>
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* mcg doses

**Pre-surgical Checklist**

Prior to induction
- Patient identity confirmed
- Does owner have questions or concerns prior to surgery? Y/N
- Owner consent signed and deposit obtained
- Physical exam completed
- Additional diagnostic tests required:
- Blood work & other diagnostic data reviewed
- Anesthetic equipment safety checked and monitors operating normally
- Anticipated critical anesthetic events reviewed (i.e. complications, drug interactions, concurrent disease)
- Surgical site marked/confirmed
- Perioperative medications required:

Prior to incision
- Has strictness been confirmed
- Has antibiotic prophylaxis been given within the 30 min?

Prior to closing
- Have all specimens been collected and proposed procedures completed?
- Instrument, sponge and needle count correct

Prior to leaving OR
- Specimens and samples labeled
- All proposed procedures completed

After Surgery is Completed
- Additional postoperative procedures required:
- All charges recorded
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History

**Broken leg as puppy (2017)**

*Acute lameness 1 month, suspect CCLR*

Physical exam

*Heart murmur 3/5*

*Anxious*

Lab data

*Mild increase in ALP (356)*

Meds

*Gabapentin 10mg/kg PRN Onsior (given last night at 10pm)*

Other

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Pre-surgical Checklist

Prior to induction
- Patient identity confirmed
- Does owner have questions or concerns prior to surgery? Y / N
- Owner consent signed and deposit obtained
- Physical exam completed
- Additional diagnostic tests required: PCV/TP
- Blood work & other diagnostic data reviewed
- Anesthetic equipment safety checked and monitors operating normally
- Anticipated critical anesthetic events reviewed (i.e. complications, drug interactions, concurrent disease)
- Surgical site marked/confirmed
- Perioperative medications required: O Onsior, O Cerenia, O Cefazolin

Prior to incision
- Has sterility been confirmed
- Has antibiotic prophylaxis been given within the 30 min?

Prior to closing
- Have all specimens been collected and proposed procedures completed?
- Instrument, sponge and needle count correct

Prior to leaving OR
- Specimens and samples labeled
- All proposed procedures completed

After Surgery is Completed
- Additional postoperative procedures required:
- All charges recorded
Checklists & Setup

- Anesthetic trays
  - Tubes
  - Ties
  - Lube
  - Laryngoscope
  - Air syringe
  - Gauze
  - Drug basket
Checklists & Setup

- Anesthetic drugs bins/bags
  - All drugs, flush required for case
Trouble Shooting

- Diagnostic aids (DDx)
  - Hypotension
  - Hypoventilation
  - Bradycardia
  - Tachycardia
  - Arrhythmias
  - Etc
- Treatment algorithms
Anesthesia App

DEVELOPED IN COLLABORATION BETWEEN THE AVA AND DECHRA

Dechra Dog and Cat Anaesthesia

The Dechra Dog & Cat Anaesthesia app is a unique resource designed to put practical, accessible information into the hands of veterinarians, veterinary nurses/technicians and vet students. Developed with specialist veterinary anaesthetists and approved by the AVA, the app contains suggested anaesthetic protocols for 24 procedures in the dog and 15 in the cat. It is like having a veterinary anaesthetist in your pocket!

Learn more here

Download on the App Store
Get it on Google Play
Patient Demographics

- Geriatrics (42-52% of dog population > 7yrs)
  - Decline in organ function or reserve, “elderly normal”
  - Combined with acute disease, surgery (stress) less ability to respond to increase demand

- Patients with comorbid conditions
  - Cardiovascular, renal, respiratory
- Longer procedures
Old Age & Anesthesia

- Greater risk of anesthetic morbidity & mortality
- Postpone & delay treatments, poorer outcomes
Today is Worse than Yesterday
But
Better than Tomorrow.
Old Age & Anesthesia

- Greater risk of anesthetic morbidity & mortality
- Postpone & delay treatments, poorer outcomes
- Predictable physiologic changes
Cardiovascular Changes

- Hypotension & arrhythmias
  - Baroreceptors less active
- Reduced CO
  - Reduced maximal CV response
Respiratory Changes

- Apnea, hypoxia, hypercarbia
  - Disruption of V/Q, impaired gas exchange
  - Ventilatory response to CO₂ & O₂ blunted
Renal Changes

• ↑ sensitivity to nephrotoxic or ischemic insults
  • 10-20% decrease in renal mass, linear decline in GFR with age
• Less tolerant of hypovolemia & dehydration
  • RAAS less responsive
Hepatic Changes

- Drug effects/changes difficult to predict
  - Decrease liver mass & total blood flow
  - Qualitatively heptacellular enzyme function remains normal
- Body composition changes, altered redistribution
CNS Changes

• ↑ sensitivity to anesthetics & anesthetic adjuncts
  • Neurotransmitter, receptor alterations?
• Postoperative sensory & cognitive alterations
  • Neurotransmitter, receptor alterations?
General Considerations

- Susceptible to hypothermia
  - Body composition changes, central response, metabolism
- Patient positioning important
  - Pre-existing conditions (i.e. OA)
- Pain
Geriatrics

• **Predictable physiological changes**, though may not correlate with chronological age
  • Less physiological reserve
  • Less tolerant of anesthetic induced cardiopulmonary depression
• Proper planning & knowledge, more important than specific drugs
  • Greater & more prolonged effects
  • Lower doses
• Co-existing conditions
  • Greater attention to detail
Improving Patient’s Quality of Anesthesia

- Consider entire perianesthetic period (emphasis comfort)
  - Pre & post
- Sedation/calming, gentle handling
  - Chill protocols
    - Trazodone, gabapentin
  - EMLA cream prior to catheterization
  - Sedation prior to catheterization?
  - Premedication IM vs IV
- Vomiting & nausea
- Smooth stress-free recovery
“Chill” Protocols

- Requires some pre-planning

- Trazodone
  - 5-10 mg/kg PO

- Gabapentin
  - 50-100 mg/cat
  - 10-15 mg/kg dog (for sedation)
Maropitant (Cerenia)

- NK-1 receptor antagonist
  - Prevention motion sickness & vomiting
  - Also blocks substances P at NK-1 receptor
- **Does NOT reduce GER**
- Reduces MAC
  - Clinically irrelevant in most situations
- Clinical use
  - Reduces vomiting with premedication (admin 1 hr prior to premed)
- **May improve quality of anesthesia, less post-op nausea, faster return to eating**
Preventing Poor Recovery

- Recover when **you & patient are ready**
- Ensure sufficient sedation/premedication
- Analgesia – think locals!
- Sternal, in kennel, do not vigorously restrain
- Comfort care – bladder, positioning, warmth, quiet
Causes Poor Recovery

- **Pain**
  - Surgical site, full distended bladder
- **Dysphoria**
  - Can be normal when recovering from inhalant anesthesia
  - Consider time of premedication given
- **Hypothermia**
  - Extreme discomfort
- **Airway irritation/compromise**
  - Leads to patient distress
Dysphoria vs Pain

- **Emergence dysphoria**
  - Acepromazine (0.01-0.02 mg/kg)
  - Propofol (1-2 mg/kg)
  - Dexmedetomidine (1-2 μg/kg)

- **Opioid dysphoria**
  - Acepromazine (0.01-0.02 mg/kg)
  - Dexmedetomidine (1-2 μg/kg)
  - Naloxone (dilute & titrate IV to effect)

- **Pain**
  - Opioid (other analgesics)
  - Dexmedetomidine (1-2 μg/kg)
Dysphoria vs Pain

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Hour 2:
Kidney disease & Anesthesia
Margaret

• Signalment & History
  • 13 yr, FS, Cocker Spaniel
  • COHAT
  • Chronic Kidney Dx (stage II)
  • No other significant history
  • rDVM bloodwork
    • Urea – 34.4 (3.2-11.0)
    • Creatinine - 223 (44-133)
    • USG 1.010-1.020

• Physical Exam
  • Very nasty mouth
  • Otherwise unremarkable
Early Renal Insufficiency

• Signalment & History
  • 13 yr, FS, Cocker Spaniel
  • COHAT
  • Chronic Kidney Dx (stage II)
  • No other significant history
  • rDVM bloodwork
    • Urea – 34.4 (3.2-11.0)
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Geriatrics & Co-existing Dz

Things to consider:

- Disease
- Anesthetic Drugs
- Concurrent Drugs
- Procedure
- Resources available
Disease Considerations

- **Azotemia/uremia**
  - Evaluate trends if available
- **Hydration (always access to water)**
  - Place on fluids for several hours prior to procedure
    - 1.5-2x maintenance for 3-4 hrs
- **Anemia (directly impacts oxygen delivery)**
  - $DO_2 = CO \times CaO_2$
- **Acid base & electrolyte imbalance**
Anesthetic Goals

- **Avoid kidney injury**
  - Hypoperfusion
  - Nephrotoxicity (aminoglycosides, NSAIDs?)
- **Optimize renal blood flow (RBF) & GFR**
  - Adequate blood pressure
  - Avoid renal vasoconstriction
  - Adequate hydration
Anesthetic Goals

- Avoid drugs requiring renal excretion or metabolism for clearance (prolonged effects)
  - Ketamine?
- Minimize pain & stress
  - Avoid catecholamine induced α1 renal vasoconstriction
- Minimize anesthetic induced hypotension
  - Excessive inhalant depth
- Impaired autoregulatory mechanisms
  - Renal disease or concurrent drugs (i.e. NSAID’s)
Regulation of Renal Blood Flow
Regulation of Renal Blood Flow
Premedication “Margaret”

Options ??

- None
- Opioid alone
- Acepromazine + opioid
- Dexmedetomidine + opioid
- Midazolam + opioid
Drug Selection

- Keep it Simple and Straightforward (KISS)
  - Fewer errors

- There are no “safest” anesthetics/protocols, only safe anesthetists
  - Very, very few ”pure” contraindications
Premedication “Margaret”

- None
  - Stress or pain response
    - Aldosterone, vasopressin, renin, catecholamines
    - Vasoconstriction may reduce blood flow to kidney
    - Reduced oxygen delivery to renal medulla

- Opioid alone
  - Reasonable option
  - Minimal direct effects on renal & cardiovascular function
Premedication “Margaret”

- Midazolam + opioid
  - Minimal direct renal effects
  - Unpredictable sedation
  - Reserved for quiet geriatric, debilitated or pediatric patients
Premedication “Margaret”

- **Dexmedetomidine + opioid?**
  - Decrease CO --> RBF
    - RBF better than saline control & vasopressin significantly reduced in isoflurane anesthetized dogs given medetomidine (20 & 40 mcg/kg IV)
  - Inhibits vasopressin, promotes diuresis may protect kidneys during ischemia (dog)
  - Renoprotective effect in ischemia-reperfusion injury (rodents)
Premedication “Margaret”

- Acepromazine - 0.01 mg/kg IV
- Hydromorphone - 0.05 mg/kg IV
Premedication “Margaret”

- Acepromazine?
  - Hypotension decrease renal blood flow?
    - Mild in normovolemic patients, low doses
  - MAC sparing – less inhalant hypotension
  - Anesthetic induced hypotension
    - Maintains renal blood flow & GFR despite hypotension
- Reno-protective ($\alpha_1$ adrenergic blocking)?
  - Minimize catecholamine induced vasoconstriction
**Methadone vs hydromorphone**

- **Veterinary labelled mu agonist opioid**
- NMDA receptor antagonist activity – significance?
- Similar efficacy & duration of action to morphine & hydromorphone
- Lower potential for side effects
  - Nausea/vomiting
  - Panting
  - Dysphoria & hyperthermia (cats)?
- Dose 0.2-0.5 mg/kg
  - IM/SQ bioavailability?
  - Larger volume
  - Less reactivity when administered IV
  - Cost – methadone > hydromorphone > morphine
Margaret – Induction

**Propofol**
- Titrate slowly to effect

**Alfaxalone**
- Reasonable alternative, similar to PPF

**Ketamine**
- Not generally recommended (cats)
- Sympathomimetic effects – renal vasoconstriction?

+ Co-Induction
  - Benzodiazepine (diazepam, midazolam)
  - Fentanyl
  - Lidocaine
Maintenance

- Isoflurane, sevoflurane
- Techniques to minimize inhalant optimal
  - Infusions
    - Opioids and/or lidocaine
  - Locoregional techniques
Locoregional Anesthesia

- Marked inhalant sparing
- Multimodal analgesia
- Easy, inexpensive, highly effective
Infraorbital Nerve Block
Infraorbital Nerve Block
Infraorbital Nerve Block
Infraorbital Nerve Block
Infraorbital Nerve Block

Image: https://www.purina.co.uk/articles/cats/health/symptoms/flat-faced-cats
Inferior Alveolar Nerve Block
Inferior Alveolar Nerve Block
Inferior Alveolar Nerve Block
Mixing Local Anesthetics (Bupivacaine & lidocaine)

- Volume & Concentration
- pH differences
- Evidence
  - Ribotsky et al. 1996
  - Sepehripour & Dheansa 2017
  - Lawal & Adetunji 2009
  - Lizarraga et al. 2013
  - Vesal et al. 2013
Intraoperative Support/Goals

- **Optimize oxygen delivery**
  - Fluids
  - Dopamine
  - RBC

- **Minimize oxygen demand**
  - Fluids
  - Diuresis

- **Prevent renal vasoconstriction**
  - Adequate anesthetic depth, avoid stress

- **Assess urine output**
  - Urinary catheter
  - Estimate, assess bladder size changes
  - USG
Outcome - Margaret

- Hypotension almost immediately following induction
  - Oscillometric (MAP 50-60 mmHg)

- First steps... (my algorithm)
  - 2x check reading
    - Measurement & accuracy
  - Assess patient
    - Anesthetic depth, procedure
  - Check heart rate (bradycardia?)
Causes of Hypotension

\[ BP = CO \times \text{Systemic Vascular Resistance (SVR)} \]

\[ CO = HR \times \text{Stroke Volume} \]

- **Contractility**
  - Reducing anesthetic delivery
  - Dopamine

- **Afterload \sim SVR**

- **Preload**
  - Fluids

- **HR (High)**

- **Lusiotropy**

- **Glycopyrrolate**

- Reducing anesthetic delivery
Hypotension

- Fluid bolus (5-20 ml/kg/15min)
  - Minimal effects in normovolemic patients
  - Diuresis – decrease O2 demand
  - 2-3 tolerated easily in most patients?
  - Caution in patients with:
    - CHF
    - Pulmonary disease
    - Coagulopathy
    - Vasculitis
    - Head trauma/intracranial tumors
    - Hypoproteinemia?
    - Anemia?
Hypotension

- **Dopamine**
  - 3-5 µg/kg/min
    - renal & splanchnic vasodilation
  - 5-10 µg/kg/min
    - myocardial contractility
  - 10-20 µg/kg/min
    - vasoconstriction

- **Dobutamine**
  - 1-5 µg/kg/min

- **Ephedrine**
  - 0.02-0.04 mg/kg
Surgical Fluid Rates

- Guidelines developed that suggested 3-5 ml/kg/hr is sufficient
- Largely based on human data
  - Preoperative prep (fasting requirements, access to water)
  - GI tract different
  - Co-morbidities different

- Our current recommendations 3-10 ml/kg/hr
  - Longer procedures, more total fluids administered
    - Consider dropping rate over time
  - Individualized to patient, preop condition, time in hospital, PE, PCV/TP, USG
Post op pain management

- Margaret
  - Peri-operative pain protocol:
    - Hydromorphone
    - Bupivacaine blocks
  - Concerns:
    - Anxious (increased stress)
    - CKD (stage 2)
    - Chronic Pain
  - Options:
    - SR Buprenorphine
    - Acetaminophine
    - NSAID (1 dose?)
    - Gabapentin???
Thank you
Anesthesia & Analgesia
A Case-based Approach

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Veterinary Consultant Orthopedic Health & Pain, Elanco AH
Director CAVCM
WSAVA Pain Council Member
Anesthesia & Analgesia
A Case-based Approach

Hour 3:
Anesthesia & Heart Disease
Thank You
Cheddar

- 10 yr, MC, DSH
- Heart murmur, confirmed HCM
- Cystotomy
  - FLUTD, bladders stones
Cheddar

- **Hx**
  - Generally healthy, HCM diagnosed 1 yr earlier
  - No meds at this time

- **PE**
  - Nearly impossible, very fractious cat!
  - “Seems OK”
What is your initial approach for managing “Cheddar”?

- Tank him down
- Opioid alone
- Midazolam + opioid
- Acepromazine + opioid
- Ketamine + midazolam/acepromazine + opioid
- Dexmedetomidine + opioid
- Alfaxalone IM
- Refer him to one of your “friends”
Aggressive Patients

- Human safety is number one priority
- Patient safety is second priority
- Inherent risks
  - Lack of predictability
    - Administration & route
    - Efficacy
    - Underlying issues
  - +- Physical exam
- Transparent communication & documentation
Oral Dexmedetomidine

- Commercial product available (US), Sileo
  - Dose 125 mcg/m2 (2-10 mcg/kg)
  - For noise sensitivity

- Injectable oral transmucosal
  - Dose 10-40 mcg/kg OTM
  - For sedation
What is your initial approach for managing “Cheddar”?

• Tank him down
• Acepromazine + opioid
• Ketamine + midazolam/acepromazine + opioid
• Dexmedetomidine + opioid
• Alfaxalone IM

Fractious
Hypertrophic cardiomyopathy
Hypertrophic Cardiomyopathy

- Diastolic dysfunction
  - Reduced SV & CO
    - Hypertrophic ventricles, small chamber volume
    - Impaired ventricular relaxation (lusiotropy)
- Elevated contractility may cause dynamic LVOT obstruction during systole
  - LVOT exaggerated with increased pressure gradient across outflow tract
- Hypertrophy may predispose to ischemia
Hemodynamic Goals

• Optimize diastolic ventricular volume
  • Adequate preload
  • Minimize tachycardia
    • More time for ventricular filling

• Avoid exacerbating LVOT obstruction
  • Avoid drugs increasing contractility
  • Avoid excessive vasodilation
Options

- Ace IM ±
  - Likely insufficient, reduces afterload, may increase LVOT obstruction
Options

- Ace IM ±
  - Likely insufficient, reduces afterload, may increase LVOT obstruction
- Ketamine IM ±
  - Effective, increases heart rate & contractility, may increase LVOT obstruction
Options

• Ace IM ±
  • Likely insufficient, reduces afterload, may increase LVOT obstruction

• Ketamine IM ±
  • Effective, increases heart rate & contractility, may increase LVOT obstruction

• Dexmedetomidine IM ±
  • Effective, increases afterload, may decrease LVOT obstruction, improved myocardial perfusion? (lower HR longer diastolic time)
  • May not be ideal for cardiac examinations
Dexmedetomidine

- Sedative
- Analgesic
- Muscle relaxant
- Reversible
- But significant cardiovascular effects
Cardiovascular Effects **NOT** Dose Dependent

- Cardiovascular effects do not change within clinically useful dose range
  - Predictability & reliability improved with higher dose
- Primary reasons for reducing dose, reduce cost & shorten duration of effects

Hemodynamic Effects of Medetomidine in the Dog: A Dose Titration Study

BRUNO H. PYPENDOP, DMV and JOHN P. VERSTEGEN, DMV, MSc, PhD
Dose Selection

Clinical (CM)
- Dogs
  - 5 mcg/kg IV
  - 10 mcg/kg IM
- Cats
  - 10 mcg/kg IV
  - 20 mcg/kg IM

Label
- Dogs
  - 10-30 mcg/kg IV
  - 10-40 mcg/kg IM
- Cats
  - 40 mcg/kg IM

Metabolic Scaling
Predictability & Efficacy

- Higher doses & combine with opioid better than alone
- IV better than IM
- Calm better than excited patient
- Semimembranosus better than lumbar

Options

- Ace IM ±
  - Ineffective, SE
- Ketamine IM ±
  - Effective, SE
- Dexmedetomidine IM ±
  - Effective, SE
- Alfaxalone IM ±
  - Effective, dose dependent sedation – anesthesia
  - Volume required acceptable
  - Improved conditions for cardiac examinations?
Injection Options

- Pre-visit sedation
  - Gabapentin 25mg/kg
- Minimal handling before injection
  - Remain in carrier
  - Feliway, towels
Protocol “Cheddar”

- **Premedication**
  - Dexmedetomidine (20 mcg/kg IM)
  - Opioid (hydromorphone 0.1 mg/kg IM)

- **Induction**
  - Alfaxalone, propofol
    - May decrease afterload (hypotension) – LVOT obstruction?
  - Ketamine
    - Increases heart rate/contractility – LVOT obstruction
    - Effects when combined with dexmedetomidine?
Fluids (heart patients)

- May be susceptible to volume overload
  - Pulmonary edema, pleural effusion
- **MANAGED INDIVIDUALLY,** underlying disease & current level of hydration
  - Pulmonary edema relatively easy to treat, ARF far more difficult
- Crystalloid versus colloid?
  - Colloid difficult to eliminate
- Careful monitoring & assessment important
  - Auscultation, SpO₂, lung compliance
Postoperative care

• Analgesia – local block, coccygeal or incisional
• Sedation to remain calm?
  • Rescue sedation on hand at recovery
• To remove catheter or not to remove catheter soon after extubation?
• Calm place with option to hide, but still be observed
• Adequate analgesia
  • Buprenophine
  • NSAID
  • Gabapentin
Sacroccocygeal or Coccygeal block

- Effective perineal anesthesia/analgesia
  - Improved postoperative comfort?
  - Facilitates urethral unblocking
- Very safe, minimal risks
Postoperative care

- Analgesia – local block, coccygeal or incisional
- Sedation to remain calm?
  - Rescue sedation on hand at recovery
- To remove catheter or not to remove catheter soon after extubation?
- Calm place with option to hide, but still be observed
- Adequate analgesia
  - Buprenophine
  - NSAID
  - Gabapentin
Heart Case # 2: LWD

- 12 year old, FS, Bichon Frise

- Presented for dental
  - Probable extractions

- PE
  - Bit nippy & “unpleasant”
  - Marked dental disease
  - Otherwise essentially normal but...
  - Heart murmur - Gr III-IV/VI, asymptomatic
Heart Murmurs

• Intensity & character of murmur combined with signalment -> reasonable DDx

• Degree of dysfunction not easily estimated
  • History & additional laboratory/diagnostic data required
  • Important for quantitating anesthetic risk
Cardiac History - LWD

- Minimal change in murmur since first noted
- No medications
- No S/V/D, occasional cough esp. night
- No orthopnea, nocturnal dyspnea
- Resting respiratory rate?
- Exercise OK
- Urine/defecation OK
Laboratory Data & Diagnostics

- Full panel plus UA
  - All within normal limits
  - USG 1.044
- Chest radiographs
  - Evidence of moderate left atrial enlargement
  - No evidence of pulmonary edema or effusion
  - Minimal changes since previous rads (1 year ago)
Laboratory Data & Diagnostics

- Full panel plus UA
- All within normal limits
- USG 1.044
- Chest radiographs
  - Evidence of moderate left atrial enlargement
  - No evidence of pulmonary edema or effusion
  - Minimal changes since previous rads (1 year ago)
Laboratory Data & Diagnostics

- Full panel plus UA
  - All within normal limits
  - USG 1.044

- Chest radiographs
  - Evidence of moderate left atrial enlargement
  - No evidence of pulmonary edema or effusion
  - Minimal changes since previous rads (1 year ago)

- Echocardiography
  - Confirms degenerative mitral valve disease (DMVD)
  - Cardiac contractility OK, significant regurgitation, moderate left atrial enlargement
Mitral Valve Disease
Hemodynamic Goals

- Minimize regurgitant fraction of blood & maintain forward flow (SV & CO)
  - Normal to slightly ↑ heart rate
  - Avoid drugs that will ↑ SVR (afterload)
    - Increase regurgitant fraction
    - Directly decreases cardiac output
  - Maintain preload
    - Optimal ventricular filling during diastole
    - Usually have high preload
  - Optimize contractility
Premed Options for LWD?

- None
- Opioid alone
- Midazolam or diazepam & opioid
- Acepromazine & opioid
- Dexmedetomidine & opioid
Premedication Options

- Opioid alone
  - Reasonable choice (very safe) but minimal sedation
  - Minimal CV effects – atropine responsive bradycardia
  - Tends to work better in very old/young or debilitated patients

- Midazolam or diazepam & opioid
  - Minimal to no CV effects besides opioid
  - Great when it works!
  - Can see paradoxical excitement
  - Tends to work better in very old/young or debilitated patients
Premedication Options

- Dexmedetomidine & opioid
  - Increased SVR, bradycardia & reduced CO .... make this a very poor choice “contra-indicated”
  - Exactly what you don’t want to do!!
Premedication - LWD

- Acepromazine & opioid
  - Acepromazine (0.01 mg/kg) IM
  - Methadone (0.4 mg/kg) IM

- Acepromazine, won’t this just compound hypotension?
  - Alpha-1 mediated vasodilation

- But consider temperament
  - Consequences of manual restraint, stress & catecholamine release
  - If opioid alone effective -> may avoid acepromazine in geriatrics
Acepromazine

• Anti-arrhythmic, anesthetic sparing, reduces afterload (hypotension)
  • Afterload reduction desirable for managing MMVD (ACE inhibitors)
  • Use cautiously in hypovolemic/dehydrated patients
    • Those relying on vasoconstriction for maintaining blood pressure
• Prepared to manage & support hypotension with dopamine
• Fluid stabilization prior to induction
• Low dose can improve recovery
Current Cardiovascular Meds

- General suggestions
  - ACE-I withhold day of surgery, may increase intraoperative hypotension
  - Pimobenden, diuretics & others – continue?

- Consider overall hydration, patient status, premeds

- Always be prepared to manage & address hypotension
Induction

• All can be used if administered appropriately but....

• Propofol
  • Vasodilation & apnea

• Alfaxalone
  • Potentially less vasodilation & apnea compared to propofol
  • Dependent on speed of administration

• Ketamine/diazepam
  • Sympathetic stimulation
  • Variable increase HR, BP & CO
  • May be undesirable in some patients (i.e. HCM)
Maintenance

- Isoflurane

- Techniques to minimize inhalant concentration is optimal
  - Infusions
    - Opioids and/or lidocaine
  - **Locoregional techniques**

- Techniques to avoid hypothermia
Recovery

Consider:
- Anxiety/stress
  - Related to heart condition
- Pain
- Comfort

To go home comfort
- NSAIDs
- Opioids?
- Gabapentin?
Thank you