The Things that Worry You: Avoiding and Trouble Shooting Common Anesthetic Complications

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
National Spay Neuter Meeting
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

- Identify patients who might be at higher risk
- Understand areas of risk
- Prevent common complications
- Be able to respond and mitigate any problems that do occur
Outline

• Patient Safety and Risk Factors
• Prevention and Monitoring
• Common Complications
  – Causes and strategies
Patient Safety

• Most important priority
• Luckily most HQ/HV patients are healthy

• What is the risk?
  – Studies of anesthetic risk in dogs and cats
  – Risks are low, but not 0
  – 0.17% for dogs, 0.24% for cats
Factors that increase risk:

- Small patient size
- Out of hours surgery
- Long procedure time
- Intubation in cats

» Broadbelt et al, 2007
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
Routine Pre-op Blood Testing

- Not commonly done in high volume settings
- Not necessary for patients who are healthy
- Do not correlate with morbidity as well as ASA status and PE findings
  » Danzic et al, Anesth & Analgesia 2001

- May be useful in higher risk patients as indicated by exam
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
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
- ** correlated with increased morbidity
Considerations for Geriatric Patients

- Unusual in HQ/HV setting
- Lower hepatic and renal clearance
- Decreased total proteins
- Increased lean body mass
Another High Risk Category
Monitoring

- Parameters to monitor:
  - Depth
  - Cardiovascular System
  - Respiratory System
  - Temperature

- Helps identify and rapidly address problems
What is the standard of care?

• ACVA guidelines
  – www.acva.org

• ASV guidelines for high volume spay neuter
  - www.sheltervet.org
Complications may be:

• Equipment related
• Drug related
• Patient related
• Procedure related

• OR......

• Some Combination of the above
Equipment related

- Machine
- Breathing Tube
Preventing Machine Related Complications

• Anesthesia machine check out
Common Anesthesia Machine Problems

- Stuck inspiratory/expiratory valves
- Soda sorb issues
- Leaks
- Non-rebreather connected improperly
- Improper plumbing
ET tube problems

- Improper intubation
- Problems with cuff
- Kinking or disconnect
- Biting through tube

- Post- anesthetic airway issues-
Other equipment considerations

- Closed pop off valve
- Waste gas scavenging and monitoring
Drug Related Complications

- Hypotension
  - Acepromazine
  - Isoflurane
  - Propofol

- Tachycardia
  - Ketamine
  - Glycopyrrolate

- Bradycardia
  - Opioids
  - Alpha 2 agonists
Patient Related Complications

- Geriatric/Pediatric
- Brachycephalic or difficult Airway
- “Sensitive” breeds
- Occult disease underlying
- Anxiety and stress of patient
Difficult Airway

- Pre-oxygenate
- Rapid induction with IV protocol
- Intubate using visualization
Procedure Related Problems

Surgeon related

• Hemorrhage

• Vagal responses
Dealing with Blood Loss

- Patient Blood Volume: 90 ml/kg
- 20% of blood volume is a ‘safe’ amount to lose
- Replace with crystalloids, refer if can’t stabilize or PCV drops below critical hematocrit
- Could consider autotransfusion
On a Daily Basis….

- May not know cause
- Commonly seen:
  - Apnea/hypoventilation
  - Arrhythmias
  - Hypo/Hyperthermia
  - Hypo/Hypertension
  - Peri-operative regurgitation
Arrhythmias

- Sinus Bradycardia
- AV block
- Bundle Branch Block
- Sinus tachycardia
- Ventricular arrhythmias
  - Treat when tachycardic, multiform or R on T
Causes of Bradycardia

- Anesthetic Overdose
- Opioids
- $A_2$-Agonists
- Excessive vagal tone
- Hypothermia
- Hyperkalemia
- Sick sinus syndrome
- AV block
- Metabolic failure
- Hypoxia
Causes of Tachycardia

- Anesthesia too light
- Ketamine
- Parasympatholytics
- Sympathomimetics
- Hypovolemia
- Hyperthermia
- Hypoxemia
- Hypercapnia
- Hypoglycemia
- Individual variation
- SVT
- Pain
- Pheochromocytoma
Vasomotor Tone

• Regulates perfusion
• Vasodilation
  – improves perfusion
  – lowers blood pressure
  – causes: systemic inflammatory response, drugs, hyperthermia (isoflurane, acepromazine)
• Vasoconstriction
  – impairs perfusion,
  – raises blood pressure
  – causes: hypovolemia, heart failure, hypothermia, vasoconstrictors (dexmedetomidine)
Detecting Problems

- Monitor within window of “safe” parameters
- Trouble shoot when values are outside of range
- I.E.- HR> 140, < 60 for canines or < 100 for cats
(keep protocol, individual patient in mind)
Monitors

- **Pulse Oximeter**
  - the must have monitor
  - Hypoxia unlikely but should be addressed rapidly
  - Failure indicates problem with patient

- **Capnography**
  - Unusual in HQ/HV setting but excellent for detecting equipment problems
Pulse Oximetry

- Should be 100%
- Low values or errors can indicate problem
- Not solely hypoxemia
- Reduced perfusion
  - vasoconstriction
  - too deep
  - too cold
- Very Sensitive
Temperature

- Hypothermia is common
- Temperature should be maintained above 96° F
- Below this level anesthetic requirements are reduced and metabolic function can be disrupted
- Minimize intra-operative heat loss
Hypothermia: negative effects

- ↑ Stress Response
- Impaired coagulation
- Impaired tissue perfusion
- Decrease MAC
- Bradycardia
- Delays recovery

- Best Cure is Prevention!!
Hyperthermia

- Avoid iatrogenic over heating
- Metabolic and genetic hyperthermia syndromes
- Greyhounds
- Treatment:
  - Rapidly identify (monitor temp)
  - Cooling, remove external warming devices
Hyperthermia of the Cat

- retrospective study: Posner (NC state)
- Implicated:
  - Ketamine, hydromorphone (any opioid?), intra-operative hypothermia
  - Inflammatory mediators
- What to do?
  - Limited morbidity
  - Cool and monitor the patient
  - Reverse pure agonists?
  - Give Acepromazine, NSAIDS?, fluids
How do we know patient is ok?

- Not too deep (or too light)
- MM pink, CRT below 2 sec
- Reg RR with no effort
- Easy to auscult heart and pulse palpates strong
- Temp ok
If monitor alarms?

• First, check patient:
  – Listen to heart
  – Feel pulse

• Once confident patient is doing well then trouble shoot monitor
Signs of a problem

• Patient not acting like they normally do
• Hard time keeping them asleep
• Lots of respiratory effort
• Pulse ox alarming or pulse is hard to feel
• Heart sounds far away
• Sudden drop in ETCO₂
• Problems in Recovery

• Airway obstruction
  – Phenylephrine can be helpful

• Vomiting/Regurgitation +/- Aspiration

• Emergence delirium v. pain
Recovery

- Monitor until patient is sternal and has good airway control
Questions

emily.mccobb@tufts.edu