Rural Area Veterinary Services

VOLUNTEER TRAINING MANUAL

THE HUMANE SOCIETY OF THE UNITED STATES
# RAVS Volunteer Training Manual
## Table of Contents

### Section 1 – Introduction
- The RAVS Program: Who We Are and What We Do  
- Volunteer Expectations, Requirements and Orientation Process

### Section 2 – RAVS Clinic Structure & Protocols
- **Team Structure and Clinic Layout**
  - Clinic Team Roles and Responsibilities
  - Clinic Position Descriptions
  - Physical Clinic Layout
- **Patient Flow & Medical Records – Surgical Patients**
- **Patient Registration / Intake Process**
- **Receiving Process & Protocols**
  - Patient Flow & Team Responsibilities
  - Preventive Medicine Protocols
  - Dispensing Take-Home Medications
  - Patient Discharge Process
  - Medicine/Wellness Appointments
  - Infectious Disease Control Protocols
- **Anesthesia Process & Protocols**
  - Patient Flow & Team Responsibilities
  - Anesthetic Equipment Overview
  - Recovery Responsibilities & Protocols
- **Surgery Process & Protocols**
  - Patient Flow & Team Responsibilities
  - Surgical Equipment / Sterile Resources Overview
  - Skills Assessment & Appropriate Learning Goals
**SECTION 3 – FIELD MEDICINE:**
**CLINICAL KNOWLEDGE & SKILL DEVELOPMENT**

- **Client Communication Basics**
- **Animal Handling & Physical Examination**
  - Low Stress & Safe Animal Handling
  - Performing a Thorough Physical Exam
    - Determining Age & Sex
    - Body Condition Scoring
- **Infectious Disease Overview**
  - Common Infectious Diseases
  - Common Ecto- and Endoparasites
- **Anesthesia & Recovery**
  - Anesthesia Basics
    - Endotracheal Intubation
  - Anesthetic Agents
  - Introduction to the Anesthesia Machine
  - Monitoring Anesthesia
  - Using Monitoring Equipment
  - Addressing Anesthetic Complications
  - Recovery Monitoring & Addressing Complications
  - Pediatric Anesthesia Considerations
- **Surgery**
  - Surgery Basics
  - High Quality Spay/Neuter & Preventive Techniques

**SECTION 4 – APPENDIX**

- **Quick Reference Guides:** Clinic Area Cheat Sheets
- **Medical Records**
  - Surgical Patient Forms & Wellness Patient Forms
  - Rabies Certificates
- **RAVS Social Media Policy**
SECTION 1: INTRODUCTION

Rural Area
Veterinary Services
THE HUMANE SOCIETY OF THE UNITED STATES
RURAL AREA VETERINARY SERVICES

The Rural Area Veterinary Services program (RAVS), established in 1995, is a non-profit veterinary service program. Our programs combine high quality veterinary field clinics with clinical training for current and future veterinary professionals to improve the health and welfare of animals in under-served rural communities where poverty and geographic isolation make regular veterinary care inaccessible. In 2002, RAVS joined The Humane Society of the United States with the goal of providing a network for veterinary professionals interested in animal welfare and protection efforts.

CARING FOR ANIMALS IN NEED

Each year, RAVS brings high quality preventative health care to more than 8,000 animals in rural communities where no other regular animal services exist. Since 2003 the program has provided over $34 million in veterinary services for more than 175,000 animals, all at no cost to the families we serve. In addition, our field training programs have provided life-changing service-learning opportunities for more than 9,700 veterinary and veterinary technician students and professionals.

A typical RAVS field clinic will include RAVS field staff and 15-20 veterinary and veterinary technician student volunteers along with 15 veterinarians, technicians, veterinary assistants, and support volunteers who travel together for 1-2 weeks, sometimes moving midweek to a new community to reach the greatest number of animals. Highly portable, everything the team needs to turn a local gymnasium or community center into a fully functioning field hospital is carefully packed in a single converted horse trailer. While the primary focus of our clinic is spay/neuter and basic wellness care, our teams are also called upon to treat a range of illnesses and other concerns, from traumatic injuries to infectious disease. In a two week tour the team may perform up to 300 surgeries and administer thousands of vaccinations and other treatments.

TRAINING AND ENGAGING VETERINARY PROFESSIONALS

In addition to the direct impact of our programs on animals in need, the RAVS program aims to address critical issues in animal health care and veterinary education by engaging veterinary students and dedicated professionals in a unique and often life-changing experience.

RAVS engages veterinary students from 30 different veterinary schools throughout North America and the UK. Under the guidance and supervision of highly skilled veterinary professionals, students have the opportunity to learn and practice a broad range of clinical skills, from client communication and education, assessment, prevention, and treatment of disease, to anesthesia and surgery. The intensity of a RAVS clinic creates memories that stay with our student volunteers long past graduation. Each aspect of our training program is designed to emphasize the best practice possible, demonstrating that even under challenging conditions, high quality veterinary care can be provided.

Our field clinics are also RACE approved continuing education opportunities for veterinarians and veterinary technicians. Through extensive online training, and daily on-site didactic and practical training in anesthesia, surgery, field medicine and animal welfare topics we strive to share high quality techniques and field treatment protocols that can be utilized in a wide range of clinical settings. Our professional volunteers range from experienced practitioners, many veterans of several RAVS clinics, to recent graduates eager to broaden their horizons and improve their skills. Each volunteer works closely with our experienced staff to deliver on the RAVS promise of high-quality care and high-quality training.

MAKING A REAL DIFFERENCE

The impact of RAVS' services in communities hard hit by economic conditions and lack of access to care is clear. The difference between quality essential veterinary care and no care at all, our clinics have alleviated suffering and saved lives for tens of thousands of animals.

In addition, by giving future veterinary professionals the tools and encouragement to use their expertise to create real improvements in animal care and welfare, RAVS inspires volunteers to take the experience and dedication to service back to their own practices and communities – improving the health and welfare of animals and their families in communities throughout the world.

03/2024
RURAL AREA VETERINARY SERVICES
VOLUNTEER REQUIREMENTS AND EXPECTATIONS

Being a RAVS volunteer is all about dependability and initiative. To be an effective volunteer and to get the most out of your experience, you must be well prepared. The following information provides an overview of what to expect and what will be expected of you as a volunteer.

WHAT TO EXPECT IN THE FIELD

Field clinics can be a physically and mentally challenging experience. The work is hard, and the hours are long. You should expect to rise early in the morning (5 AM) and work for as many hours as are required to complete the clinic, often until 8 or 9 PM with limited breaks.

You should be prepared to live and work under a variety of conditions. The facilities that we stay in are safe, but often pretty basic. Sleeping arrangements will generally involve camping out on the floor in a vacant house, community center, or auditorium. Most communities will have showers. However, a large team of volunteers can put significant strain on local resources. Plumbing and/or hot water does not always work. Disposable wipes, waterless shampoo or other ‘camping hygiene’ items are good additions to your personal supplies.

Food and amenities are variable. We prepare many of our team meals as a group. In most communities primarily vegetarian food is served and those who feel they need to have animal products should plan to bring easily packed supplemental food items. While generally available for most meals, strictly vegan food may not always be abundant at all meals. In other words, if you have any specific dietary requirements, you should be prepared to pack some back up supplies. For everyone, having a few snacks on hand (granola bars, peanut butter, dried fruit and nuts, etc.) is always a good idea.

The Team

The size and makeup of each RAVS team will vary slightly. A typical surgical clinic team will consist of 35-45 people (8-10 veterinarians, 8-10 veterinary technicians/assistants, 15-20 students and 2-3 support volunteers), all supervised by a staff Trip Lead. The clinic is organized into four primary areas:

- Receiving (physical exams, assessment, medical treatment, client communication)
- Anesthesia (assessment, induction, monitoring, intensive care)
- Surgery (spay/neuter, instrument prep/sterilization)
- Recovery (post-surgical monitoring, intensive care)

Each area is overseen by RAVS staff Area Leads. Additional staff and professional volunteers work together with veterinary students and support volunteers to care for animals and clients in each area. The team will include new volunteers as well as seasoned RAVS alumni and will have a range of prior experience levels represented.

Volunteer Assignments

Professional and support volunteers may be assigned to any area of the clinic depending on experience, interests, and operational need. Veterinary students who have prepared fully in advance can generally expect to rotate through each area of the clinic. On a five-day clinic most students will spend one day in surgery and two days each in anesthesia and receiving. However, the scheduling of some trips may not allow for equal distribution of tasks, and you will be expected to work wherever you are most needed. In addition to clinical work, be prepared to share in all the various duties required to support a field clinic including cleaning, inventory, packing, paperwork, instrument prep, and occasionally cooking.

Your RAVS experience is likely to include a lot of hard work and a good number of personal and team challenges. It is also an amazing opportunity to meet incredible people and animals in communities you might never otherwise visit; to work with and learn from passionate and highly skilled professionals and to share experiences with dedicated students and other volunteers from all over the country as well as from other countries and to use your knowledge, energy, and skills to make life better for hundreds of animals and their families. Get ready for the adventure! We look forward to working with you!
PRE-TRIP CHECKLIST

☐ **Background Clearance, Confirmation / Volunteer Agreement** (all volunteers)
See website and acceptance emails for details

☐ **Submit Travel Plans** (all volunteers): Volunteers are responsible for transportation to and from the designated meeting site, and all ground transportation during the trip. A contact list will be distributed for each team via email. Please reach out to arrange ride-shares with others on your clinic team both to conserve resources and to reduce the number of vehicles traveling to the clinic sites.

Travel details for each trip are listed on the Schedule page of the website. Personal travel information must be submitted online no later than 30 days prior to your scheduled trip. Don't wait! Providing this information early will help us to coordinate trip logistics and make preparations for your team.

☐ **Submit Online Volunteer Training and Orientation Manual** (all volunteers)

☐ **Submit Online Training Evaluation** (all volunteers): A passing score (>80%) must be submitted by all volunteers no later than 30 days prior to your trip.

☐ **Prepare for Practical Skills Assessment** (veterinary students): See volunteer manual for assessment details. The better prepared you are, the better care we will be able to provide and the more opportunities you will have in the clinic. Plan plenty of time for pre-trip review and skills practice!

☐ **Obtain Necessary Supplies/Equipment**

**Required Items:**
- Sleeping bag and pillow
- Camping mattress
- Towel
- Comfortable shoes
- Scrubs (one pair/clinic day)
- Lab coat or smock
- Sweatshirt, jacket or other warm layer
- Personal items for the duration of the trip
- Mess kit with a plate, cup, and utensils
- Refillable water bottle
- Stethoscope
- Thermometer
- Calculator (small)
- Pens and permanent marker
- Small notepad (pocket-sized)
- Watch that counts seconds
- Sterile surgeon's gloves (6 pair/week)  
  *(veterinary students only)*

**Optional Recommended Items:**
- Small bandage scissors
- Extra cloth surgery caps / masks if desired
- Head lamp or small flashlight
- Snacks or other ready to eat personal food / beverage items as needed
- Coffee, personal coffee press  
  *(if you are particular about such things)*
- Ear plugs and/or sleeping mask
  *(sleeping space is usually shared)*
- Camping hygiene supplies
  *(baby wipes, extra roll of TP, etc.)*
- Insect repellent and sun block
- Hat to protect from sun  
  *Do not* bring fancy clothes, sparkly tiaras, large cameras or other valuables

☐ **Make final arrangements**, check weather, and travel forecasts, print out travel directions and field team contact numbers and get ready for an amazing experience!
RAVS SAFETY POLICY

Every effort is made to maintain volunteer safety during RAVS field clinics. All volunteers must read and agree to comply with the RAVS Safety Policy prior to participation. Volunteers will sign a release ahead of each clinic which includes a statement that they understand the safety policies as described here and that they will provide their own medical insurance while volunteering.

By participating in a RAVS clinic, you are agreeing to release The Humane Society of the United States and affiliates, its staff and consultants, and the supervising professionals from liability for injuries that may occur during the trip or while traveling to the site.

Health Insurance
Volunteers will be required to have personal health insurance, and to carry an insurance card on the trip.

Rabies Prophylaxis
We recommend that all volunteers have previous vaccinations for rabies and a titer check according to current CDC ACIP rabies vaccine recommendations. It is the responsibility of the volunteer to have this done. Volunteers who have not been vaccinated or do not have an acceptable titer will be able to handle animals at clinics only after signing a release of liability form which places all responsibility for post-exposure treatment and medical expenses in the event of a bite or other potential rabies exposure on the volunteer.

If confronted with an animal who they feel poses a threat, volunteers are to alert the RAVS staff in charge of the clinic. Training materials including information on safe animal handling will be required reading for all volunteers prior to the clinic. At the start of all trips an orientation will be held including a talk on animal handling and bite prevention.

If a bite occurs, it is the volunteer’s responsibility to alert the Trip Lead in charge immediately. RAVS personnel will make arrangements for the volunteer to receive medical care at a local medical clinic if needed. The volunteer will be responsible for any charges incurred. The physician at the local clinic will make recommendations on post exposure rabies prophylaxis and wound treatment.

General Personal Health and Safety Reminders for Personnel Working with Animals

- Wash your hands frequently with soap and water or waterless hand sanitizer, especially after handling any animal and prior to eating or smoking.
- Wear long pants and sturdy shoes or boots.
- Use gloves when handling animals and when cleaning up feces, urine, or vomit.
- Immediately wash scratches and bite wounds thoroughly. Keep scratches or other abrasions covered, especially when cleaning up after animals.
- Learn safe and humane animal-handling techniques and use proper equipment.
- Seek assistance when handling animals whose dispositions are questionable.
- If exposed to tick-infested areas, check your body and clothing frequently. Use tweezers and wear gloves to remove ticks, taking care not to squeeze or puncture the body of the tick.
- Report any bites or injuries to a supervisor and seek medical treatment as appropriate.
- Tell your physician that you work closely with animals and visit him or her regularly.
- Stay current on appropriate vaccinations, such as tetanus and rabies.
- If you are pregnant, immunocompromised or have other health concerns notify RAVS staff prior to the clinic and discuss any issues or special needs with the Trip Leader. Discuss appropriate precautions with your physician in advance and make modifications as necessary.
RAVS VOLUNTEER TRAINING PROGRAM

Each RAVS clinic team will be made up of volunteers from a range of backgrounds and experience levels. Once we gather onsite, we will have a very short period of time in which to get to know each other, set up and orient everyone to the clinic and their roles before we begin seeing patients. It is imperative that all volunteers come to the experience as prepared to learn and contribute from the start.

Training Materials

Volunteer Training & Orientation Manual: The protocols and techniques presented here have been developed to provide a standard level of care for the animals treated in our field clinics and allow for a standardized teaching curriculum. All volunteers are expected to follow these protocols and recommendations as they are written.

Virtual Clinic Walk-Through: A virtual walk-through file will be made available to volunteers prior to the trip. The walk-through is designed to provide an additional introduction to RAVS surgery clinics. The walk-through does not replace the content in this manual and all volunteers are expected to review both the presentation and this orientation manual.

Supplemental Video Instruction: Training videos are available on our website for review; these are designed to augment the materials found within this training manual.

If you have difficulty accessing information, questions about the material, or concerns about a specific protocol, please contact us by email (ravsvolunteer@humanesociety.org) well before your scheduled trip.

Pre-Trip Online Training Evaluation
An online training evaluation is required of all volunteers. The training evaluation is intended to review the clinic training materials available here to ensure that all volunteers are familiar with RAVS protocols and are prepared to function in the clinic setting. All volunteers are required to submit a score of 80% or higher on the online evaluation at least 30 days prior to your scheduled trip.

Topics covered in the evaluation:
-- Veterinary students: All training materials
-- Technicians/assistants and technician students: All materials except surgery sections
-- Veterinarians: All materials with focus on clinic protocols
-- Support volunteers: All materials except anesthesia and surgery sections

Practical Skills Assessment
All veterinary students will participate in a practical skills assessment at the start of the clinic to demonstrate proficiency in basic suture patterns and knot tying. Student participation and responsibility levels in surgery will be determined by the results of this assessment. Detailed requirements for the practical are outlined in this manual and learning tips are provided in the online videos. It’s up to you to practice and prepare. Many students over-estimate their preparedness and/or are more nervous than expected when taking the practical. Please make the time to practice and get coaching as needed before your trip.

In-Clinic Training
In-clinic training will include an initial introductory orientation, daily orientations in each clinic area and evening rounds to answer questions, discuss cases or review relevant clinical or professional topics. There is a lot of information to take in over a relatively short period of time! Pre-trip preparation by all volunteers, including thorough review of this training manual and sufficient skills practice is essential for smooth clinic operations.

Note for Veterinary Students and Veterinary Technician Students
Successful RAVS volunteers show initiative and resourcefulness. You will have the opportunity to work with an exceptional group of professional mentors in the field. The more prepared you are in advance, the more you will have a chance to do and the more you will gain from the experience. Students who put time and effort into preparation will be given a great deal of responsibility. To get the most out of your volunteer experience, it will be up to you to commit sufficient time to study and practice prior to the clinic.
Note for Professional Volunteers
During your field experience you are likely to be hands-on providing direct care as well as acting as a teacher and mentor to student volunteers in various areas of the clinic. To optimize clinic efficiency and student learning, a standardized training curriculum is presented. It is important that all volunteers be familiar with our protocols and approaches and are able to work within our established teaching guidelines.

Protocols in a field teaching clinic must take into account a particularly wide variety of factors and may differ somewhat from clinical protocols you routinely use. Additional details on specific clinical protocols for each clinic area will be presented during onsite orientations. If there is something that is unclear or you would like to discuss in advance, please contact us ahead of your scheduled trip.
SECTION 2: CLINIC STRUCTURE & PROTOCOLS

Rural Area Veterinary Services
RAVS FIELD TEAM ROLES AND RESPONSIBILITIES

The size and makeup of each RAVS team will vary slightly. On most clinics in the United States there are approximately 6-8 veterinarians, 6-8 veterinary technicians/assistants, 25-30 veterinary and veterinary technician students and 2-3 support volunteers, all supervised by a staff Trip Lead.

➢ Trip Lead
  ▪ Directs all clinic operations.
  ▪ Has final authority and responsibility for all clinic decisions.

➢ RAVS Staff / Area Leads
  ▪ Includes veterinarians and credentialed veterinary technicians.
  ▪ Assist Trip Lead in clinic coordination/operations.
  ▪ Oversee activities of all clinic volunteers.

➢ Volunteer Veterinarians
  ▪ Under the direction of RAVS staff, supervise activities of veterinary students and other volunteers in various areas of the clinic.
  ▪ Provide guidance and training for student volunteers.
  ▪ Evaluate animals with identified health concerns and recommend treatment according to RAVS standards and protocols.

➢ Volunteer Veterinary Technicians and Assistants
  ▪ Provide technical support and nursing care in all areas of clinic operation.
  ▪ Under the direction of RAVS staff, experienced technicians provide guidance and training of students and other volunteers in anesthesia, recovery and intake.

➢ Support Volunteers
  ▪ Assist with clinic operations as directed by RAVS staff.
  ▪ Support volunteers will most frequently assist with intake and client education.

➢ Student Volunteers - Veterinary / Veterinary Technician
  ▪ Participate in all aspects of clinic operations.
  ▪ See below for more information.

Experienced RAVS personnel will be assigned as Area Leads in each clinic area (Receiving, Anesthesia, Surgery, Recovery). Volunteers will report to the section lead for their assigned area who, in turn, report to the Trip Lead. The Trip Lead has final authority on all clinic operations.

Volunteers will be assigned to clinic areas based on interests/experience and operational needs. Veterinarians will most often be assigned to the receiving or surgery teams. Veterinarians will occasionally be asked to help oversee recovery. Veterinary technicians and assistants are most frequently asked to work in anesthesia or recovery but may be assigned to receiving or other areas as needed. During each clinic, veterinary and veterinary technician students will rotate through most areas of clinic operations (receiving/discharge, anesthesia, surgery, recovery). While every effort is made to distribute assignments evenly, it is not always possible to do so.

Patient welfare takes priority in all assignments. Volunteers will be expected to work wherever they are most needed based on clinic flow and patient need.
CLINIC POSITIONS

Receiving

➢ **Receiving Lead** - RAVS staff veterinarian. Oversees Intake/Receiving operations. Point of contact for all medical case decisions/questions.

➢ **Intake Coordinator** - First contact with clients. Explains services and encourages clients to take advantage of appropriate services. Coordinates discharge process.

➢ **Intake Support Volunteers** - Assist clients in completing appropriate paperwork. Discuss basic animal health and husbandry issues with clients and community residents.

➢ **Intake Veterinarians** - Supervise and assist student intake teams with physical examination, diagnosis and treatment of incoming animals according to RAVS standards and protocols.

➢ **Student Exam / Assessment Teams** - Teams of two veterinary students, or one veterinary student and one technician student, are responsible for examination of patients and administration of appropriate preventive treatments, etc. Maintain medical records and communicate findings to clients.

Discharge – The Receiving team is also responsible for discharging surgery patients. Verify completeness of medical record, review findings and treatments with client and provide post-surgery instructions. Ensure patients are cleared by a RAVS staff member prior to release.

Anesthesia

➢ **Anesthesia Lead/Triage** - RAVS staff technician. Oversees Anesthesia functions. Point of contact for all anesthesia case decisions/questions. Evaluates and prioritizes patients, distributes premeds, assigns anesthetists and coordinates all anesthetic protocols/processes.

➢ **Induction Technicians** – Technicians responsible for induction process. Administer induction agents, supervise/assist students with intubation, monitoring and preparation of surgery patient.


➢ **Recovery Lead/Coordinator** - Most often a RAVS staff Technician or Veterinarian overseeing recovery area. May also be an experienced volunteer Technician or Veterinarian. Supervises and assists student anesthetists with patient monitoring and addressing post-procedure complications. Releases animals from recovery area as per recovery protocol.

➢ **Anesthetists** - Veterinary and veterinary technician students responsible for anesthesia of surgery patients, from post pre-med evaluation through recovery. Act as patient advocate.

➢ **Anesthesia Support** - Administer pre-medications. Place IV catheters or restrain for IV catheter placement. Provide pre- and post-surgical patient support as directed by Anesthesia Lead.

➢ **Recovery Support** - Work with Recovery Lead/Coordinator to provide care and monitoring of patients until fully recovered and discharged.

Surgery

➢ **Surgery Lead** - RAVS staff veterinarian. Oversees all surgery functions. Evaluates and assigns surgical cases. Point of contact for all surgical case decisions/questions. Manages complex or complicated cases.

➢ **Surgery Veterinarians** - Perform surgery, supervise and train veterinary students according to standard RAVS surgical protocols.

➢ **Student Surgeons** - With veterinary mentorship perform, assist, or observe procedures as appropriate. Responsible for cleaning and wrapping used surgery packs. Write surgery report. Responsible for ensuring that entire medical record is accurate / complete before patient is discharged.
CLINIC LAYOUT

This schematic shows a typical RAVS surgical teaching clinic layout. In most cases, clinics are set up in a large community center or gym with this basic layout as if viewed from overhead. The exact setup of the clinic will vary slightly depending on the facility and available space.
This photo of the general clinic setup shows cat receiving & recovery tents to the left, dog exam tables in the foreground, and dog holding kennels (covered with sheets) to the right. The anesthesia and surgical areas are in the background.

This photo of the anesthesia and surgery areas shows surgery tables in the background; surgery prep area and dog recovery zone to the right; anesthesia supply table and induction tables in the center, and surgery boards and anesthesia triage table to the lower right

(Photo credit: Lance Murphey)
PATIENT FLOW AND MEDICAL RECORDS OVERVIEW

PATIENT FLOW
RAVS clinics operate similarly to brick and mortar clinics in that clients check in at registration and wait with their animals to be seen. The patients are evaluated for surgical/anesthetic suitability, and if cleared for surgery, are admitted for the day. At the day’s end patients are discharged back to their family.

During most surgery clinic days, and on the final clinic day, certain patients will also be seen for health checks, preventive care, and/or assessment for illness or injury. These patients are not typically admitted for the day, thus only go through the first two areas of the clinic.

MEDICAL RECORDS
Quality medical record-keeping is a skill best learned early on. The medical record is a legal document and is a gift to your patient, the client, as well as to your colleagues who will be reading the record. On a RAVS clinic this includes veterinarians, veterinary technicians, support volunteers and students.


Any animal over 12 weeks old and who receives a rabies vaccination is also given a rabies certificate and tag. The rabies certificate can save patients’ lives - filling them out accurately and completely is critical. Details of this will be presented later in the manual and on site.

Patients under 12 weeks old may receive rabies vaccine but DO NOT receive a rabies certificate and tag. They should be revaccinated at 12 weeks of age and issued a rabies certificate at that time.

Medical records and rabies certificates from every clinic are electronically scanned post-clinic for data collection purposes and for program staff to refer to should clients have questions about their animals after a clinic has concluded. The details of how/when to fill out each section of RAVS’ medical records will be reviewed throughout this training manual as well as during on-site orientations.

Important general reminders when completing medical records:
- Write legibly.
- Record your name wherever the record indicates.
- Initial and record the time next to any treatments administered.
- Fill out every part of a section for which you are responsible.
  - RAVS’ records often utilize check boxes for various treatments or tests. Boxes should be checked only after the treatment has been administered (do not “pre-check” boxes). Always, ensure the appropriate box is checked once the treatment occurs to avoid accidental double treatments.
- Double check the record. Triple check when you are tired.
- When in doubt, ask.

**See Appendix for sample copies of RAVS’ Medical Records and Rabies Certificates**
INTAKE PROCESS / INTAKE COORDINATOR DUTIES

The clinic receiving process involves the initial client registration, acquisition of medical history, physical examination, anesthetic/surgical risk assessment, preventive needs and treatments and client education. Clients are registered on a first come, first serve basis.

Intake Coordinator: The role of the Intake Coordinator is to greet incoming clients, determine their need for services and maintain a registration list to provide for an organized intake and discharge process. This position also affords an excellent opportunity to talk with clients about their animals and to provide educational information and materials as appropriate. The Intake Coordinator position is critical to smooth clinic operations and must be filled by an experienced and knowledgeable volunteer.

Intake Assistant Volunteer: Intake support volunteers assist the Intake Coordinator with many aspects of the intake role.

INTAKE RESPONSIBILITIES:

- **Greet client** and determine what type of animals they are bringing in. ALL clients must sign in with the Intake Coordinator before completing any paperwork.

- **Assist clients with animal handling**—provide leashes or carriers as needed. Separate highly agitated, fearful, or stressed animals to a quieter area.

- **Explain services offered and determine the animal/client's needs.** The client may not know what the animal needs or what services we can provide. Explain how the process will work (paperwork/medical history, physical exam/vaccinations and de-worming, drop off for surgery, anesthesia/surgery, recovery, pickup later in the day . . .)
  - On surgery days confirm they do want surgery for their pet. Pets who are not sick/injured and present for wellness only will be seen later in the day, after surgery intake is complete.

- **Explain that there will be a wait** as the health assessment teams examine each incoming animal to be sure he/she is healthy enough for surgery/vaccinations.

- **Record appropriate information on Clinic Registration List** *(see example below)*
  - Client name
  - Animal names and types
  - Type of service requested
    - Any non-routine requests will need to be evaluated by the Trip Lead or Receiving Lead DVM during the exam appointment.
  - Additional notes to help identify client or flag for special attention
  - Record a phone number, preferably one that can receive texts.

- **Maintain running tally of services requested**. This allows us to accept an appropriate number of patients as decided by the Trip Lead and prevent clients from waiting only to find the clinic is full. Update the Trip Lead regularly until the maximum patient number (determined in advance) has been reached.

- **Assign a Receiving Team to each family.** When a Receiving Team is available, they will consult the Intake Coordinator for the next patient. **Direct the receiving team to their next client, mark as received, and note time assigned.**

- **Delegate Intake Assistant(s) to assist clients in completing the appropriate paperwork** for animals waiting.
  - Female/Spay-Yellow Form; Male/Neuter-Blue Form; Vaccine Only-Tan/White Form
  - Intake volunteer should obtain necessary information to complete the client information, animal information and patient history sections of the form.
Review the ‘Consent for Anesthesia and Surgery’ with the client and have them sign the form for EACH animal they are bringing in. EVERY ANIMAL HAVING SURGERY MUST HAVE A SEPARATE COMPLETED AND SIGNED CONSENT FORM.

Clients should NOT complete the medical record paperwork on their own as it is important for history to be a conversation with open-ended questions in order to gain the most thorough understanding of an animal’s health. It is particularly important that an experienced person review the Consent for Anesthesia and Surgery and the Patient History with the client, explaining each section and obtaining more information as needed.

Obtain a contact phone number where the client can be reached should a question or problem arise with the animal. This is also how we will notify the client when their animal is ready to go home. If the client does not have a telephone, try to get the number of a friend or neighbor who can be contacted. Mark if phone is able to receive texts.

While clients are waiting for their animal to be examined, the Intake Coordinator and Intake Assistants should take advantage of the opportunity to talk informally with clients about their animals. We want clients to have a positive experience seeking veterinary care and to feel comfortable leaving their animals in our care.

Important Notes:

Most clinic days patients will be accepted on a first come first serve basis from 8:00 am from the start of the day until the schedule is full (# determined by Trip Lead). In some communities, surgery days will be separate from vaccine-only days. In other locations, surgery patients will be admitted starting in the morning until full, and vaccine-only patients will be seen in the afternoon. Some flexibility can be used after consultation with Trip or Receiving leads. For example, If one family is presenting several animals for different services, we would prefer to see them all at the same time. However, care must be taken to avoid creating conflict between community members if exceptions are made for some but not others.

Once a client signs in, they MUST wait for their name to be called. If they leave the clinic site and miss their turn, they will have to wait until the end to be seen if there is space.

If there is a long wait expected before they are seen in the morning, the Intake Coordinator may give the client the option to leave and come back at an appropriate time explaining that there may still be a wait when they return and that they must be here when we call their name.

Clients MUST wait with their animal until a physical exam has been completed and the animal has been cleared for surgery. If the client absolutely cannot wait, an occasional exception can be made at the discretion of the Trip or Receiving Lead. In this case, it is the Intake Coordinator’s responsibility to make sure a consent form has been signed, the patient history has been reviewed and we have a contact number where the client can be reached ALL DAY. If a number is not available, the client must wait until the animal can be seen. The Intake Coordinator must take responsibility for having the animal examined.

*Exceptions are highly discouraged and can be a sensitive area as other clients may see you bend the rules for one person which can cause conflict among community members and bad feelings toward RAVS.

When the surgery list is full for the day, a sign should be posted indicating that the clinic is full and include the future clinic schedule (if applicable).

Pre-registrations for the next day are NOT to be accepted in advance. Registration will proceed on a first-come basis each day unless prior arrangements have been made by the host community to take scheduled appointments.

After an animal has been examined and cleared for surgery, the client should be informed that they will be contacted via call or text when their animal is ready to go home, which will usually be between 2-8pm. An estimated time for discharge should not be given as this can vary for several reasons. It is important that clients understand that there are a
number of variables that effect the time their animal is ready to go home (number/type of surgeries that day, priority medical/surgical cases, individual variation in anesthetic recovery, etc.). Some animals may not be ready to go until very late in the evening and surgeries are not performed in the order they arrive due to medical factors.

- **Please do not try to alter the intake process.** Many years of trial and error have gone into developing a process that most efficiently serves the most animals with the least potential for confusion or frustration for volunteers or clients. Your suggestions are valuable though! If you have questions or ideas, please feel free to discuss them with RAVS staff.

### EXAMPLE: CLINIC REGISTRATION LIST – SURGERY

Clinic Location: **Somewhere Amazing**  
Date: **1/11/2024**

*1 animal per line helps keep the list organized (e.g. 6 animals in 1 family = use 6 lines)*

<table>
<thead>
<tr>
<th>Hx</th>
<th>Rcv Time</th>
<th>Team</th>
<th>Rcv</th>
<th>RTG</th>
<th>D/C</th>
<th>Pt #</th>
<th>Client Name</th>
<th>Patient Names</th>
<th>CS</th>
<th>CN</th>
<th>FS</th>
<th>FN</th>
<th>O</th>
<th>Notes / Phone</th>
<th>Run Tot</th>
</tr>
</thead>
<tbody>
<tr>
<td>√</td>
<td>8:05</td>
<td>Tom/Jerry</td>
<td>√</td>
<td>√</td>
<td>1</td>
<td>Sally Jones</td>
<td>Scruffy</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Green van behind bldg 555-335-2323</td>
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<tr>
<td>√</td>
<td>8:15</td>
<td>Jack/Jill</td>
<td>√</td>
<td>√</td>
<td>A</td>
<td>Horace Hoffman</td>
<td>Eenie</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sitting outside xxx-xxx-xxxx</td>
<td>-</td>
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<td>√</td>
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<td></td>
<td></td>
<td>Can only pickup after 8pm</td>
<td>-</td>
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<td></td>
<td>Lives 2 hours away</td>
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<td></td>
<td></td>
<td>1 kit has sniffles ccc-ccc-cccc</td>
<td>6</td>
</tr>
<tr>
<td>√</td>
<td>8:43</td>
<td>Sara/Lee</td>
<td>√</td>
<td>√</td>
<td>3</td>
<td>Matilda Smith</td>
<td>Fluffy</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yellow truck CAUTION! 222-222-2222</td>
<td>7</td>
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</tbody>
</table>

### EXAMPLE: CLINIC REGISTRATION LIST - VACCINE ONLY

Clinic Location: **Somewhere Amazing**  
Date: **1/11/2024**
PATIENT DISCHARGE PROCESS

All patients MUST be officially cleared by RAVS staff member prior to being discharged.

PATIENT TRACKING & RELEASE (Intake Coordinator / receiving volunteers)

- The Intake Coordinator is the point person for discharging animals, using the Intake Registration List to track patients and communicate status to clients.

- All patients must be cleared by a RAVS staff member prior to being discharged. When an animal is out of recovery and has been cleared for discharge, a staff member will initial the patient record on the bottom right corner. Mark the patient as Cleared/Ready to Go (RTG) on the Discharge List. The client can be contacted by phone at this time with an invitation to pick up their animal (check the status of other animals in the same family prior to calling for a pickup as repeat visits to the clinic may be a hardship for some families).

- When the client arrives for pick-up, if patient has been cleared, a receiving student or other assigned volunteer should review the discharge instructions with the client.
  - It is best to review all discharge instructions prior to bringing the animal out to the family so that the client can concentrate on the information.
  - Review any medications being dispensed and demonstrate administration techniques.
  - Show the client the incision and tattoo (on dogs only since cats should remain in their carriers/boxes) and explain what it looks like and what to watch for.
  - Before returning the animal to their family, be sure any bandages have been removed.

- Important Note: Before an animal is released, their general condition should be briefly assessed (mentation, MM/CRT) by the student facilitating the release. If any potential abnormalities or concerns are noted prior to release, consult staff to have the animal reassessed. Even if the animal was cleared by a staff member earlier, conditions can change and may warrant attention before the animal is released.

- Encourage clients to call or return to the clinic (if team will be there) at any time day/night if they have any questions or concerns. It is much easier to see an animal on recheck while we are still in town than to troubleshoot complications long-distance.
RECEIVING PROCESS: PATIENT FLOW AND TEAM RESPONSIBILITIES

The clinic receiving process follows patient registration and includes review of medical history, physical examination, anesthetic/surgical risk assessment, vaccination needs assessment, initial treatments, and client education.

The Receiving Team consists of the Receiving Lead (RAVS staff), volunteer veterinarian(s), veterinary students and veterinary technician students. On some clinics veterinary technicians or assistants or clinic support volunteers may also participate on exam teams.

Some of the animals in the communities we serve may be in very poor physical condition due to lack or resources. Poor nutrition and internal and external parasite infestations are common. Most have never seen a veterinarian before. It is important to be open and non-judgmental when evaluating an animal and communicating with clients. Although they may lack the resources or information needed to provide optimum care, our clients care about their animals very much.

Our goal is to help clients and communities learn more about the health and care of their companion animals and how they can best provide for them given available resources. Economic and other constraints on an individual or community (remote locations, lack of access to veterinary care and animal care products, etc.) must be taken into consideration when making recommendations. If you have any questions about local conditions or resources, please do not hesitate to consult a RAVS staff member.

Discussing treatment options with clients visiting a RAVS clinic is the same as it is in any regular clinic back home. Whether in a university teaching hospital, a one doctor small town clinic or RAVS field clinic, clients should always be presented with all reasonable options. It is our job to explain what diagnostics and treatments are available and the estimated costs, risks and benefits of each. The client must be allowed to determine which alternatives are feasible and supported in making the treatment decisions that are most appropriate for their animal and situation.

Although RAVS’ services are focused on providing basic preventive health care, we are sometimes able to provide other services to care for ill or injured animals. Any animal requiring diagnostics or treatment outside of our basic clinic services should be evaluated by a RAVS staff veterinarian.
**PRE-SURGICAL RECEIVING PROCESS**

**Receiving Process Outline:** Teams of two veterinary students or a veterinary student and a veterinary technician student are responsible for examination and assessment of patients and administration of appropriate treatments. RAVS staff veterinarians and volunteer veterinarians will be available for consultation and assistance throughout the process.

1. **Accept case** from Intake Coordinator then **greet client.**
2. **Review consent** form and **verify services** requested.
3. Obtain **patient history** and/or confirm responses.
4. Perform **physical exam** / record findings.
5. **Communicate findings and treatment options** to client and address concerns or questions.
6. Administer **treatments**: anti-parasitics / additional pre-surgical treatments, then record treatments.
7. Assess **vaccination needs** / **highlight** on record.
8. Fill prescription medications, if needed.
9. **Complete appropriate sections of Animal Care Record** (discharge form)
10. Add patient to **surgery board** / record patient number on record.
11. **Review medical record** for completeness / accuracy.
12. **Kennel animal** / Inform client they will receive a text/call when patient is ready to go home.
13. **Clean caddy** / prepare for next case.
14. Return to Intake Coordinator for next case.

**The Details:**

➢ **Consult Intake Coordinator** for next patient assignment.

➢ **Greet client.** Introduce yourself and your teammate.

  “Hi, my name is Susan and this is John. We are veterinary students and will be asking you some questions and examining Fluffy. If any questions come up, we will ask a supervising veterinarian to also examine Fluffy. As long as Fluffy’s health checks out, we’ll get her admitted for her spay surgery today and ensure she receives any preventive care to help keep her healthy…”

➢ **If client information** has not yet been completed on the paperwork, please do this. Clinic volunteers should complete all paperwork - the client should not write in the record themselves. However, ensure the **client’s signature is obtained** on the consent form.

  ▪ Ensure we have a valid phone number where the client can be reached during their animal’s stay is should a question or problem arise with the animal. If the client does not have a telephone, try to get the number of a friend or neighbor who can be contacted. Indicate if client’s phone number can receive texts.
If the animal history section is not yet completed, obtain a history prior to handling the patient. Take a brief but thorough clinical history from the client using the questions on the receiving form. Ask any follow-up questions necessary to clarify responses. Ask if the client has any questions or concerns about their animal. Verify vaccines the animal has previously received and determine what vaccines or treatments are currently needed. If the history was completed by the intake team, be sure to review with the client and ask confirmatory questions as needed as sometimes the client will recall additional information. Any history question with a ‘Yes’ response will generally warrant follow-up questions to further assess potential concerns. No question on the history form should be left blank.

Perform a thorough physical examination on the animal.

- **DOGS** are examined car-side or on exam tables inside the building. All dogs should wear a slip lead during the examination. If a leash should stay attached to the dog for safety once placed into a kennel, convert the lead to a figure 8 harness for patient safety. Attach an additional lead as needed to make the leash length safely accessible later.

- **CATS** are examined inside a cat tent. Cats should have a figure 8 slip lead harness placed before the exam begins. The harness should be left on the patient for the duration of their clinic stay.

- **Wear exam gloves** for any patient < 5 month of age or less. When in doubt, wear gloves.

- Be careful and accurate but remember that we will often treat over a hundred animals in a day, so efficiency is important. Accurately and thoroughly **record** all exam findings.

- If at any time an animal becomes too agitated or aggressive to safely handle for an exam, stop - give the animal time to relax and ask for assistance from the Receiving Lead.

Communicate findings to the client. Explain any health concerns and recommendations and address any other questions or concerns the client may have.

- If you have any questions or concerns about an animal’s condition OR if a patient meets any RAVS Alerts, consult a veterinarian. **Animals with alerts must be evaluated by a veterinarian before they can be admitted for surgery.**

- Any findings that may impact anesthesia or surgery (heart murmur, cryptorchid, pregnant, etc.) should be noted on the 'Alerts' section of the anesthetic record.
Administer **anti-parasitic treatments** and **pre-surgical anti-anxiety medication** as appropriate.

- Dogs > 5 months and < 6 years will receive trazodone by the student receiving team.
- Cats > 5 months will receive gabapentin. This may happen during your appointment or after the cat is admitted.
- If there are treatments needed in Recovery (i.e. ear cleaning) highlight this on the recovery section under Tx Needed

Place paper collar with patient’s name (first and last) on all dogs (if safe to do so). Label all cats in carry/kennel with first and last name, collars are not required for cats.

**Place dogs in a holding kennel.** Cats stay in their own kennel (if it is safe and secure – a cardboard cat carrier is not secure!) or are moved to a wire kennel within the cat receiving tent. Cover kennel if appropriate to help reduce stress.

- If an animal has displayed any potential aggression to humans or animals or if an animal is extremely fearful, consult the Anesthesia Lead before kenneling as alternative plans may be made. If an aggressive animal is eventually placed in a kennel, the kennel should be labeled with a CAUTION sign.

Complete appropriate sections of the **Animal Care Record.** This is the client’s discharge care sheet. Receiving teams will mark any preventives administered during the appointment along with due dates for all preventives (including vaccinations). As teams will not be giving vaccines during the pre-surgical exam, do not check the box for these on the Animal Care Record. The induction team will physically check the boxes for vaccinations.

**Highlight any needed vaccinations** on anesthesia page of the record under Induction Procedures Needed.

Write the requested information on the appropriate **surgery board** under the next available number (dogs) / letter (cats). Be sure to write this number on the top of every page of the record in the hashtag box.

Place neon duct tape on front of kennel with patient’s surgery #/Letter and name written clearly (last name is also helpful)

**Verify** all pages of the medical record are completed.

If any **dispensed medications** are needed, ensure these are recorded properly in the record, a label created and placed on a zip lock bag, and the bag placed with the patient record in a plastic sleeve and placed in the anesthesia bin. See Prescribing Medications for further instruction.

Place all completed records, inside plastic sleeve, in anesthesia bin at triage table.

**Helpful Tips:**
- When handling a multi-patient appointment, write the animal’s name on the top of each page of the record. This helps ensure the correct animal’s information is recorded onto the correct record.
- Keep a slip leash and a handful of exam gloves always available in your pocket.
- Efficiency tip: Examiner verbalizes physical exam findings for exam partner to record.
- Prep in advance: anti-parasitics and anxiolytics (trazodone and/or gabapentin) can be pulled up in advance by one team member while the other is reviewing history or talking with the client.
- If patient history indicates a temperature is needed, obtain at the end of your exam as this can be stressful for patients and make them less inclined to cooperate for the rest of the exam.
Utilize receiving area equipment & resources to aid in safe, efficient, and thorough patient care

➢ Exam Caddies
   ▪ Each team will use a small plastic caddie containing commonly used items such as syringes & needles, along with small bottles of preventives for ease of patient-side dosing.
   ▪ Keep the caddy clean between families to help control spread of infectious disease.

➢ Handling Aids: Towels / Blankets / Muzzles / Treats
   ▪ Low stress handling can facilitate a thorough exam and help minimize risk of injury to the animal or handlers.
   ▪ Safety of animals and people are priority!
   ▪ Muzzles, when used properly, can be a helpful tool in certain situations though should be on a patient for the least amount of time possible. Always have a plan and all necessary supplies ready to go before placing a muzzle.

➢ Laboratory
   ▪ Includes basic diagnostics including parvo snap tests, glucometer, microscope, stat-spin for checking PCV/TS
   ▪ Efficiency tip: if result of test will not change plan, gather sample but evaluate after the patient is admitted or during downtime later in the day.

➢ Pharmacy
   ▪ We keep a well-stocked basic pharmacy for a variety of patient needs.
   ▪ Consider medications and dosing strategies to facilitate client compliance.

➢ Clinic Library
   ▪ Variety of clinical reference books available as needed.
   ▪ RAVS Formulary will be available onsite.

➢ Animal Health and Disease Information Sheets for Clients
   ▪ Available at the Intake Desk

➢ Receiving Cheat Sheet
   ▪ Keep this in your pocket! 😊
RAVS TREATMENT PROTOCOL
PREVENTIVE MEDICINE: VACCINES & ANTI-PARASITICS

The standard RAVS core wellness care protocol includes:

- Vaccination
- Deworming
- Administration of a flea and tick treatment product

VACCINATION

Available vaccines include:

- **DAPP (MLV):** Canine Distemper-Adenovirus-Parovirus-Parainfluenza Modified Live Virus
  - Requires reconstituting with diluent
- **FVRCP (MLV):** Feline Viral Rhinotracheitis-Calicivirus-Panleukopenia Modified Live Virus
  - Requires reconstituting with diluent
- **Rabies (KV):** Killed Virus, 3 year licensed for use in Dogs and Cats
  - Does not require reconstituting

RAVS supports triennial vaccination when appropriate, however given high risk of disease exposure and lack of available follow-up in the communities we serve, we generally recommend that adult animals are vaccinated annually for DAPP or FVRCP.

Vaccines should always be kept chilled. Those requiring reconstitution should be prepared immediately before use. Vaccines are drawn up using a 3 ml syringe. A new needle (22g or 25g) is placed on the syringe before administration.

Consult with RAVS Staff:

- **BEFORE recommending vaccination for patients with the following exam findings:**
  - severely dehydrated, lethargy/ depressed mentation or other significant abnormalities on physical examination.
- **BEFORE recommending vaccination for senior patients** so that risks and benefits can be discussed with the client. Adult dogs and cats > 10 years of age, with previous history of annual (or triannual) DAPP or FVRCP vaccination, may not need to be re-vaccinated.
- **When examining puppies and kittens less than 4 weeks of age to discuss vaccination and preventive treatments most appropriate for their lifestyle.**

When are the vaccines administered during a RAVS clinic?

- **Surgical patients:** Vaccines are administered at induction by the anesthesia team.
- **Non-Surgical patients:** Vaccines are administered by the receiving team as part of the exam appointment.
CANINE VACCINE PROTOCOLS

➢ **Adult Dogs and Older Puppies (≥ 20 weeks old)**
  - DAPP (MLV) – subcutaneous injection, right lateral forelimb
    - Revaccination is recommended in 1 year.
    - Eruption of adult canine teeth can be used as an indicator of 20 weeks of age.
  - Rabies (KV) – subcutaneous injection, right lateral hindlimb
    - See note below regarding rabies vaccine duration and timing of boosters.

➢ **Pregnant or Nursing Bitch:**
  - After a conversation with the client about the low but potential risks, and with client consent, vaccinate as per standard protocol for dogs five months of age or older using modified live DAPP and killed virus rabies vaccines.
  - While vaccination of pregnant dogs may not be routinely recommended in other practice environments, the significant and life-threatening risk of infectious disease in the communities RAVS serves often outweighs the small risk of vaccine-related issues for our patients.

➢ **Puppies (4 - 20 weeks old)**
  - DAPP (MLV) – subcutaneous injection, right lateral forelimb
    - DAPP is routinely administered beginning at 4 weeks of age.
      - *See below for puppies < 4 weeks of age*
    - Puppies should receive repeat vaccinations every 4 weeks until adult canines erupt (approximately 20 weeks of age).
    - Once adult canines are visible, revaccination is recommended in 1 year.
  - Rabies (KV) - subcutaneous injection, right lateral hindlimb
    - Puppies can be administered rabies vaccinations beginning at 4 weeks of age.
    - **Puppies vaccinated before 12 weeks of age need to be revaccinated for rabies at or after 12 weeks of age. A certificate is ONLY issued for dogs/puppies 12 weeks of age and older.**
      - *See Rabies Vaccine Certificate section regarding rabies vaccine duration and timing of boosters.*

➢ **Puppies less than 4 weeks of age: Consult RAVS staff**
  - Staff will have a conversation with owners of puppies less than 4 weeks of age to determine vaccination schedules for neonates. Evidence shows that DAPP and/or rabies vaccination is potentially life-saving and poses little risk. Considerations include risk assessment, ongoing access to vaccination and preventive care, and client preference.
FELINE VACCINE PROTOCOLS

➢ **Adult Cats and Older Kittens (≥ 20 weeks old)**

- **FVRCP (MLV)** - subcutaneous injection, distal right forelimb
  - Revaccination is recommended in 1 year.
  - Eruption of adult canine teeth can be used as an indicator of 20 weeks of age.

- **Rabies (KV)** - subcutaneous injection, distal right lateral hindlimb
  - See note below regarding rabies vaccine duration and timing of boosters

➢ **Pregnant or Nursing Queens**

- After a conversation with the client about the low but potential risks, and with client consent, vaccinate as per standard protocol for cats six months of age or older using modified live FVRCP and killed virus rabies vaccines.
- While vaccination of pregnant queens may not be routinely recommended in other practice environments, the significant and life-threatening risk of infectious disease in the communities RAVS serves outweighs the small risk of vaccine-related issues for our patients.

➢ **Kittens (4 - 20 weeks old)**

- **FVRCP (MLV)** - subcutaneous injection, distal right forelimb
  - FVRCP is administered beginning at 4 weeks of age.
  - Kittens should receive repeat vaccinations every 4 weeks until adult canines begin to erupt (~ 20 weeks of age).
  - Once adult canines are visible, revaccination is recommended in 1 year.

- **Rabies (KV)** - subcutaneous injection, distal right hindlimb
  - Kittens can be administered rabies vaccinations beginning at 4 weeks of age.
  - **Kittens vaccinated before 12 weeks of age need to be revaccinated for rabies at or after 12 weeks of age.** A certificate is ONLY issued for cats/kittens 12 weeks of age and older.
  - See Rabies Vaccine Certificate section regarding rabies vaccine duration and timing of boosters.
Rabies Vaccine Certificate Due Dates - dogs and cats OVER 12 weeks of age only

When to recommend booster vaccination in 1 year:
- If vaccine administered today is the patient's first rabies vaccine after 12 weeks of age, or no record of previous vaccination is available a one-year rabies certificate will be issued.

When to recommend booster vaccination in 3 years:
- If the patient has had a previous rabies vaccination after 12 weeks of age and has record of vaccination a three-year rabies certificate can be issued.

It is OKAY to vaccinate for rabies up to 6 months before the next scheduled due date. We advise this in any case where there is limited access to rabies vaccinations and veterinary care. This prevents the animal from becoming overdue in the future.

Newly vaccinated animals are not fully protected against rabies for 1 month following vaccination! Maximum immunity following subsequent booster rabies vaccines is reached in a few days.

➢ RABIES VACCINATIONS IN PUPPIES AND KITTENS: At RAVS clinics off-label rabies vaccination of puppies and kittens under 12 weeks of age is recommended due to the lack of regular access to veterinary care/ vaccinations in combination with the presence of free roaming animals including wildlife. For many animals, a visit to our clinics might be a once in a lifetime opportunity. Evidence has shown vaccination under 12 weeks of age may be protective and is very low risk. Jurisdictions may not recognize this vaccination as meeting legal rabies vaccination requirements (if required by tribal, state, or local ordinances) and clients will be counseled accordingly.
  - Revaccination is needed at or after 12 weeks of age.
  - Rabies certificates will only be issued for dogs and cats vaccinated at or after 12 weeks of age.
FELINE FLEA TREATMENT & DEWORMING

➢ Apply selamectin (Revolution®) topically on the skin between the shoulder blades to cats and kittens ≥ 4 weeks of age to control fleas and some ticks.
➢ Selamectin is also effective in cats for treatment of ear mites, hookworms and roundworms.
➢ First dose is applied during patient examination. Advise client that Revolution® or other flea/tick treatment should be repeated in a month.
➢ Dose: 6-12 mg/kg [0.3 ml / 5 kg using large K9 product (120 mg/ml)]

<table>
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<tr>
<th>REVOLUTION (Selamectin)</th>
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<tr>
<td>120 mg/ml</td>
</tr>
<tr>
<td>6-12 mg/kg</td>
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<tr>
<td>=0.05-0.1 ml/kg</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Revolution (ml)</th>
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</thead>
<tbody>
<tr>
<td>0.5-0.9 kg</td>
<td>0.05 ml</td>
</tr>
<tr>
<td>1 - 2</td>
<td>0.1</td>
</tr>
<tr>
<td>3 - 4</td>
<td>0.2</td>
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<tr>
<td>5 - 9</td>
<td>0.45</td>
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</table>

CANINE FLEA AND TICK TREATMENT

➢ Adult Dogs and Older Puppies (≥ 20 weeks old): Seresto® (flumethrin/imidacloprid)
  ▪ Place a Seresto® collar on dogs (≥ 20 weeks old during patient examination. Seresto® collars are highly effective for killing and repelling fleas and ticks.
    ▪ Collars come in 2 sizes - small (dogs ≤ 8 kg) and large (dogs ≥ 8 kg).
    ▪ Collars should be placed snugly with the ability to place two fingers beneath the collar. Collars that are too loose will be ineffective.
      - Owners of dogs < 1 year of age should be counseled to check collar for tightness as dog grows. Collars can be loosened as needed.
    ▪ Duration of action for Seresto® collars is 8 months and should be removed and replaced at that time.
      • The date of placement is written in sharpie on the collar.
      • In some communities colored zip ties are used to denote the month. Trip leads will inform the team if zip ties coding is in use.

➢ Puppies (8 - 20 weeks old): Bravecto® (fluralaner)
  ▪ Apply Fluralaner (Bravecto®) topically to puppies 8-20 weeks old for treatment of fleas and ticks.
  ▪ First dose is applied during patient examination. Advise client that Bravecto® or other flea/tick treatment should be repeated in one month for puppies.
  ▪ Dose used is 22.5 mg/kg for puppies and lasts for up to 3 months.

➢ Note on fluralaner/bravecto dosing: Dogs > 6 months of age can be dosed up to 50 mg/kg for a duration of 3 months (see mange protocol)
ROUTINE DEWORMING

Intestinal parasite treatment for hookworms and roundworms

- **Adult Dogs (≥ 20 weeks old)**
  - Administer oral dose of pyrantel pamoate (1ml/4.5kg) at time of exam.
  - Recommend next dose due in 1 year.
  - Pregnant and nursing dogs- send second dose home to be administered 14 days after the initial dose.

- **Puppies (2 weeks – 20 weeks old)**
  - Administer oral dose of pyrantel pamoate (1ml/4.5kg) at time of examination.
  - Send a second dose home to be administered 14 days after the initial dose.
  - If highly parasitized, a third dose can be dispensed to be given in four weeks.
  - Estimate for weight gain as puppies grow

- **Cats (2-3 weeks of age)**
  - Administer oral dose of pyrantel pamoate (1ml/4.5kg) at time of examination.
  - Send a second dose home to be administered 14 days after the initial dose.
  - Estimate for weight gain as kittens grow

- **Cats (> 4 weeks of age)**
  - Dewormed using selamectin (Revolution) see chart/section “flea & tick treatment.”

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Pyrantel (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 kg</td>
<td>0.3 ml</td>
</tr>
<tr>
<td>1 – 2.9</td>
<td>0.6</td>
</tr>
<tr>
<td>3 – 4.9</td>
<td>1</td>
</tr>
<tr>
<td>5 – 9.9</td>
<td>2</td>
</tr>
<tr>
<td>10 – 14.9</td>
<td>3</td>
</tr>
<tr>
<td>15 – 24.9</td>
<td>6</td>
</tr>
<tr>
<td>25 – 39.9</td>
<td>8</td>
</tr>
<tr>
<td>40 – 50.9</td>
<td>10</td>
</tr>
<tr>
<td>51 – 60+</td>
<td>12</td>
</tr>
</tbody>
</table>

To facilitate efficient dispensing, this chart provides appropriate dosages within the dosing range.

Occasionally, a more comprehensive deworming protocol may be required. If necessary, fenbendazole (Panacur® 100 mg/ml) is available for giardia, roundworms, hookworms and whipworms. See Pharmacy Formulary.
Dispensing Prescription Drugs
All prescriptions dispensed other than standard anti-parasitics (pyrantel) must be approved by a veterinarian prior to being filled. All controlled drugs MUST be prescribed by a staff veterinarian and dispensed by approved RAVS staff only.

When dispensing medication for a patient, remember that the medication is only effective if the client is successful in administering it as prescribed. Please refer to the RAVS Formulary for our standard of care and dosing protocols.

Prescription Information
The prescription label should include:
1. Name, address and phone of RAVS (pre-printed labels)
2. Patient's name followed by last name of the client
3. Date
4. Dosage and directions for use - fully written out in simple language
5. Name, strength and quantity of the drug
6. Expiration date of prescription (i.e. usually end of treatment or one year in case of refills)
7. Name of prescribing veterinarian (the veterinarian should write this)

Note: Pyrantel prescriptions are very commonly used, thus the RAVS pharmacy has pre-printed pyrantel labels available.
Once you have prescribed medication, there are **TWO places on the medical record** to also record this information: At the bottom of page 2 (RAVS’ copy of the dispensed medication; written in veterinary terminology/shorthand), and on the Animal Care Record (the client copy; written out simply in lay terminology). Here is a sample of the bottom of page two for a young animal receiving a second dose of pyrantel along with amoxicillin for an infection.

![Medication Table]

AND here is the same animal’s medication section of the Animal Care Record:

![Animal Care Record Sample]

**Helpful Tip: Dosage Calculations and the Reality of Dosages Dispensed**

Amount to administer = Weight x Dose x 1/Strength of Drug (*weight x dose x strength of drug inverted*)

- mg needed = weight x dose
  
  Ex: How many mg of amoxicillin are needed for a 10 kg dog if the dose is 22 mg/kg?  
  Answer: mg needed = 10 kg x 22 mg/kg = 220 mg

When you check our pharmacy, you’ll see we do not carry 220 mg amoxicillin, but we do have 250 mg amoxicillin capsules, thus this patient would receive a 250 mg dose.  

*Students should always consult a DVM on dosage calculations and dosages sent home.*

If we did not have oral capsules, one alternative could be liquid amoxicillin.  Here is a sample calculation for the liquid version.

- Volume needed = dose / concentration

  Example: How many ml of amoxicillin are needed for a 10 kg dog if it comes in a 50 mg/ml concentration?  Answer: ml needed = 200 mg / 50 mg/ml = 4 ml
Discharge/Release Procedure

- The Intake Coordinator is the point person for discharging animals after surgery.
- **All patients must be cleared by a RAVS staff member prior to being discharged.**
  Be sure that the name of the DVM/RVT approving the discharge is recorded on the record.
- Routine discharges will be done by student Receiving Teams. If there were any concerns or complications, a veterinarian will speak with the client.
- Go over discharge instructions BEFORE bringing the animal to the client. It is difficult for a client to listen when they are distracted by the animal. Assure client that their animal is doing well and that you would like to go over important instructions.
- Show client the Animal Care Record. Briefly go over what each of the treatments are and when they are due again.
  - Point out the list of things to look for post-surgery / post-vaccination and the contact number to call should they have any concerns (on back of Animal Care Record)
  - Ask clients to keep this form for their records and bring to all future veterinary appointments.
- Check patient records for any abnormalities of which the client should be made aware. Explain to client what treatments/procedures have been performed. Explain the most important points-what the condition is, how it is treated and why it is important to treat.
  - It is important to be thorough but brief when discussing the important points.
  - The entire discharge process should take about 5 minutes.
- Dispense any medications to be sent home.
  - Explain why the medication is being prescribed and what it will do for the animal.
  - Explain what could happen as a result of the condition if not treated (e.g. infection, death)
  - Review the treatment instructions with the client - How often? How long? When to start?
  - Ensure client understands the route of administration AND how to administer.
  - Demonstrate for the client exactly how to administer the medication and provide tips to make medicating as easy as possible (e.g. can the drug be given with food?)
- Discuss basic surgical aftercare as indicated on the discharge instruction sheet.
  - Housing: Keep animal indoors overnight. You may have to help think of a way to do this (garage, porch, bathroom). In some cases, it may not be possible. If the animal must stay outdoors, be sure they are completely recovered from anesthesia before releasing.
  - Feeding: Animals should be offered 1/2 of their normal meal the evening of surgery. Resume normal feeding the following morning.
  - Behavior: The patient may be slightly groggy tonight but should be acting normally by tomorrow.
  - DO NOT give aspirin, Tylenol or other human medications for pain relief. These medications can be harmful or fatal to animals.
  - Female animals should be kept separate from males for the week following surgery.
  - Problems to watch for: Should the animal show ANY of the following signs, clients should call the number listed on the discharge form or a local veterinary clinic:
    - Unwillingness to eat or drink for more than 24 hours, straining to urinate/defecate, whining or resistance to being handled, unwillingness to move or stand, abnormal breathing, any swelling or discharge from incision.
- Before returning the animal to their family, check to be sure any bandages have been removed.
- Assist clients with animal handling-provide leashes or carriers as needed.
- Check to be sure the medical record is complete; correct any missing or illegible information.
- Return completed records to the Intake Coordinator.
- **Important Note:** If you have any concerns or identify any potential abnormalities, signs of pain, nausea or other issues at the time of discharge, consult staff to have the animal reassessed. Even if the animal was cleared by a staff member earlier in the day, conditions can change and may warrant attention before the animal is released.
WELLNESS / MEDICINE APPOINTMENTS  
(Non-Surgical Cases)

On many surgical clinic days, the receiving team will also be managing some wellness or medicine cases after the surgical patients are checked in. Most of these appointments are outpatient in nature and are seen on a first come, first serve basis. The Receiving Lead and/or Trip Lead will coordinate non-surgical case registration with the Intake Coordinator.

Additionally, most RAVS clinics incorporate a separate day or two dedicated entirely to wellness and preventive care for community animals. Nearly the entire veterinary team will participate in receiving on this day. These days move quickly, and we frequently see 150-200+ patients in just a few hours.

Dogs are still examined car-side or on exam tables inside the building and cats are always examined inside the building either in the cat tents or in a side room for infectious disease control purposes.

KEY DIFFERENCES FOR WELLNESS / MEDICINE APPOINTMENTS

➢ A **wellness / medicine medical record** is used (Tan/white form).

➢ Patients are **not recorded on dry erase boards**, as these patients are typically not admitted to the clinic for anesthetic or surgical procedures.

➢ In general, all **weights are estimated**, however weights should be checked on a scale if prescribing medications other than pyrantel.
   - A **veterinarian should be involved in prescribing any medications**. Pyrantel is an exception and may be dispensed as per RAVS protocols, without consulting a veterinarian.

➢ The focus for wellness appointments is to **assess overall health & quality of life along with evaluating candidacy for vaccination**. Goal = “Get the vaccines in the animals.”
   - Surgical and anesthetic risks are of lower importance; however, any abnormal findings or medicine/wellness physical exam alerts should be discussed with the client and a veterinarian should be consulted.

➢ **Vaccinations are given during the appointment.**
   - It is okay and encouraged to use treats for distraction! This is a great time to practice low stress handling techniques.
   - Dewormers and antiparasitics are administered during the receiving appointment as with surgical patients.

➢ Consult appointments - those where the client is bringing an animal in specifically due to illness or injury - are triaged by a Receiving Team with a veterinarian involved early to improve efficiency and facilitate appropriate care.

➢ Review the Animal Care Record (front and back) with the client before they leave
   - Clients do not need to check back in with the Intake Coordinator before they leave unless there are extenuating circumstances.

➢ Completed **medical records are turned into the Intake Coordinator after the appointment**.

Should a patient be sick or injured enough to warrant potential hospitalization or surgery please notify the Receiving Lead or Trip Lead who will assist with the case and assess what level of care we are able to provide. Patient welfare will always be a top priority in the decision-making process.
CLEANING AND INFECTIOUS DISEASE CONTROL

At every RAVS clinic we will serve hundreds of animal patients. Some of these animals are seriously ill or injured and may be immunocompromised. Many have never seen a veterinarian or been vaccinated for common infectious conditions. Almost all are under considerable stress.

It is the responsibility of all team members to provide the best possible care to every patient. An important part of that care includes providing a clean, healthy environment. Thorough cleaning helps lessen spread of disease and infection. Do not take shortcuts during cleaning. The well-being of our patients depends on this crucial task.

Standard Disinfectant: For most standard cleaning, we use Rescue (accelerated hydrogen peroxide), a broad-spectrum disinfectant, diluted with water to a 1:16 ratio (8 ounces per gallon). Follow dilution instructions carefully! Using more does not disinfect better. It wastes the product and increases the risk of chemical irritation to both personnel and animals. At this concentration contact time for disinfecting is 5 minutes. Note: In certain clinics we may use the disinfectant Trifectant in place of Rescue. Rescue is considered both a cleaner and disinfectant, however this must be done in two steps. Organic debris must be collected and disposed of prior to cleaning the surface in order to properly disinfect.

Bleach: Diluted bleach should be used to disinfect any area contaminated with a potentially resistant disease agent (eg: parvovirus, ringworm) if Rescue or Trifectant is unavailable. Bleach is used at a dilution of 1:32 with water. Bleach solutions are not stable once mixed and must be replaced every 24 hours. Bleach should never be used with Rescue as they can create a toxic gas if combined.

Clinic Cleanliness: Clinics are set up in various community facilities which can sometimes make disinfecting surfaces challenging. However, the general cleanliness of the clinic area must be maintained at all times. Exam areas and treatment areas should be cleaned and disinfected as thoroughly as possible throughout the day. If possible, floors should be swept and mopped throughout the day. Before the clinic is packed, all equipment must be thoroughly disinfected before being packed. This includes the packing boxes.

For your own safety, human food should remain in the designated area and not be taken to animal treatment areas.

Consider the Fomites: Stethoscopes, caddies, kennels, leashes, muzzles, pens and clipboard, etc. can all harbor infectious agents and should be disinfected frequently throughout the day – especially between families! Hands should be washed and/or sanitized between patients. Exam gloves are required when handling all patients less than 5 months of age. Gloves are encouraged for handling any patient.

Isolation Protocol: Initial triage for potential illness or exposure should begin with a thorough patient history prior to the animal being handled or examined. If there are any clinical signs of infectious disease, history of illness or recent exposure to sick animals, a RAVS staff member should be consulted to assess isolation needs prior to the animal being handled or admitted to the clinic.

Any animal with a known or suspected contagious disease should be isolated from the general clinic population immediately. Conditions warranting isolation include but are not limited to canine parvovirus, canine distemper, feline panleukopenia, feline upper respiratory infection, and canine infectious respiratory disease complex.

Animals in isolation should be handled as little as possible and by a limited number of identified caretakers. Clean exam gloves and isolation gown or other protection (trash bags make great improvised gowns!) should be worn whenever the animal must be handled. Additional infectious disease handling instructions will be provided onsite as necessary.
ANESTHESIA PATIENT FLOW & TEAM RESPONSIBILITIES

The anesthesia team includes veterinary students, veterinary technician students and assistants overseen and supported by RAVS staff and experienced volunteer technicians. Key team roles include: **Anesthesia Lead** (staff); **Induction Technicians** (staff and volunteer); **Anesthesia Monitoring Lead aka Line Walker** (staff or experienced volunteer) and **Recovery Lead** (staff or volunteer). Once patients are placed on the surgery boards by the receiving team, the anesthesia team takes over the case and will manage patient care until the animal is safely through surgery and fully recovered.

### OUTLINE OF ANESTHESIA PROCESS

1. **Anesthesia Lead** decides patient order and assigns patient to student anesthetist (anesthetist will stay with and care for patient from assessment through induction, surgery, and the beginning stages of recovery)
2. Patient receives pre-medication (dogs)
3. **Assessment** of patient by student anesthetist
4. Patient is cleared for anesthesia by RAVS staff
5. Patient taken to induction table
6. **Induction** and patient prep facilitated by Induction Technician
7. Patient moved from induction to surgery table. Student anesthetist continues patient **monitoring** during surgery
8. Student anesthetist and Line Walker communicate regularly about patient status throughout procedure
9. Following surgery, student anesthetist brings patient to **recovery** and monitors until released by Recovery Lead
10. Once released from recovery, student anesthetist returns to Anesthesia Lead to be assigned another patient

### PRE-ANESTHETIC ASSESSMENT

The anesthesia student assigned to the patient will assess both the paperwork and the patient and begin preparing for anesthesia as described below:

Reminder for pediatrics: WEAR GLOVES and ensure patient was given a snack during their initial appointment. If they did not have a snack, consult Anesthesia Lead before proceeding.

- **Administer pre-anesthetic medication (DOGS)**
  
  When asked to administer a pre-medication (or any drug):
  
  - **Review** the medical record – Be sure medication has not already been administered by another volunteer and that the animal’s condition has not changed since intake.
  - **Consider** species, age, weight and condition to be sure that dose is appropriate
  - If you identify any inconsistencies or concerns about the patient’s condition, consult the anesthesia lead before administering the medication.
  - **Assess** the patient’s heart rate. If the heart rate is outside normal ranges, consult the anesthesia lead before administering pre-anesthetic medications.
  - **Administer** the medication as directed.
  - **Record** the drug, dosage, route and time (DDRAT) on the patient's record & your initials. Also record the time of pre-medication on the **surgery board**.

### DOGS VS CATS

- Dogs receive trazodone after intake, cats receive gabapentin
- Dogs receive injectable pre-medication, cats do not receive pre-meds.
- Dogs are induced with anesthetic drugs given IV; cats are induced via IM injection given by RAVS staff during Ax clearing process. Student anesthetists never leave the patient after IM injection.
- Cats are brought to the induction tables inside their carrier once sedated.
- Intubation and IVC training are dependent upon student experience and patient needs. Demonstration of basic skills required prior to training in cats.
- Dogs may be placed on a rebreather circuit or non-rebreather, size dependent; cats are always placed on non-rebreather.
- Dogs are recovered on a beach setup; cats are recovered inside the tents.

![Patients receive a pre-anesthetic evaluation by student anesthetists before being cleared for induction by the Anesthesia Lead.](image)
During the MAINTENANCE patient needs so as not to prolong the process. Academic questions are encouraged after the procedure. We ask that any conversation be limited to immediate serve in an assistant role and should focus considered 'expedited'. This means that once they reach the induction table, the student anesthetist will expedited Cases:

- Evaluate patient
- Express bladder
- Inflation
- Lubricate eyes
- Induction technician clips hair and vacuums
- Administer ancillary medications (penicillin, meloxicam) & vaccinations if needed; check off & place vaccine labels on chart
- Local block is administered as appropriate
- Express bladder for patient comfort and surgical visibility
- Evaluate patient - If stable, move to surgery table

All anesthetic drugs will be drawn up and dispensed by the Anesthesia Lead. Most of the anesthetic drugs we use are controlled substances and must be logged appropriately. It is the anesthetist's responsibility to ensure that all drugs administered are appropriately recorded in the patient's record.

Expedited Cases: Some patients, either due to their health status, age, or caseload timing will be considered 'expedited'. This means that once they reach the induction table, the student anesthetist will serve in an assistant role and should focus solely on patient monitoring. The induction technician will proceed with all technical aspects of the process. We ask that any conversation be limited to immediate patient needs so as not to prolong the process. Academic questions are encouraged after the procedure.

MAINTENANCE / PATIENT MONITORING (see 'Patient Monitoring' in Section 3 for more information)

During the maintenance period the anesthetist has two responsibilities:

1) Monitor the patient closely to ensure that the animal's vital signs remain within acceptable limits.
   a. Track time. Surgeons may ask you for updates as there are surgical time limits (Dog Spay 45 min / Dog Neuter 20 min / Cat Spay 30 min / Cat Neuter 10 min)
   Remember anesthesia total time supersedes surgery time (60 mins total ax time).
2) Maintain the animal at an appropriate anesthetic depth. Vital signs are recorded to the surgery record every 5 minutes throughout the anesthetic procedure, but patient monitoring should be a continuous process.

**Urgent Situations:** If the animal has a low respiratory rate, appears to have stopped breathing or has a low or no auscultable heartbeat—**TURN THE VAPORIZER OFF and CALL FOR HELP.** The Line Walker +/- other staff will be there to assist you immediately. *(see Addressing Anesthetic Complications in Section 3 for more information)*

**RECOVERY** *(see ‘Recovery Protocols’ in Section 2 for more information)*

The anesthetist will stay with their patient as the patient moves to recovery and will continue monitoring until the patient is stable. The anesthetist must be cleared by the Recovery Lead to transfer the patient to a dedicated recovery monitor and return to the Anesthesia Lead for their next case.

*Anesthetists and recovery monitors tend to recovering patients, monitoring vital signs and ensuring patient comfort until the patient is fully recovered.*
ANESTHETIC EQUIPMENT OVERVIEW

It is crucial that you understand the basic mechanisms of all standard anesthetic and monitoring equipment and you are familiar with the layout and functioning of the machine(s) you will be using. It is impossible to trouble-shoot anesthetic complications unless you understand how the anesthetic equipment is assembled and how each part functions. Take time to familiarize yourself with the equipment BEFORE you have a patient anesthetized. If you are unfamiliar with the machine or need to review any part of the equipment function or setup, ask a staff or volunteer technician for a review.

Available Anesthetic and Monitoring Equipment:
- **Anesthesia Machine** with Rebreathing (Circle) Systems and Non-Rebreather Systems available – Anesthesia machines are used both at the induction tables and at the surgery tables and are used for all anesthetized patients to deliver oxygen +/- isoflurane gas.
- **PetMap Multi-Parameter Monitor** – all monitors have blood pressure, pulse oximetry and temperature monitoring functionality. Other functions may be available on select machines. PetMaps are used during the anesthesia maintenance phase of all anesthetized patients.
- **Pulse Oximetry Machines** – used as needed, often at the induction table.
- **Esophageal Stethoscope** – used during the maintenance phase for all anesthetized patients.
- **Thermometers** – used as needed ** confirm whether using orally/intranasally or rectally! **
- **Doppler Blood Pressure Monitor** – used as needed; volunteer and staff technicians will assist with training how / when to use.
- **ECG Machine** – for emergencies / urgent cases.

Note, while not considered monitoring equipment, all anesthetized patients will have access to heat support if needed in the form of protected heating pads, warmed blankets, warmed IV fluids, and protected warmed bottles or heat discs. Care MUST be taken to avoid thermal injury to anesthetized patients. Other equipment available include laryngoscopes, headlamps, manual suction, along with a wide range of endotracheal tube sizes, and IV catheters. Autotransfusion equipment is available along with readily accessible emergency drugs. RAVS staff will direct equipment use during any emergency.

Important: If at ANY point you note anesthetic equipment or monitoring devices are not working or giving questionable results, **ALWAYS CHECK THE PATIENT** and notify a supervising anesthesia technician for assistance.
'Recovery' includes everything from the time anesthesia/surgery ends until the animal is alert, ambulatory, and all vitals have returned to normal ranges. **Recovery is the most physically demanding area of the clinic and is the phase of a patient’s anesthetic experience where the animal’s status can take a turn quickly, thus vigilance and adherence to protocols is vital for optimal patient safety.

RAVS clinics contain two recovery areas – a large, sectioned mat for dogs (dog beach) and a recovery tent for cats. Many clinics will also contain a “stage 2” recovery zone for patients who might require continued oversight but are stable enough to be without a dedicated recovery monitor.

**RECOVERY TEAM**

- **Recovery Lead/Coordinator** – Staff (lead) or volunteer technician or veterinarian (coordinator) who oversees and guides recovery area.  
  On some clinics there will be a canine Recovery Lead and a feline Recovery Lead.
- **Anesthetist** – Veterinary or veterinary technician student responsible for patient care from pre-anesthetic assessment, through induction and surgery into recovery and until patient is stable.
- **Recovery Support** – Volunteer technicians and assistants, under the direction of the Recovery Lead, assist anesthetists and provide care and monitoring of animals until fully recovered.

**RECOVERY RESPONSIBILITIES**

**Recovery Lead/Coordinator**

- **Guides recovery of all patients** by overseeing and keeping in close communication with student anesthetists and recovery assistants who are handling direct care for each patient. 
  The Recovery Lead/Coordinator should be aware at all times of the current status of all recovery patients.
  - Identify potential issues and determine when interventions may be needed (i.e. reversal agents, additional analgesics, anti-nausea medications etc.).
  - Volunteer Recovery Coordinators may not make the final decision on what treatments but will identify potential issues and consult RAVS staff as needed.
  - Aggressive animals are recovered in a kennel with a CAUTION sign posted on the cage. The Recovery Lead/Coordinator should coordinate this.
  - Cats can be moved to a small wire kennel as soon as they are able to sit up sternal. Keep the kennel in the recovery area until the animal is fully alert. Kennels can be partially covered to help reduce stress for recovery cats. 
  - Cats should not be placed in a cardboard carrier until they are completely recovered – it’s impossible to monitor an animal we can’t see!
- **Coordinates dismissal of student anesthetists/rotation of recovery assistants**
  - Once anesthetist and patient have met the guidelines for case transfer, the Recovery Lead/Coordinator will assign a recovery support volunteer to assume the case.
  - The Recovery Lead/Coordinator should assess vital signs, pain and overall condition of the patient to determine if any interventions are needed **prior to dismissing the anesthetist**. The Recovery Lead/Coordinator (in consultation with staff as needed) can then make a plan and assign a recovery support volunteer to carry out the plan.

**Student Anesthetist**

- **Deflate endotracheal tube** and assess patient prior to transferring animal to recovery area.
- **Transfer patient to clean recovery bed**, untie endotracheal tube, verify cuff has been deflated. 
  - Before the animal is transported from the surgery table, the endotracheal tube cuff should be deflated with the animal in lateral recumbency. Saliva can collect in the back of the throat and slide down the trachea if de-cuffed in dorsal recumbency.
- The **anesthetist MUST stay with their patient** until the endotracheal tube has been removed, at least one TPR has been recorded and the Recovery Lead/Coordinator has approved the patient for transfer.
➢ Remove endotracheal tube once animal has regained swallow reflex.
   ▪ Maintain the endotracheal tube until the animal demonstrates the first sign of gag or rejection reflex (swallow or cough).
   ▪ Hold the tube and apply a constant pulling tension. The tube should come out smoothly and quickly. If a tube is difficult to remove or the animal’s respiration is abnormal, notify the supervising technician or veterinarian immediately.
   ▪ The animal may cough for a few seconds after extubation but should quickly resume normal respirations.

➢ Monitor TPR and mm/CRT immediately post-surgery, then every 5-10 minutes as needed until animal is turned over to the recovery team. Address any abnormalities.

➢ When the **animal is stable and cleared for transfer by the Recovery Lead/Coordinator**, the patient can be turned over to the recovery support volunteers - Be sure to notify recovery crew of any abnormalities or difficulties during anesthesia, surgery or recovery. In certain situations, student anesthetists may remain with their patients until the patient is released from recovery.

➢ The anesthetist should complete all anesthesia sections of the record before turning the patient over to the recovery team.

**Recovery Support Volunteers**

➢ **Monitor TPR and mm/CRT** every 15-20 minutes and address abnormalities as needed.
   ▪ If the animal is aroused or the temperature is difficult to take and all other parameters are within normal limits, do not attempt to take the temperature. Over-stimulation can make for a rough recovery.
   ▪ Use caution monitoring mucous membrane color. Animals may bite while coming out of anesthesia. Never put your finger in the mouth, just lift the lip enough to see the gums.

➢ **Monitor incision** for any swelling or oozing.

➢ **Pediatric patients should be offered a small amount of canned food** as soon as they are alert enough to eat. Hypoglycemia can result in delayed recovery times. If young animals are not recovering within 15-20 minutes, rub a small amount of karō syrup on the gums.

**OTHER RECOVERY NOTES**

**IV Catheter Removal**

➢ **Dogs:** Unless a dog is marked as feral or caution the **IV catheter should be left in place until the patient is fully recovered** to allow for immediate IV access for analgesic/sedative administration or emergency purposes.

➢ **Cats:** Consult with Recovery Lead regarding when IVC should be removed. Sometimes cats’ window of tolerance for IVC removal is short!

➢ **Any feral / aggressive animal:** IVC should be removed as soon as the animal begins to arouse.

➢ **Ensure band-aids or wraps are removed before patient is released from recovery.**

**Safe Handling and Restraint**

➢ Utilize wire kennels for aggressive or feral animals as noted above. Maintaining clean cages in both cat and dog recovery areas will enable recovery personnel to make use of them quickly.

➢ All cats should wear a figure 8 harness throughout recovery. The harness is not removed until they are ready to be discharged.

➢ All dogs should wear a slip lead while recovering on the beach area. The slip lead should be removed once the dog is placed in a kennel. Only a dog wearing an extended figure 8 harness (created from slip leads) for safe handling purposes can keep the harness on while kenneled.

➢ **Leashes should always be in a someone’s hand when animals are not in kennels.** Quick escapers seem to know the moment their leash is not being held!
Recovery Treatments

➢ Check the ‘Tx Needed’ section of the Anesthesia Record for any requested treatments. This section is used by the receiving teams to indicate procedures that could not be done in receiving due to patient temperament, etc. Often these are best performed before the animal begins to arouse. Marked all treatments done in recovery as completed and initial.

Grooming – when time and patient status permit

➢ Clip toenails as needed, flea comb, remove ticks, clean ears.
➢ Once an animal begins to recover, it is best to avoid any unnecessary stimulation which may elicit a hyper-arousal response.

Record-Keeping

➢ Review medical record and verify that all pages are completed.
➢ Any drugs administered during recovery should be recorded in the recovery record under Post-Op Medications. The drug, concentration, amount, route, and time are noted along with responsible person’s initials and reason for medicating.
➢ If an aFAST (abdominal Focused Assessment Sonogram for Trauma) or other scanning ultrasound is performed, the time and findings should be recorded.

Maintain Cleanliness of Recovery Area

➢ Keep recovery area clean of animal waste & garbage.
➢ Wipe bedding and crates with disinfectant between patients.
➢ Plastic coverings on bedding should be changed when they are torn or soiled.
➢ Endotracheal tubes are placed in a tub of disinfectant solution and cleaned throughout the day. Inflate cuff, scrub interior and exterior of tube, rinse thoroughly and deflate cuff. Clean tubes should be returned to the induction table.

Minimize Use of Laundry.

➢ Doing large amounts of laundry is time consuming, expensive and often not even an option. Use towels/blankets covered with garbage bags. These can be cleaned with disinfectant when soiled and replaced when torn. Blue non-sterile surgical drape may be used in certain circumstances.

PATIENT RELEASE CRITERIA: Once the animal is alert, ambulatory, and all parameters are within normal range they can be released by the Recovery Lead/Coordinator and returned to a kennel in the receiving area (dogs) or into the appropriate tent (cats). Before releasing an animal, examine incision for swelling or oozing, verify the catheter band-aid is removed, and record the Recovery Release time.
SURGICAL PATIENT FLOW AND TEAM RESPONSIBILITIES

SURGERY TEAM
- Surgery Lead and Surgery Support Surgeon (staff veterinarians)
- Volunteer Veterinarians
- Veterinary Students
- Veterinary Technician Students

SURGICAL PROCESS OVERVIEW
1. The Anesthesia Lead and Surgery Lead communicate about patient flow and Surgery Lead will assign patients to veterinarians/students.
2. Assigned surgery student is responsible for gathering any needed surgical supplies.
3. Once patients are induced by the anesthesia team and moved to the surgery table, the anesthesia team will continue with patient monitoring and making any needed anesthetic adjustments while surgery team members focus on assisting in patient positioning, scrubbing the surgical site and opening the surgical packs/instruments.
4. The student and veterinarian assigned to a case will be preparing themselves for the surgery and thus will NOT be scrubbing their own patient; others on the surgery team will assist here.
5. Once surgery is completed, the surgery student will help move to the patient to recovery and will write the surgery report. The mentoring veterinarian reviews and initials the report.
6. Sharps are removed at the surgery table; the pack is moved to the instrument cleaning area and the surgery table cleaned for the next patient. This is a team effort though the assigned student should ensure all steps are completed.

Important:
- Any anesthetist questions or concerns relating to anesthesia should be directed to the Ax Line Walker and not the surgical team. The surgery team is asked to focus on the surgical needs of the patient.
- Any intra-operative concerns (torn spermatic cords, dropped pedicles, abnormal anatomy, etc.) should be relayed in real-time to the Surgery Lead. Keeping in mind that patient safety is our priority, RAVS staff veterinarians will glove in to aid in addressing intra-operative surgical complications. RAVS staff veterinarians will be primary case managers for any post-operative complications (hemoabdomen, incisional dehiscence, etc.) so that clinic flow is not disrupted.

The primary focus of the RAVS surgical team is to provide safe and efficient spay/neuter surgeries for animals who will benefit from these procedures. RAVS surgical protocols are modeled after high quality, high volume (HQHV) surgical rhythms and employ HQHV surgical techniques but have been modified to incorporate preventative techniques appropriate to our patient caseload and field environment. More details on this can be found in Section 3: Field Considerations.

When needed and when resources and logistics allow, the RAVS surgical team may also provide surgical procedures other than spay/neuter to save or improve a patient’s quality of life; the involvement of the volunteers on these cases will be patient and team dependent.

The secondary focus of the RAVS surgical team is to provide mentored surgical opportunities for veterinary student volunteers while providing rewarding veterinary field surgical service opportunities for both student volunteers and veterinary professionals.
Student surgical participation will be determined by three factors:

- First, the health and safety needs of the patient
- Second, the surgical and teaching comfort level of the attending veterinarian
- Third, the student’s skill assessment results and learning goals

Ultimately the level of participation for each procedure is determined on a case-by-case basis at the discretion of the assigned veterinary surgeon and, ultimately, the Surgery Lead.

Surgical time limits exist for each spay/neuter procedure to ensure teaching does not supersede patient welfare. Surgical time limits are maximums, not goals and are to be adhered to by all surgery team members. The Surgery Lead is responsible for reminding volunteers to stay within the surgery time limits.

**Expedited Cases:** There will be cases considered non-teaching (no active student participation), either due to patient health status and/or due to caseload timing. Occasionally a student will be assigned specifically to observe an expedited case. Surgery students not actively involved in another project may observe expedited procedures with the veterinarian’s approval. A teaching case may be converted to a non-teaching case if patient status changes under anesthesia or the patient’s surgical status is requiring a lengthier surgical time due to intra-operative challenges or complications.

### SURGICAL STUDENT RESPONSIBILITIES – THE DETAILS

- The Surgery Lead will assign each case to a veterinarian +/- surgery student
  - Veterinary students will work directly with a veterinarian on each case, actively observing, assisting, or performing various parts of each procedure as appropriate based on prior experience, preparation and patient status.
  - Veterinary Technician Students will work directly with a veterinarian on each case, actively observing, assisting and practicing sterile technique.
  - The veterinarian assigned to the case will have primary responsibility for the surgical patient, and will guide, monitor, and approve all techniques used by surgical students.
- Before the procedure begins, the student meets with their assigned veterinarian to discuss the case. Supplies are gathered (pack, suture material, blade, etc.), and the surgery table is set up.
  - **Suture sizes and applications:** RAVS clinics use synthetic monofilament absorbable sutures with a swaged needle. Use the following guidelines to aid in choosing suture:

<table>
<thead>
<tr>
<th></th>
<th>1 – 5 kg</th>
<th>5 - 9 kg</th>
<th>9 – 18 kg</th>
<th>18 + kgs</th>
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<tbody>
<tr>
<td>Dog Spay</td>
<td>2-0 (3-0 pediatric)</td>
<td>2-0 linea alba</td>
<td>2-0 or 0 linea alba</td>
<td>0 linea alba</td>
</tr>
<tr>
<td></td>
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<td>2-0 or 3-0 skin</td>
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<td>2-0 skin</td>
</tr>
<tr>
<td>Dog Neuter</td>
<td>3-0</td>
<td>2-0</td>
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<tr>
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<td>3-0 linea alba and skin, 2-0 may be used for larger/pregnant cats</td>
<td>2-0</td>
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- A chlorohexidine presurgical hand scrub will be performed at the beginning of each day (and whenever there is gross contamination of the hands). Immediately prior to each procedure, leave-on Avaguard will be used on the skin following cap and mask placement.
  - New sterile surgery gloves are used for EVERY surgical procedure
  - Gowns are used by students for all cases except cat Neuters and are used by veterinarians for all abdominal procedures.
- The surgery team should be scrubbing in as the patient is anesthetized and should be prepared to begin draping the animal as soon as the final positioning and patient prep is complete.
  - **An anesthetized patient should never be waiting for a surgeon.**
- After the procedure the surgery table is cleaned and prepared for the next procedure. Instruments should be washed, audited, repacked, and autoclaved. Gowns are rewrapped and autoclaved. **(Details will be provided during onsite orientations.)**
- The student writes the surgical report and has it reviewed by the veterinarian. Any intra-operative complications should be relayed to the Recovery Lead and recorded in the surgery report.

### Surgical Time Limits

- Canine Spay: 45 minutes or less
- Canine Neuter: 20 minutes or less
- Feline Spay: 30 minutes or less
- Feline Neuter: 10 minutes or less

**Supplies are gathered (pack, suture material, blade, etc.)** and will guide, monitor, and approve all techniques used by surgical students.

**Expedited Procedures:** Surgical time limits are maximums, not goals and are to be adhered to by all surgery team members. The Surgery Lead is responsible for reminding volunteers to stay within the surgery time limits.

- **Expedited Cases:** There will be cases considered non-teaching (no active student participation), either due to patient health status and/or due to caseload timing. Occasionally a student will be assigned specifically to observe an expedited case. Surgery students not actively involved in another project may observe expedited procedures with the veterinarian’s approval. A teaching case may be converted to a non-teaching case if patient status changes under anesthesia or the patient’s surgical status is requiring a lengthier surgical time due to intra-operative challenges or complications.

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- The student writes the surgical report and has it reviewed by the veterinarian. Any intra-operative complications should be relayed to the Recovery Lead and recorded in the surgery report.
This is a general overview of available surgical equipment. Volunteers will receive more detailed onsite orientation regarding the location of supplies, how to process / wrap gowns and instruments and how to sterilize the equipment.

Available Surgical Equipment:

- **Surgery Tables.** Our tables are designed to be lightweight, easily transportable, and are commonly used in field settings. Headlamps will be provided for lighting the surgical field.

- **Double-wrapped Sterile Surgical Packs**
  - Spay Packs / Canine Neuter Packs / Eye Pack / Bone Pack
  - Spay and neuter packs contain a folded, non-fenestrated patient drape and gauze

- **Steri-Pouch Instruments**
  - Feline neuter packs
  - Individual instruments used as needed

- **Sterile blades #15 / #10.**
  - Blades are discarded after each surgery.

- **Sterile monofilament absorbable suture with swaged needle.**
  - Sizes range from 4-0 to 1. Suture is not re-used in other patients. Excess may be used for practice on models.

- **Sterile, powder-free latex surgical gloves for veterinarians.**
  - Notify RAVS staff if you have a latex allergy.
  - Veterinary students are expected to bring sterile surgical gloves in the appropriate size.

- **Single-wrapped sterile cloth surgical gowns.**
  - Gowns are re-autoclaved after each use unless grossly contaminated in which case they will be laundered between trips before next use.

- **Tattoo ink.** Used in scoring tattoos on all surgical patients

- **Tissue Glue.** Veterinary brand - we do not use superglue due to increased tissue reactivity.

- **Sterile non-woven gauze**

- **Sterile lap sponges**

- **Gelfoam**

- **Retractors**

- **Cautery pen (hand-held high-temp)**

- **Supplies for complicated/lengthy procedures**
  - used most often by RAVS staff veterinarians
  - Autotransfusion supplies
  - Wound Soaker catheter supplies
  - Electrosurgical cutting/cautery unit

- **Manual Autoclaves.** All equipment is steam-sterilized in manual pressure autoclaves. Cold-sterilization methods are not used for any surgical instruments.
Veterinary students planning to participate in surgeries at RAVS clinics will be responsible for knowing all of the following information and having practiced all the listed techniques until proficient. Surgeons are not born or hatched; they are trained just as one would train to acquire any manual skill. We expect that students will dedicate sufficient time practicing suturing and ligating prior to the trip. Surgical skill level will be assessed on the clinic meet day before you are assigned to clinic duties. If you have difficulty in accessing or learning this information, please contact RAVS staff well in advance of your scheduled trip.

All veterinary student volunteers who wish to participate in surgery will take a practical skills assessment at the start of each trip. Assessments will be done on simple models that volunteers can make and use at home for practice. Examples of the models used are in our surgical teaching videos.

Students will be assessed into one of three categories based on their skills level (color coded – think of the ski slope designations).

- **Green level**: student will gain vital tissue handling experience in the live patient, however, will not be suturing or ligating in the live patient as these skills need further development.
- **Blue level**: student may suture/ligate in the live patient with veterinarian supervision pending patient status and veterinarian comfort level.
- **Black level**: student builds on blue level skillset with veterinarian supervision; these are returning RAVS students with exceptional results on skills assessment who also show safe surgical skill.

**Recommended Practice Materials:**

- 1/2 inch rubber tubing (found at most hardware stores)
- A surgical huck towel or dish towel
- A 6-10 inch length of 1/8 inch paracord
- Monofilament suture (0 or 2-0) or nylon fishing line (~ 20 gauge)
- Basic instruments
  - pair of Olsen-Hager needle drivers (the type containing scissors for cutting suture), curved mosquito hemostats, Adson-Brown thumb forceps and a pair of suture removal scissors.

RAVS clinics use monofilament suture (PDS, Monocryl, Monomend, etc) it is a good idea to practice with either these suture types or nylon fishing line. The actual assessment will usually be done using 0 or 2-0 Monomend with a swaged-on needle.

No model is exactly the same as real skin or tissue, however practicing on phantoms will help you to develop critical muscle memory and proper techniques. Practicing your surgical skills on phantoms is also important for patient safety. It is unethical to perform a procedure without practicing all you can and mastering basic skills first outside of the live patient. The simple materials suggested here, and used in the assessment, will provide an excellent and inexpensive opportunity to develop the basic skills.

**Tips for successful preparation:**

- It’s okay to begin practicing while sitting at a table, then practice in a standing position, as that will be the position in which you will be doing surgery; your back should be straight and your elbows at your sides.
- Prepare for this by practicing in distracting situations, while being watched, etc. Remember: You’ll be more nervous during the assessment and during surgery!
- Ensure you understand the proper techniques and then practice these until the procedures become muscle memory. Just “figuring it out” is not sufficient.
SURGICAL SKILLS ASSESSMENT

The following are the specifics of what will be on the practical assessment, along with practice hints. Video demonstrations of components of the skills assessment are available on the RAVS website.

Students will perform ligature, suturing and a figure 8 knots. All criteria discussed below must be met for every test for a student to assess into the blue or black level skills categories.

1. **FIGURE-8 KNOT**: RAVS clinics use the “figure 8” knot for ligating the cord on cat castrations. Fossum has a good diagram of this and there is a demonstration in the surgical training videos of how to maneuver the hemostat to create this knot. You will be tested on a 6-inch piece of parachord. One end of the cord will be attached to a board (to simulate the cat). The other end will have a knot tied in it to simulate the testis. You will be asked to tie the knot in the cord with a curved mosquito hemostat as demonstrated in the training videos.

   To meet blue/black level assessment criteria **You will have approximately 15 seconds to complete the knot in the figure 8 configuration.**

   **Practice Hints:**
   - Practice the hand motions in this technique until you don’t have to watch your hands.
   - The most common problem in using these cord ligation techniques is that novice surgeons try to create the knot under tension and try to tie the knot too close to the testis, rather than using all the exposed cord and tying close to the animal.

2. **LIGATURE**: Create a ligature using an instrument tie on a piece of rubber tubing. The ligature may be either a Surgeon’s knot or a Modified Miller’s or Strangle knot with three additional, flat throws. Each throw should lie parallel to the preceding one, making a series of square knots and avoiding the slip knot effect (and no “grannies”). If a slip knot or granny is created, two additional flat throws should be placed to secure the ligature. The final knot must be tight (wrinkle the tubing).

   To meet blue/black level assessment criteria: **The procedure should be completed in 30 seconds, the ligature must be tight on the tubing, and the three additional throws must be flat; if a slip knot or granny knot is made, it should be locked down with two flat throws (one square knot on top of the slip knot). The needleless end of the suture MUST be used for knot formation.**

   **Practice Hints:**
   - Assessments will be performed standing at a surgery table with the tubing parallel or perpendicular to your shoulders. Practice tying ligatures with the tubing at different angles to your body - you never know what angle you might be in when trying to control hemorrhage.
   - Learn how to pass suture around a pedicle (in this case the tubing) with an instrument. This allows better visualization and less tissue trauma.
   - Learn how to keep track of your suture. Monofilament has “memory” and will fall out of the sterile field or slip away when you are trying to grasp it until you learn how to keep it gathered in your hand. This is where many students lose most of their time.
   - Pass the end of the suture **without** the needle around the tubing (“pedicle”). This is much easier and avoids inadvertent laceration of tissues with the needle.
   - Train yourself to make a good “square knot” every time you add a throw. This is done by moving your hands in correct, alternating directions (which MUST become a reflex - if you have to think about it, you haven’t practiced enough) and pulling evenly on both suture ends.
   - To avoid excessively long tails (which waste suture and make knot tying difficult) pull evenly on both ends of the suture only for the last few millimeters before the throw becomes tight.
   - Pull your first throw (Surgeon or Miller’s) tight and watch to ensure it doesn’t slip and release tension as the second throw is placed. This is THE most common cause of ligature failure.
   - The assessment evaluates students for competency in suturing and knot-tying mechanics, however specific types/numbers of knots and ligatures used in the clinic setting is both patient and veterinarian dependent.
3. **SIMPLE CONTINUOUS PATTERN:** You will make a 2.5-inch simple continuous suture pattern using a *square* knot with a total of 4 “throws” to start and end the pattern. The phantom will be a standard surgical towel. You will be using Olson-Hagar needle holders and may use either rat tooth, Brown-Adson thumb forceps or fingers to handle the “tissue”.

To meet blue/black level assessment criteria: Three minutes will be allotted. The final product should have sound tight knots at both ends and apposed towel edges without overlapping. An effort should be made to ensure the pattern is snug (so as to avoid “tissue” migrating through an incision that sutured too loosely). Sutures should be spaced ~1/4 inch apart and ~1/4 inch from the edge of the “incision”

**Practice Hints:**
- It is generally easier for right-handed people to suture right to left and lefties to go left to right. Stand so that your shoulders are parallel to the line of sutures.
- Grasp your needle so that it is perpendicular to the needle holder and get in the habit of resetting your needle in the needle holders efficiently and accurately every time. **Much time is wasted by having to readjust your needle grip several times before each stitch.**
- Pay attention to the same issues of suture control and knot tying mentioned under ‘ligatures’.
- When tying square knots, keep both hands in the same plane as once they are in different planes it is easy to pull with unequal tension thus creating a slip knot. Keep your hands close to the body wall - The farther they are away from the body wall, the easier it is to get hands out of the same plane, the greater the chance of losing control of the suture material.
- Remember you are using Olson-Hagar needle holders. These are the kind containing scissors - take care not to accidentally cut the suture when using these needle drivers.
- To get good wound edge apposition, make sure that you are taking the same sized “bite” on each side of the wound edge. Practice this using 1/4-inch bites. Space stitches evenly approximately ¼” apart.
- When tying the end knot in a continuous pattern, make your last two bites closer together, create a large loop, and be sure to grasp the loop in the center to avoid uneven tension when making your knot. Open your needle drivers slightly as you evenly tighten the knot in order to keep even tension on the loop.
- You may pick up your needle following each stitch with your fingers, thumb forceps, or needle holders. Each technique has advantages and disadvantages, which we will discuss in rounds. Try all techniques, but we advise to pick a method to practice for the assessment.

This is a complete description of the assessment. It will be simple and short (~ 5 minutes). We recognize that you’ll be nervous; there are no dings for shaky hands! 😃 You will be closely observed and timed - practice with someone watching and timing you once you’ve become proficient on your own. This added level of pressure helps to mimic the added pressure of performing surgery on a live patient. **Student participation during their assigned surgeries will be defined by the initial results of the surgical assessment.** All students will rotate through the surgery rotation and gain valuable experience learning to identify and handle live tissue gently; those students who have demonstrated proficiency in suturing and ligating during the assessment (i.e. met at least all blue level criteria) may also have the opportunity to practice these skills in the live patient. Realize that it takes practice, practice, practice to become proficient and it’s impossible to “cram” for a surgery practical. Start early and practice often!

If you have questions about any of these techniques or how to learn them, please contact RAVS staff well before your scheduled trip!
STUDENT LEARNING GOALS BASED ON ASSESSMENT LEVEL

Based on the skill category each student assesses into, below are a listing of common surgery techniques you may practice pending patient status and mentoring veterinarian comfort level.

Active Observer (Level 1 - GREEN)

- **Feline Neuter**
  - manipulate testicles into scrotum, apply tension on skin, incise scrotum over testicle
  - exteriorize testicle and spermatic cord and remove fascia
  - use blade to cut spermatic cord against clamp
  - tattoo

- **Canine Neuter**
  - manipulate testicle in pre-scrotal position, apply tension on skin, incise skin over testicle
  - exteriorize testicle and spermatic cord and remove fascia
  - place and remove clamps from spermatic cord
  - use blade to cut spermatic cord against clamps
  - cut suture (DVM ligates/sutures)
  - tattoo

- **Feline or Canine Spay**
  - skin incision, blunt and sharp dissection of subcutaneous tissue
  - identify linea alba
  - practice tenting up the linea (vet enters abdomen)
  - palpate inside abdomen through incision
  - use spay hook on right side of patient to retrieve uterus
  - palpate suspensory ligament (vet stretches or breaks down)
  - place and remove clamps
  - use blade to cut tissue against clamps
  - cut suture (DVM ligates/sutures)
  - tattoo

Assistant Surgeon (Level 2 - BLUE)

- Blue Learning Goals = Green level skills, PLUS:

- **Feline Neuter**
  - Perform figure 8 knot

- **Canine Neuter**
  - place 1 of 2 ligatures on spermatic cords
  - suture subcutaneous tissue & skin

- **Feline Spay or Canine Spay**
  - place 1 of 2 ligatures at each location
  - suture subcutaneous tissue & skin

Mentored Surgeon (Level 3 - BLACK)

- Black Learning Goals = Green and Blue level skills, PLUS:

- Start procedure at beginning & work for defined time OR start procedure at halfway point & work for defined time

- Focus on challenging parts of procedure -
  - Entering/closing abdomen, breaking down suspensory ligaments, friable tissue handling, abdominal closure

- Place both ligatures on neuters and spays

- Learn high volume techniques with a staff member or other experienced HQHV surgeon
SECTION 3: CLINICAL KNOWLEDGE & SKILL DEVELOPMENT

Rural Area Veterinary Services
CLIENT COMMUNICATION

Client communication is a critical part of your role as a veterinary professional. **One of the most important things you can do for the animals in your care is to effectively educate clients about animal health and preventive medicine.** Effective communication is a skill that must be practiced and refined over time.

In the veterinary-client relationship you have an important commonality with the client - you both care about and want to help the animal. What you say and how you say it play an important part in establishing rapport and stimulating open communication. If the client feels that they are being criticized or judged, they will not feel comfortable sharing information or asking questions.

When obtaining a medical history or discussing medical conditions and treatments with a client it is extremely important to use language that they can understand. Many clients have not been to a veterinarian before so they may have little knowledge of basic animal health concerns or current preventative health recommendations. Use simple explanations and examples that they can relate to. Stop frequently to verify that the client understands your explanations. Repeating important information and explaining more complicated concepts in several different ways can help the client fully comprehend what you are sharing.

Remember resources and availability of veterinary care vary considerably across the world. It is very important to consider these issues and to make realistic recommendations within the context of individual and community resources.

PATIENT HISTORY

An accurate and thorough patient history is critical to providing good medical care. **A complete history and thorough physical exam are the backbones of medical practice.**

**RAVS REMINDER:** Clients should never be asked to complete the patient history section of the medical record on their own. The history should always be reviewed with the client verbally so that additional follow up questions can be asked as needed to obtain an accurate clinical history.

Think about what information you are trying to obtain and **phrase questions openly to provide the most useful information.** Asking questions that require only a "yes or no" answer will frequently result in incomplete or misleading communications.

- Asking “Does your dog drink much water?” would not encourage the client to provide specific information. Asking “How much water does your dog drink?”, on the other hand, requires the owner to describe the amount of water consumed but not judge whether he or she believes the amount to be abnormal.
- Asking “Has the animal had diarrhea?” may prompt the client to answer “No”, as they have not observed the animal to have diarrhea. Instead, asking “Have you seen the animal’s stool recently?” will allow you to determine whether the client can provide an accurate description, or whether you may need to look to other physical signs for the information.
- A common tendency when taking a history is to ask leading questions of the client. In this example, asking the question “Your dog doesn't drink much water, does she?” would suggest to the client that the appropriate response should be "No, I guess not.” You would thus fail to obtain an accurate patient history.
MEDICAL INSTRUCTIONS AND COMPLIANCE

A crucial aspect of offering information to clients is to verify that understanding has taken place. This can be achieved by having the client repeat the information or demonstrate the instructions for you.

It may be necessary to repeat the information several times. It can be difficult for family members to absorb or process information when they are concerned about their animal’s health or safety. Simply asking “Do you understand?” “Does this make sense?” or “Do you have any questions?” though important, do not in themselves result in an assurance of understanding. Clients will often say that they understand to avoid appearing unintelligent. They may not have had enough time to assimilate the information and recognize what questions they may have.

It is important to know that people are more likely to remember what they hear than what they have read, and what they say is generally retained even longer than what is heard or read. Therefore, having clients repeat or clarify key information helps them remember it and lets you know if they have understood you.

Animals may present with several health or welfare concerns. Attempting to address all these concerns at one time is likely to overwhelm the client and result in none of the issues being adequately understood. Instead, identify one or two of the most important topics and focus on addressing those. If the client is particularly interested and seems to understand everything, you can always share more information. If at any point the client seems to lose interest or becomes confused, review the most important points then stop.

In many cases the information may be too overwhelming for clients to digest in a brief period. In addition to verbal explanation, clients should be given written instructions about their animal’s care to take home with them for reference. Clients should always be encouraged to contact RAVS or a local veterinarian if any additional questions or problems arise.

Key Points for Effective Communication

▪ Remember you and the client are a team – you both care about the animal and want to provide the best care possible.

▪ Establish rapport with the clients by introducing yourself and pointing out something special about their animal.

▪ Use open nonjudgmental language to establish trust. Do not presume what a client will or will not do for their animal – clients should always be presented with all reasonable options and the risks and benefits of each.

▪ Ask open-ended non leading questions when obtaining a patient’s history.

▪ Use simple descriptions and examples clients can relate to when explaining medical procedures, diseases, treatments, etc.

▪ Repeat important information and clarify complicated concepts in several ways to facilitate client comprehension and retention. Having clients repeat important information back to you also helps them remember it and ensures you they have understood.

▪ Animals may present with multiple health problems and trying to address all problems simultaneously can easily overwhelm the client. Focus on one or two of the most important issues.

▪ Always remember to thank the client for bringing their animal in and acknowledge that they are doing a great thing for their companion.
ANIMAL HANDLING AND GENTLE CONTROL

Safe, humane animal handling, considerate approach and gentle control are essential to be an effective veterinary professional. If you cannot safely handle an animal, you will likely miss important physical exam findings, cause excessive stress to the animal, and potentially become injured or cause injury to your patient. The public watches us to learn how to properly handle and interact with animals. Being professional means being SAFE and HUMANE.

Safe, humane and effective animal handling requires a thorough understanding of the normal behavior and responses of each species. This section of the manual includes general information on safe handling and interpreting animal’s signs of FAS – fear, anxiety and stress. However, there is no substitute for careful observation and experience.

Be aware of the stressors for animals in a clinic setting. The most common motivation for aggressive behavior is fear. Doing everything we can to reduce fear and distress will keep our patients and our teams safer and healthier.

Many of our patients have lived entirely outdoors and have not been handled much or ever examined before. They may not have any experience on a leash and may panic in response. It is important to remember this when handling these patients and to pay particular attention to ways to reduce stimulation and stress for our patients throughout their clinic stay.

RAVS REMINDER: Communicating animal behavior concerns to team members is important for the safety of the patient and to anyone handling the animal. If you encounter an animal exhibiting potentially unsafe behavior or severe FAS, please seek assistance from your Area Lead. The safety of our team and patients is most important!

Less is More, Don’t Rush!
The first points to keep in mind when handling any kind of animal is that a considerate approach is helpful for reducing FAS and the least physical restraint is often best. This does not mean that you give up your control, just that you use as little physical restraint as necessary while maintaining gentle control of the situation.

Before attempting to handle or examine an animal, take a moment to "introduce yourself" and allow the animal to become comfortable with you:

- Don’t rush into touching the animal - allow them to smell you through the carrier. If the animal is on the ground, approach from the side crouching down so that you are on their level and not imposing above them. Extend your hand for them to smell and allow them to approach you first if possible.
- Offer a small amount of high value food to ‘make friends’ with animals who are food-motivated.
- Face slightly away and avoid direct eye contact but maintain safe visual contact with the animal.
- Talk in calm, low, soothing tones. Avoid high-pitched tones or excited talk.

Safety Tips

- Never put your face directly into the face of a dog or cat.
- Always have the animal on a leash and hold the leash (slip lead or figure 8 harness – see notes below) in order to have a means of control when needed.
- Concentrate on the animal you are handling without being distracted by other activities. Be aware of their attitude and reactions throughout the exam or procedure.

Go Slow! Take time to introduce yourself to the patient. Photo credit: Lance Murphey
If an animal starts to resist, their behavior is escalating (tail thumping in cats, growling, ears flattened against head, body very tense) or you cannot safely finish the treatment, stop and get staff help. Do NOT try to “push through” to finish the exam on an increasingly reactive patient!

Always be prepared to protect yourself or move away quickly in the event an animal reacts unexpectedly. NEVER sit on the floor while handling/examining an animal. If the animal displays aggressive behavior, you will be unable to move away quickly. It is best to crouch / kneel next to the animal in a way that allows you to stand immediately if needed.

**TOOLS TO ACHIEVE GENTLE CONTROL**

**Verbal**
A low and calm tone of voice can calm a frightened animal. **Yelling or screaming should never be used as it can cause the animal to become more fearful or aggressive.**

**High Value Food**
A tasty treat can change the animal’s experience from fearful to pleasant and procedures can often be performed with an assistant holding a leash while offering a snack.

**Physical**
Various tools can aid with safe and humane handling of a patient.

- **Leash:** The most common tool used to handle animals in a clinic is the leash. Remember some dogs have never been on a leash and will freeze up, struggle and jerk away when one is placed around their neck. In the event a dog refuses to cooperate with a leash, you may need to carry the animal. In certain cases, having the client walk with or encourage their animal will help an otherwise resistant dog move to a different location. **NEVER drag a dog on a leash.**

A **figure 8 harness**, made from a slip lead leash, placed on an animal is another great way to keep control of an animal. The harness gives you control of the animal without the leash tightening around their neck when they pull. Make a figure-eight harness first by placing the slip lead as normal around the patient’s neck (solid arrow), then looping the free end of the slip lead behind the front legs (dotted arrow) and then back through the metal ring. The metal ring will be on top between the shoulders.

**RAVS REMINDER:** **EVERY** animal being transported or handled in the clinic **must ALWAYS be on a leash** – either as a slip lead around their neck or as a figure 8 harness. This includes puppies, kittens and sedated animals.

- **ALL cats should have a figure 8 harness placed at the start of their physical exam and kept on throughout their stay in the clinic.**
- **Animals should NEVER be placed in a kennel with a slip lead around their neck only. An extended figure 8 harness can be placed on dogs if having a leash on while kenneled will facilitate future handling.**
- **Animals presented on any type of client-owned leash should be transferred to a slip lead and the leash returned to the client so that it is not lost during the animal’s stay.**
**Towels:** A towel or blanket is a very useful tool for cats and small dogs. A towel can be used to decrease an animal’s arousal by covering the head and body and can help protect from sharp claws and teeth. Towels can be sprayed with calming pheromones to help lower an animal’s stress during handling.

**Nets:** A net is the primary tool used to handle escaped cats. When used properly, it allows for the safe handling and transfer of even the most fearful or feral cat. Effective use of the net requires training and practice. If you need to handle a fearful or fractious cat, ask for assistance from a staff member.

**Muzzles:** Muzzles are sometimes used when a potentially aggressive dog must be handled. There are nylon muzzles and plastic basket styles available. Because dogs often try to remove a muzzle, it is important that the muzzle be placed securely. A poorly fitting muzzle may lead to a false sense of security and the possibility of being bitten. Even with a securely placed muzzle, appropriate handling must be used to prevent injury.

**Pharmaceuticals:** When animals are experiencing high levels of FAS, it is preferable to use anxiolytics +/- sedatives and/or anesthesia to facilitate care. If you are unable to safely handle an animal without inducing severe FAS (see chart), notify a staff member to determine if medication is appropriate. Early intervention to help calm the patient is essential for human and patient safety. See ‘Anesthesia Agents’ in Section 3 for details pertaining to sedative/anesthetic drugs.

**RAVS REMINDER:** When receiving an animal for surgery who exhibits difficult or aggressive behavior, consult the Anesthesia Lead prior to the client leaving and/or kenneling the animal as we may opt to administer a pre-anesthetic sedative immediately and expedite the surgery process to minimize the animal’s time in the clinic.

**FINAL REMINDERS**
Safe and humane gentle control techniques will be demonstrated on-site during the clinic orientation. The time where correct use of gentle control is the most critical is when two people are handling the animal. Both people involved should be in constant communication about handling the animal. “Tell me when you are ready, and I’ll give the vaccine in the right hind leg.” “Okay, I’m ready now.” [injection given] “Okay, injection is in, I’m all done.”

LASTLY - If an animal gets loose while inside the clinic building, yell “DOOR” – this should prompt the doors to be closed.blocked to prevent the animal from escaping. Remain calm and do NOT chase the loose animal. RAVS staff will catch the animal and give an all-clear once the animal has been safely confined.

See the following pages for infographics from www.fearfreehappyhomes.com for behavioral and physical indicators of fear, anxiety and stress in dogs and cats. Permission granted for use of graphics.
THE SPECTRUM OF FEAR, ANXIETY & STRESS

RED: SEVERE SIGNS - FIGHT/AGGRESSION (FAS 5)
- Offensive aggression: lunging forward, ears forward, tail up, hair may be up on the shoulders, rump, and tail, showing only the front teeth, lip pucker - lips pulled forward, tongue tight and thin, pupils possibly dilated or constricted.
- Defensive aggression: hair may be up on the back and rump, dilated pupils, direct eye contact, showing all teeth including molars, body crouched and retreating, tail tucked, ears back.

RED: SEVERE SIGNS - FLIGHT/FREEZE/FRET (FAS 4)
- Right: ears back, tail tucked, actively trying to escape - slinking away or running, mouth closed or excessive panting - tongue tight instead of loose out of mouth, showing whites of eyes, brow furrowed, pupils dilated.
- Freeze/Fret: tonic immobility, pupils dilated, increased respiratory rate, trembling, tense closed mouth, ears back, tail tucked, body hunched.

YELLOW: MODERATE SIGNS (FAS 3)
- Similar to FAS 2 but turning head away, may refuse treats for brief moments or take treats roughly, may be hesitant to interact but not completely avoiding interaction.

YELLOW: MODERATE SIGNS (FAS 2)
- Ears slightly back or to the side, tail down but not necessarily completely tucked, furrowed brow, slow movements or unable to settle, fidgeting, attention seeking to owner, panting with a tighter mouth, moderate pupil dilation.

GREEN: MILD/SUBTLE SIGNS (FAS 1)
- Lip licking, avoids eye contact, turns head away without moving away, licks paw, partially dilated pupils, slight panting but commissures of lips are relaxed.

GREEN: ALERT/EXCITED/ANXIOUS? (FAS 0-1)
- Tail up higher, looking directly, mouth closed, eyes more intense, more pupil dilation, brow tense, hair may be just slightly up on the back and tail, may be expectant and excited or highly aroused.

GREEN: PERKED/INTERESTED/ANXIOUS? (FAS 0-1)
- Looking directly but not intensely, tail up slightly, mouth open slightly but loose lips, ears perked forward, slight pupil dilation.

GREEN: RELAXED (FAS 0)
- Sleeping.
- Neutral: ears in neutral position, not perked forward, brow soft, eyes soft, mouth closed but lips relaxed, body loose, tail carriage neutral, pupils normal dilation.
- Friendly greeting: slow back and forth tail and butt wag, ears just slightly back, relaxed brow and eyes, may have mouth slightly open with relaxed lips and loose tongue.

FEAR FREE HAPPY HOMES
www.fearfreehappyhomes.com
THE SPECTRUM OF FEAR, ANXIETY & STRESS

RED: SEVERE SIGNS - FIGHT/AGGRESSION (FAS 5)
- Offensive aggression: pupils constricted or dilated, cat leaning forward, ears forward, moving forward, whiskers forward, tail is an inverted L (first inch of tail is horizontal with ground then the tail drops down), rump raised higher than front (on tip toes), staring, may be growling.
- Defensive aggression: ears back, pupils dilated, hunkered down, tail tight or tucked or tail thrashing, whiskers back, hissing, lips pulled back, staring, furrowed brow, could be swatting.

RED: SEVERE SIGNS - FLIGHT/FREEZE/FRET (FAS 4)
- Flight: actively trying to escape, pupils dilated, ears back, whiskers back, tail down and bottlebrushed, fleeing, turning to look at stimulus.
- Freeze/Fret: tonic immobility, dilated pupils, body flattened and tense, tail tucked, increased respiratory rate, ears back, staring, whiskers back.

YELLOW: MODERATE SIGNS (FAS 2-3)
- Ears further to the side, more pupil dilation but not completely dilated, increase in respiratory rate, brow furrowed, looking at stimulus instead of looking away, tail tight to body, possible tip of tail moving some, whiskers back, body crouched and leaning away.

GREEN: MILD/SUBTLE SIGNS (FAS 1)
- Avoids eye contact, turns head away without moving away, partially dilated pupils, head held just slightly down, slight brow furrowing, whiskers slightly back, ears partially to the side, body shifted slightly away, tail closer to body with possibly some slight flicking.

GREEN: PERKED/INTERESTED/ANXIOUS? (FAS 0-1)
- Looking directly but not intensely, tail up and winding, mouth closed with loose lips, ears perked forward, whiskers forward, slight pupil dilation.

GREEN: RELAXED (FAS 0)
- Sleeping.
- Neutral: ears in neutral position, brow soft, eyes soft, mouth closed with relaxed lips, body loose, tail carriage U-shaped, pupils normal dilation.
- Friendly greeting: tail up and winding, may elevate rear end slightly by standing on toes, ears neutral, forward, or slightly back, might have squinty eyes, brow relaxed, might cheek mark or rub on person or object.

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PHYSICAL EXAMINATION OF DOGS AND CATS

GENERAL GUIDELINES

The physical examination is THE most important practical skill for a clinician to develop. It can also be one of the most challenging. A good physical examination can detect minor abnormalities before they become serious problems as well as identify major organ dysfunction without extensive and expensive medical tests.

➢ For potential surgical patients, careful pre-operative assessment is necessary for selection of appropriate anesthetic protocols. Many surgical and anesthetic complications are a result of pre-existing clinical conditions, most of which are associated with abnormalities that could have been identified by a skilled examiner and thorough exam. A good physical exam can point to many conditions and cause a change in anesthetic or surgical technique, monitoring, and support.

Learning to trust your physical exam skills can be challenging. To complicate matters, technologic advances and the increasing availability of diagnostic equipment can lead to a reliance on these tools. Take your time and learn that your ears, eyes, hands, and brain are exceptional diagnostics.

While a thorough examination is completed during pre-surgical receiving or as part of wellness or medicine consult appointments, every interaction you have with an animal should be used as an opportunity to assess the physical condition and health status of the patient as parameters may change. With experience, this can be done quickly and easily. This should become a life-long habit from which your patients will ultimately benefit.

Say Hello

Remember to first greet the client, review / confirm history, then introduce yourself to the patient before starting the examination. Taking a few moments to develop rapport with the client and a relationship with the patient will save time and stress later. Go slow.

Start with your eyes, not your hands

Start your physical examination by examining your patient from a distance. Note how he or she walks, sits, breathes, etc. Evaluate your patient's level of comfort in the environment. This information will give you important handling cues.

Be consistent and thorough

Examine the animal from head to tail and be sure to check everything in between. Develop a consistent method and use it every time.

Avoid the temptation to immediately focus on the most obvious complaint. The dog presented for limping might also be affected by something severe (e.g. intermittent internal bleeding from a mass or injury) to something less severe but problematic and in need of treatment (e.g. a stick caught in the mouth or tumor within the genitalia). Perform a complete exam regardless of the presenting complaint.

Client communication tip: “I’m sorry to hear Fluffy’s leg is bothering him. I’m going to examine him thoroughly and evaluate the painful part last for his comfort.”

Write it down

Record ALL results (both positive and negative) of your examination. Your colleagues will be using this information to evaluate and track the patient’s condition. It is crucial that exam results are thorough and legible. Remember to write your name the on the exam record so that the next person working with the animal can ask follow-up questions if necessary.
**Use safe, low stress handling**
Because of the inherently chaotic environments we work in, it can be challenging to minimize fear, anxiety and stress (FAS) to best allow for a physical exam. Use of a considerate approach when handling and throughout the exam is beneficial. Have an assistant use gentle control and distract the patient for a thorough exam. In general, we discourage clients from restraining their own animal (instead encourage clients to distract / talk to their animal), however in certain circumstances, client’s restraining their own animal may be the safest option. Clients should remain with their animals for exams whenever possible, as this has been shown to be less stressful for dogs and cats. Animals experiencing less stress equates to a better physical exam. Anxiolytic +/- sedatives may be indicated if severe FAS is present.

**Learn from your experience**
The more animals you examine, the more skilled you will become. Make a commitment to yourself to learn something new from every animal you examine. If you have ANY question as to whether a finding is abnormal or how to interpret an exam finding, consult a supervising veterinarian.

**RAVS REMINDER: Physical Exam Alerts**
When examining potential surgery patients, keep in mind that you are not only determining their general condition, but evaluating for anesthetic and surgical risk factors as well.

Any abnormal physical exam finding or medical history that might impact anesthesia or surgery must be evaluated by a veterinarian or RAVS staff BEFORE the animal is admitted for surgery. RAVS staff may decline surgery on any animal if we believe that there may be risk factors that cannot be adequately evaluated or addressed.

- Abnormalities or findings that might impact anesthesia or surgery (e.g. age, physical condition, reproductive status (in heat, pregnant, etc.) should be noted in the Alerts area of the Anesthesia Record and on the Surgery Board to alert the anesthesia and surgery teams to the findings.

For wellness patients, exam alerts that may impact vaccination candidacy should also be brought to the attention of a veterinarian before vaccinating. **If at any time you identify a problem that you feel is an emergency, immediately notify a veterinarian.**

**THE PHYSICAL EXAM**

**Signalment:** Complete description of the animal
- Species, Breed, Age, Sex, Reproductive status, other distinguishing characteristics
- **Always double-check client reported information** (sex, age, etc)
- Keep this information in mind as you examine the animal and make clinical judgments.

**History (Hx):**
- Includes housing, diet, medical and reproductive history, vaccination status and current medications.
  - **RAVS REMINDER: Rabies Vaccination History**
    - We MUST have proof of previous vaccination in order to treat an animal as previously vaccinated. This can be from the Visit Logs available at the Intake Desk or from client-provided paperwork or from a verbal confirmation (phone call) from the veterinary clinic that administered the vaccination. A rabies tag is not proof of vaccination as tags/collars can be moved from animal to animal. If no proof exists, we must mark the animal as NOT previously vaccinated.
  - Description and history of chief/presenting complaint.
  - Reported concerns should be followed up with additional questions to clarify nature of the complaint.

**RAVS REMINDER: Patient History**
Many of our patients will be presented by caretakers who do not have extensive information on the animal. The animal may live outdoors or roam much of the time, preventing the caretaker from making close observations. To obtain a useful history, it is important to phrase questions in such a way as to obtain the most accurate information possible. Asking, “Has the animal had diarrhea?” may prompt the client to answer “No”, as they have not observed the animal to have diarrhea. Instead, asking “Have you seen the animal’s stool recently?” will allow you to determine whether the client can provide an accurate description, or whether you may need to look to other physical signs for the information.
General Appearance / Initial Observations

- **General appearance** – observe animal from a distance and up close before any handling.

- **Behavior**
  - Gentle / Social – patient is friendly, compliant, and calm during the exam.
  - Fearful / Possible Caution – patient is exhibiting signs of moderate to severe FAS (see Fear Free charts)
  - Aggressive / Feral – patient is not able to be safely handled or history of such.

- **Body condition / State of nutrition** (see Purina Small Animal Body Condition Scoring chart)
  - Assign appropriate Body Condition Score using standard nine-point scale (BCS = 1-9)
  - In general, the animal is too thin if his ribs are easily seen, normal if they are readily felt without a layer of fat lying over them and obese if it is difficult to feel them at all.

- **Hydration status** - (see Assessing Dehydration below)
  - Often expressed as percentage of body weight (0-15%) which can be fairly subjective.
  - For our purposes, hydration is reported as either ‘adequate’, ‘marginal’, or ‘inadequate’.
  - Loss of the elasticity of the skin (skin turgor) is first sign of dehydration. Check the skin of the upper eyelid and the neck for tenting.
  - Signs of dehydration are more difficult to see in some animals. Skin may "tent" more in emaciated animals and certain breeds (e.g. sharpei, bassett hounds). Obese animals may not have skin tenting even when dehydrated.

- **Mentation / Level of consciousness** – attentiveness / reaction to environment
  - Bright, Alert, and Responsive (BAR) - Quiet, Alert and Responsive (QAR) - Depressed

- **Body Weight**
  - **Accurate weight** is required for our anesthesia /surgical patients and any patient that is prescribed medications.
  - **RAVS REMINDER:** Circle estimate vs. actual to indicate which method was used when documenting patient weight.

  When animals are weighed:
  - All animals < 10 kg should be weighed using a pediatric/small animal scale
  - Any animal < 3 kg or > 33 kg must be examined by a veterinarian for surgery clearance
  - **Weights are recorded in kilograms** – double check the scale to be sure you are reading the correct units!

Vital Signs

- **Temperature**: Via rectal thermometer
  - Normal: 100.5-102.5°F
  - A low temperature could indicate a patient:
    - is in shock / has poor perfusion
    - has been outside in cold weather for a prolonged period of time.
  - A high temperature could indicate a patient:
    - has an infection or inflammatory process occurring
    - is hyperexcitable, hyperactive, stressed or nervous
    - has been outside in hot weather for a prolonged period of time
  - Examine rectal area for signs of diarrhea, parasites or other abnormality when taking temp.
RAVS REMINDER: Clinic Protocol – Temperature and Rectal Exams

- Most animals will resist having their temperature taken. Complete the rest of the exam before obtaining a temperature to avoid making examination more difficult.
- Do not struggle with an animal to obtain temperature. If having difficulty consult a supervising veterinarian or staff member.
- Any temperature < 99 °F or > 105 °F warrants immediate evaluation by a supervisor.
- Consult a RAVS staff veterinarian about patients whose temperature is 103-104.5 °F. An animal who is excited/overactive and has no history consistent with or other signs of infection/illness may still be admitted for surgery and have their temperature rechecked prior to anesthesia to differentiate between a true fever and an elevated temperature due to ambient temp or excitement.
- Rectal Exams: While we recognize the importance of thorough physical examination, on RAVS clinics, rectal exams are performed only when clinically indicated and should be performed by a veterinarian or under direct veterinary supervision. Rectal exams may be requested while the patient is under anesthesia if indicated.

Heart Rate / Pulse Rate
- Normal: Canine: 80-160 bpm; Feline: 140-220 bpm
  - Pediatric patients generally have high normal or higher resting heart rates
  - Auscultate for abnormalities in addition to rate (Murmurs and arrhythmias)
- Evaluate pulse at femoral artery
  - Evaluate pulse rate, strength and quality (e.g., strong, weak, bounding)
  - Compare both sides and heart rate: pulse rate < heart rate = pulse deficit → consult DVM

Respiratory Rate and Character
- Normal: Canine: 15-30 bpm; Feline: 20-40 bpm
- RR determined visually or by auscultation. Count either inspirations or expirations.

Perfusion Indicators - (see ‘Assessing Mucous Membrane Color’ below)
- Mucous membrane color (MM) - provides indication of the blood flow to peripheral tissues.
- Capillary refill time (CRT) - reflects perfusion of peripheral tissues
  - Press on an area of mucous membrane. The gums will "blanch" white as they are pressed and become pink again when pressure is released.
  - CRT < 2 seconds is normal
  - CRT > 2 seconds is abnormal and may indicate compromised circulation due to cold, shock, cardiovascular disease, anemia or other causes.
- RAVS REMINDER: Abnormal MM color or CRT should be further evaluated by RAVS staff before admitting the animal for surgery.

The Physical Exam (Head to Toe Approach)
Head and Neck (EENT/Mouth)
- Compare both sides of face and head for symmetry.
- Assess eyes for size, position, discharge – lids, conjunctiva, sclera, pupil, cornea, lens
  - Note discharge, inflammation, redness, uneven/abnormal pupil size, corneal clouding, squinting
- Evaluate nose and nares for symmetry, conformation, and evidence of discharge
  - Classify discharge: serous, purulent, hemorrhagic, mucoid or mucopurulent
- RAVS REMINDER: Brachycephalic breeds should receive an Anesthetic Alert due to higher anesthetic risk. Nasal discharge may be a sign of infectious disease and warrants veterinary consultation.
- Examine oral cavity - lips, mucous membranes, teeth, hard and soft palate, tongue, and as much of the pharyngeal region as patient will safely allow
- Evaluate carriage and position of ears, thickness/malleability of pinnae and cleanliness of ear canals
- Palpate the mandibular lymph nodes
- Palpate salivary glands, larynx (both normally palpable), & thyroid gland (not normally palpable)
- Palpate the trachea – note coughing, swelling,
Trunk and Limbs (INTEG, M/S, PLN)

- **Posture and gait** - watch the animal walk to exam area or kennel. Look for limping, incoordination or unsteadiness and abnormal limb placement.
- **Inspect body** for symmetry, masses, tenderness, etc.
- **Palpate each limb and joint**: Note abnormalities in angulation, deformities, swelling, bleeding, bony protrusions, obvious fractures or joint luxation’s, range of motion, atrophy, knuckling, crepitus, etc.
  - Assess all limbs in weight-bearing and non-weight-bearing positions
  - Note the condition of the **feet and nails**

**RAVS REMINDER**: If nail trim needed and patient is here for surgery, mark as Tx in Recovery. If wellness patient, weigh pros/cons and timing)

- **Evaluate muscle mass and tone**
- **Examine skin and haircoat** for alopecia, masses, parasites, dryness, excessive oil, matting, etc.
  - Include identification of **ectoparasites** (fleas, ticks, lice)
  - Animals exhibiting clinical signs of generalized alopecia and intense pruritis should be evaluated for sarcoptes. Skin scrapings can be performed if warranted and time/resources permit.
- **Palpate pelvic region** for conformation and symmetry
- **Palpate vertebral column** to assess for deviations and pain
- **Palpate peripheral lymph nodes** (PLN): mandibular, superficial cervical, axillary, inguinal and popliteal
  - Normal lymph nodes should be firm, and freely moveable.
  - Enlarged or asymmetric lymph nodes may indicate a local or systemic infection, allergy or neoplastic disease
  - Normally palpable: mandibular, superficial cervical (difficult to locate in small or overweight animals), popliteal. Not normally palpable: inguinal (in awake animal), axillary

Thorax

- Observe and palpate the **thorax** for conformation, symmetry, masses, etc.
- **Cardiac auscultation** (CV)
  - Palpate the area between the fourth and sixth intercostal spaces on both sides of the thorax for the **point of maximum intensity** (PMI) of the heartbeat and any cardiac thrills.
  - Evaluate **heart rate** (HR) and **rhythm** (count beats for 15 seconds and multiply by 4)
  - **Normal heart sounds**:
    - ‘Lub-Dub’ = Should be a short time gap between heart sounds
    - S1 = loud, long, low pitch (closure of AV valves) ; S2 = closure of semilunar valves
  - **Abnormal heart sounds**:
    - **Arrhythmia** = e.g. sinus arrhythmia, atrial fibrillation, heart block, premature ventricular contractions, gallop rhythm (three or four sounds instead of two)
      - Sinus arrhythmia = Slight increase in heart rate during inspiration and decrease with expiration. Normal finding. More common in the dog than in the cat.
    - **Murmur** (see ‘Evaluating Heart Murmurs’ below)
      - Prolonged series of audible vibrations during normally silent part of cardiac cycle.
      - Often heard as a soft, swooshing sound.
      - Murmurs are described on basis of location, timing, duration, character and grade
    - **Muffled heart sounds** may be a result of fluid in the chest – if having difficulty hearing the heartbeat do not assume it is just you – it never hurts to get a second opinion.
Auscultate the heart in multiple locations on both the right and left sides of the chest. A heart murmur or other abnormality may go undetected unless each valve is ausculted independently.

- **Left 4th-6th intercostal space (PMI)** just above the sternal border = mitral valve
- **Left 2nd-4th intercostal space** above sternal border = pulmonic valve
- **Left 3rd-5th intercostal space** at mid thorax = aortic valve
- **Right 3rd-5th intercostal space** at mid thorax = tricuspid valve

**RAVS REMINDER:** Any doubts or concerns about an animal's cardiovascular status or the presence of a murmur or arrhythmia should be brought to the attention of a veterinarian.

**Respiratory auscultation (RESP)**

- Listen for noisy breathing at mouth and nares without stethoscope, then auscultate at least four different areas of the chest, including right and left ventral and right and left dorsal lung fields.
- **Respiratory Rate** (RR) – assess visually or auscultate and count breaths per minute
- **Depth / Effort** – watch degree of chest movement (normal, shallow, deep)
- **Character** – note sounds and any difficulty on inspiration and/or expiration
  - Normal respiratory sounds: vesicular / bronchial (soft, breezy/rustling sounds)
  - Abnormal lung sounds:
    - ‘Wheezes’ (continuous high-pitched hissing heard more often on expiration) - occurs with small airway diseases such as asthma
    - ‘Rales/crackles’ (course to fine - discontinuous, nonmusical, brief sounds heard more commonly on inspiration) – may be heard when fluid in the lungs
    - ‘Sonorous wheeze’ (continuous low-pitched dull snore-like gurgling sound, used to be called rhonchi, heard more commonly on expiration) – occurs with blockages to the airways by mucus, lesions or foreign bodies
    - ‘Dull’ lung sounds may indicate pneumonia, or consolidation
    - Absence of breath sounds may indicate pleural space disease (pleural effusion) or space-occupying lesions

- Changes may be associated with **location of respiratory system disease**
  - Loud breathing = large airway disease (nasal passages, trachea, larynx/pharynx)
  - Inspiratory noise or difficulty = extra thoracic airway disease (esp. the larynx)
  - Expiratory noise or difficulty = intrathoracic tracheal disease
  - Rapid/shallow breathing = pleural space disease (fluid or air)
  - Difficulty breathing on both inspiration and expiration = lung disease.

- Signs of **respiratory distress (dyspnea) will change** as disease progresses.
  - First sign usually a change in respiratory rate.
  - Next a change in respiratory rhythm and character (depth).
  - Posturing is a very late sign of respiratory disease: may be standing or sitting with back arched, neck extended, and elbows out and will be reluctant to lie down.
  - Other signs include exaggerated chest or abdominal movements on inspiration, open mouth breathing and flared nostrils. In extreme cases the animal may become cyanotic

**RAVS REMINDER:** Any abnormal lung sounds or perceived abnormalities in respiratory rate or effort should be further evaluated by a supervising veterinarian.
Abdomen (ABD/GI)
- **Inspect** for distention, deformity, displacement, symmetry, and bruising
- **Auscultate** abdomen to detect intestinal hypermotility or hypomotility
- **Abdominal palpation**
  - Using 1 or 2 hands, begin at the spine and move ventrally, allowing the abdominal viscera to slip through the fingers. Repeat throughout abdomen, noting organ size and location and the presence of fluid, gas, fetuses, masses or feces. Note any pain or guarding of the abdomen.
  - General identifications:
    - **Cranial abdomen** – stomach, liver, spleen, area of pancreas, small intestine
    - **Mid-abdomen** – spleen, kidneys, small intestine
      - **RAVS REMINDER**: Splenomegaly is a common finding in dogs with tick-borne disease.
    - **Caudal abdomen** – urinary bladder, prostate, uterus, colon, small intestine
  - Notes on Specific Organs:
    - **Stomach**: If animal has recently eaten, may be palpable behind ribs to mid-abdomen
    - **Liver**: edges normally sharp and well defined (not palpable in most patients)
    - **Small intestines**: masses, foreign bodies, pain on palpation
    - **Kidneys**: Right more cranial than left (usually not palpable in dogs)
    - **Bladder**: Pear-shaped in dog, spherical in cat

External Genitalia and Perineum (GU)
- Always **verify sex and reproductive status** – don’t assume client has provided accurate info
- **Inspect** perianal area for hair mats, hernias, feces, masses and evidence of discharge
- In dogs – palpate externally for impacted or abscessed anal sacs
  - **Male**: Inspect **prepuce and penis** - noting any discharge, inflammation, tumors. If intact – inspect both **testicles** for symmetry, size, location (both descended) and conformation.
  - **Female**: Palpate and visually assess **mammary glands** for tumors (cats too!), cysts, swelling, heat, lactation, or discharge. Inspect **vulva** for size, inflammation, discharge (blood, pus), polyps, tumors or structural defects.
    - **RAVS REMINDER**: Lactation should be noted as an Anesthesia Alert. If there are no kittens or puppies with mom, inquire with client if they are at home, their age and if they are exclusively nursing. Puppies and kittens may need to be brought to the clinic to wait with mom if they are still nursing exclusively (usually < 4 weeks of age) to prevent hypoglycemia.

Special Note: Canine Transmissible Venereal Tumor (CTVT or TVT) is common in several geographic regions where RAVS works. Bleeding from the vulva is a common physical exam finding or clinical history and which may be present when a dog is in heat but may also indicate infection. Spreading the vulvar lips to check for a tumor is important. Males are also affected thus evaluation of the penis, as far up the shaft as possible, is important in high-risk patients.

If you are unable to get a good exam during the PE and the patient is being admitted for surgery, record an Alert on the Anesthesia page so the Induction Technician can further examine the patient once anesthetized.

More information about TVT is available in the ‘Common Infectious Disease’ section of this manual.
Special Note – External Parasites: Evidence of parasitism should be recorded during the physical exam in association with the relevant body system. In addition, to obtain community animal health data the physical exam form includes a separate area to record parasites identified.

**IMPORTANT REMINDERS:**

**Record-keeping:** At the end of your exam, take a moment to review your notes and be sure that you have covered everything, and the exam findings are properly documented. In all record-keeping, use descriptive, factual language when describing your physical exam findings. If you are making an educated guess, distinguish that from something you know for certain. This helps prevent you from going down the wrong track prematurely. Once a diagnosis has been written down, it is surprisingly hard to remain open to other possible explanations. At this stage, it’s best to remain open to all possibilities.

**Surgical/Anesthetic Risks:** Before developing a treatment plan and approving the patient for surgery, any potential history, signalment or clinical findings that may impact anesthesia or surgery should be considered and discussed with a veterinarian. Additional pre-anesthetic evaluation may be required to determine whether the patient will be accepted for surgery. It is important to record this information clearly and accurately for the benefit of the anesthetists and others who may handle the patient later.

**ABBREVIATIONS:** Commonly used medical abbreviations to describe physical exam findings include:

- **TPR:** Temperature, pulse and respiratory rate
- **BAR:** Bright, alert and responsive (animal who is aware of their surroundings – not acting sick)
- **QAR:** Quiet, alert and responsive (still aware, but not as happy/active, may or may not be sick)
- **MM:** Mucous membranes
- **INTEG:** Integument
- **EENT:** Eyes, ears, nose, throat (and mouth)
- **CV:** Cardiovascular
- **RESP:** Respiratory
- **M/S:** Musculoskeletal
- **OS:** Left eye
- **OD:** Right eye
- **AS:** Left ear
- **AD:** Right ear
- **OU:** Both eyes
- **AU:** Both ears
- **e/d:** Eating/drinking
- **v/d:** Vomiting/diarrhea
- **c/e:** Clear and eupneic (re: lung auscultation and respiration)
- **c/d/i:** Clean/dry/intact (re: incision during final discharge exam)

Helpful hint: The abbreviations “S” for left and “D” for right date back to the days when left-handed people were considered **Sinister** while right-handed people were admired for their **Dexterity**. The “U” can be thought of as standing for **Universal ☺**.
### Assessing Dehydration:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5%</td>
<td>Adequate</td>
<td>No abnormalities seen – skin immediately returns to normal position after tenting, CRT normal (1-2 sec), eyes normal, mucous membranes pink and moist</td>
</tr>
<tr>
<td>5-8%</td>
<td>Marginal</td>
<td>Slight delay (2-4 seconds) in return of the skin to normal position, slight increase in CRT (2+ sec), eyes slightly sunken in sockets, mucous membranes slightly dry or tacky</td>
</tr>
<tr>
<td>8-10%</td>
<td>Inadequate</td>
<td>Obvious delay (5-10 seconds) in skin returning to normal position, increased CRT (2.5-3 sec), eyes sunken in sockets, mucous membranes dry, slightly tacky</td>
</tr>
<tr>
<td>10-12%</td>
<td>Inadequate</td>
<td>Skin remains tented (10-30 seconds), CRT increased dramatically (3+ sec), eyes very sunken, dry mucous membranes, animal is depressed, may see signs of shock (cool extremities, rapid/weak pulse, tachycardia)</td>
</tr>
<tr>
<td>12-15%</td>
<td></td>
<td>State of shock, death is probable</td>
</tr>
</tbody>
</table>

### Assessing Mucous Membrane Color

<table>
<thead>
<tr>
<th>Color</th>
<th>Interpretation</th>
<th>Possible Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pink</td>
<td>Normal</td>
<td>Adequate perfusion/oxygenation of peripheral tissues</td>
</tr>
<tr>
<td>Pale or White</td>
<td>Anemia, poor perfusion, vasoconstriction</td>
<td>Blood loss, shock, decreased peripheral blood flow</td>
</tr>
<tr>
<td>Blue (cyanotic)</td>
<td>Inadequate oxygenation</td>
<td>Hypoxemia</td>
</tr>
<tr>
<td>Brick Red</td>
<td>Increased perfusion, Vasodilation</td>
<td>Early shock, sepsis, fever, systemic inflammatory response syndrome</td>
</tr>
<tr>
<td>Yellow (icteric)</td>
<td>Bilirubin accumulation</td>
<td>Hepatic or biliary disorder and/or hemolysis</td>
</tr>
<tr>
<td>Brown</td>
<td>Methemoglobinemia</td>
<td>Acetaminophen toxicity in cats, intravascular hemolysis</td>
</tr>
<tr>
<td>Petechiae (red splotching)</td>
<td>Coagulation disorder</td>
<td>Platelet disorder, DIC, coagulation factor deficiencies</td>
</tr>
</tbody>
</table>

### Evaluating Heart Murmurs

**Description of Heart Murmurs**

- **Location:** Usually the valve area over which the murmur is loudest = Aortic / Mitral / Tricuspid / Pulmonic
  - May also be described in relation to chest structure (e.g. sternal border)

- **Timing:** The part of the cardiac cycle during which the murmur is heard = Systole / Diastole / Continuous

- **Duration:** Refers to the duration within cardiac cycle murmur is heard = Early systole/ Holosystolic/ Diastole

- **Character:** The quality of the murmur
  - Plateau or regurgitant type (same sound for the duration of murmur)
  - Decrescendo, crescendo, crescendo-decrescendo or ejection type (intensity changes throughout duration of murmur)
  - Machinery (heard throughout systole and diastole)
  - Decrescendo or blowing

- **Grade:** Loudness. Subjective assessment, does not necessarily indicate degree of cardiac dysfunction
  - 1/6 – Can only be heard in quiet room after several minutes of listening
  - 2/6 – Can be heard immediately, but is very soft
  - 3/6 – Low to moderately intense
  - 4/6 – Loud, but without a palpable thrill
  - 5/6 – Loud, with a palpable thrill
  - 6/6 – Can be heard with the stethoscope slightly off the thoracic wall

A helpful web reference: [https://www.youtube.com/watch?v=czfar-nXyXA](https://www.youtube.com/watch?v=czfar-nXyXA)
How to Determine a Cat's or Dog's Age

Examining teeth is one of the best ways to determine the approximate age of a cat or dog. Look at the degree of growth to determine the ages of kittens and puppies, and look at the degree of wear to determine the ages of adult cats and dogs. The diagram and chart below can help.

Be aware of two things that can throw off your estimate. First, an animal who has received dental care will have better-looking teeth than an animal who has not received such treatment. Second, variations exist among animals, even two from the same litter. Teeth are only a rough indicator of any animal’s actual age.

<table>
<thead>
<tr>
<th>ESTIMATED AGE</th>
<th>CAT’S TEETH</th>
<th>DOG’S TEETH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4 weeks</td>
<td>Deciduous (baby) incisors coming in</td>
<td>No noticeable tooth growth</td>
</tr>
<tr>
<td>3-4 weeks</td>
<td>Deciduous (baby) canines coming in</td>
<td>Deciduous (baby) canines coming in</td>
</tr>
<tr>
<td>4-6 weeks</td>
<td>Deciduous (baby) premolars coming in on lower jaw</td>
<td>Deciduous (baby) incisors and premolars coming in</td>
</tr>
<tr>
<td>8 weeks</td>
<td>All deciduous (baby) teeth are in</td>
<td>All deciduous (baby) teeth are in</td>
</tr>
<tr>
<td>3½ - 4 months</td>
<td>Permanent incisors coming in</td>
<td>No noticeable permanent tooth growth</td>
</tr>
<tr>
<td>4-5 months</td>
<td>Permanent canines, premolars, and molars coming in</td>
<td>Permanent incisors coming in; some growth of premolars and molars</td>
</tr>
<tr>
<td>5-7 months</td>
<td>All permanent teeth in by 6 months</td>
<td>Permanent canines, premolars, and molars coming in; all teeth in by 7 months</td>
</tr>
<tr>
<td>1 year</td>
<td>Teeth white and clean</td>
<td>Teeth white and clean</td>
</tr>
<tr>
<td>1-2 years</td>
<td>Teeth may appear dull with some tartar build-up (yellowing) on back teeth</td>
<td>Teeth may appear dull with some tartar build-up (yellowing) on back teeth</td>
</tr>
<tr>
<td>3-5 years</td>
<td>Teeth show more tartar build-up (on all teeth) and some tooth wear</td>
<td>Teeth show more tartar build-up (on all teeth) and some tooth wear</td>
</tr>
<tr>
<td>5-10 years</td>
<td>Teeth show increased wear and disease; pigment visible on gums</td>
<td>Teeth show increased wear and disease</td>
</tr>
<tr>
<td>10-15 years</td>
<td>Teeth are worn and show heavy tartar build-up; some teeth may be missing</td>
<td>Teeth are worn and show heavy tartar build-up; some teeth may be missing</td>
</tr>
</tbody>
</table>

Note: The location of teeth in a dog’s jaw is similar to the cat’s jaw shown here.
How to Determine a Cat's Sex

It's not always easy to figure out if a kitten or cat is a boy or girl. In kittens, unlike in puppies, no testicles are plainly visible until the animals reach 6-10 weeks of age. In adult cats, neutered males can be easily confused with females. The diagrams below can help.

In small kittens, gently lift the tail and look at the spacing between the anus and the sexual organ.

- The kitten is a male if the spacing between the anus and the penis is relatively wide (about ½ inch apart). The penis is usually hidden, but the area around it will look more like a hole than a slit.
- The kitten is a female if the anus and the vaginal opening are close together—almost adjacent to each other. The vaginal opening looks more like a slit than a round hole.

Because they are missing their testicles, adult neutered male cats don't look much different from adult female cats. Gently lift the tail and look at the spacing between the anus and the sexual organ.

- The cat is a neutered male if the spacing between the anus and the penis is relatively wide (more than one inch apart).
- The cat is a female if the anus and the vaginal opening are relatively close together (less than ½ inch apart).
BODY CONDITION SCORE

Body condition scores (BCS) provide a semi-quantitative method of evaluating body fat tissue percentages. The scale used by many veterinary professionals, including RAVS, is the nine-point Purina Body Condition Score. Using this scale, lower numbers reflect thinner conditions and higher numbers indicate more obese animals. Animals are assessed visually and by palpation of the ribs, spine and pelvic bones.

![Image of Body Condition Score System]

The BODY CONDITION SYSTEM was developed at the Nestlé Purina PetCare Center and has been validated as documented in the following publications:


Leffamore DM. Development and Validation of a Body Condition Score System for Dogs. Canine Practice July/August 1997; 22: 10-15

Koody, et al. Effects of Diet Restriction on Life Span and Age-Related Changes in Dogs. JAVMA 2002; 220:1315-1320

Call 1-800-222-VETS (8387), weekdays, 8:00 a.m. to 4:30 p.m. CT
Nestlé PURINA

BODY CONDITION SYSTEM

1 Ribs visible on shorthaired cats; no palpable fat; severe abdominal tuck; lumbar vertebrae and wings of ilia easily palpated.

2 Ribs easily visible on shorthaired cats; lumbar vertebrae obvious with minimal muscle mass; pronounced abdominal tuck; no palpable fat.

3 Ribs easily palpable with minimal fat covering; lumbar vertebrae obvious; obvious waist behind ribs; minimal abdominal fat.

4 Ribs palpable with minimal fat covering; noticeable waist behind ribs; slight abdominal tuck; abdominal fat pad absent.

5 Well-proportioned; observe waist behind ribs; ribs palpable with slight fat covering; abdominal fat pad minimal.

6 Ribs palpable with slight excess fat covering; waist and abdominal fat pad distinguishable but not obvious; abdominal tuck absent.

7 Ribs not easily palpated with moderate fat covering; waist poorly discernible; obvious rounding of abdomen; moderate abdominal fat pad.

8 Ribs not palpable with excess fat covering; waist absent; obvious rounding of abdomen with prominent abdominal fat pad; fat deposits present over lumbar area.

9 Ribs not palpable under heavy fat cover; heavy fat deposits over lumbar area, face and limbs; distention of abdomen with no waist; extensive abdominal fat deposits.

Call 1-800-222-VETS (8387), weekdays, 8:00 a.m. to 4:30 p.m. CT
The purpose of this section is to review the basics of some of the more common infectious diseases seen on field clinics. Volunteers should have a thorough understanding of these conditions and be able to effectively communicate this information to clients using terminology and recommendations that are clear and realistic for the client.

*The majority of animals coming into the clinic have had little or no previous veterinary care or vaccination history.* Many live outdoors and may roam freely having contact with other domestic and wild animals on a regular basis. The incidence of parasite infestation and infectious diseases are often high.

An important part of your role as a veterinary professional includes educating clients about the prevention of these conditions through good husbandry, vaccination and veterinary care.

Additionally, it is important to know how to minimize the transmission of the etiologic agents between patients. We do not want to become the source of infectious spread (don’t be the fomite!). Many of the pathogens listed below are very contagious AND difficult to inactivate/kill, specifically the non-enveloped viruses. The non-enveloped structure of these viruses makes them very hardy in nature (can last months to years) and resistant to many cleaning products. Specific cleaning and sanitation recommendations are made below for the non-enveloped viruses.

*NOTE: See SECTION 2 of the training manual for specific RAVS vaccination and anti-parasitic protocols.* For general vaccination guidelines, consult the American Animal Hospital Association guidelines for dogs and the American Association of Feline Practitioners guidelines for cats.

### Rabies

<table>
<thead>
<tr>
<th>Agent:</th>
<th><em>Rhabdoviridae</em> (enveloped single stranded RNA virus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission:</td>
<td>Most commonly transmitted via bite of an infected animal. The virus will begin shedding in saliva a short time before clinical signs develop, usually less than 10 days. Rabies can be transmitted through direct contact with infected saliva or brain/nervous tissue via broken skin or mucous membranes of the eyes, nose or mouth.</td>
</tr>
<tr>
<td>Incubation:</td>
<td>Can be weeks to months – dependent on site of exposure, the type of rabies virus and the immunity in the animal or person exposed</td>
</tr>
<tr>
<td>Clinical signs:</td>
<td>Attacks the brain and spinal cord causing progressive inflammation. Most commonly causes sudden behavioral changes and unexplained paralysis but any neurological dysfunction in rabies endemic areas should be considered a rabies suspect. There are two patterns of clinical signs commonly seen. The paralytic or &quot;dumb&quot; form causes a paralysis of the throat and jaw muscles leading to an inability to swallow that progresses to generalized paralysis and death. The furious form is characterized by irrationality, aggression, and loss of fear that progresses to seizures and lack of muscle coordination and eventual paralysis and death. Animals rarely live beyond 10 days after onset of clinical signs</td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>Diagnosis can only be made post-mortem via direct fluorescent antibody test of brain tissue</td>
</tr>
<tr>
<td>Prevention:</td>
<td>Killed vaccines are available for rabies and are considered a Core Vaccine thus vaccination is advised for all animals. Both dogs and cats should be vaccinated. State laws/requirements may differ.</td>
</tr>
<tr>
<td>Additional Notes:</td>
<td>Zoonotic! Every animal bite in an endemic area should be treated as a rabies suspect. Mortality is essentially 100% in domestic animals and humans.</td>
</tr>
</tbody>
</table>
### Canine Parvovirus (CPV, “parvo”)

<table>
<thead>
<tr>
<th>Agent:</th>
<th>Canine parvovirus (non-enveloped DNA virus)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission:</strong></td>
<td><strong>Very contagious!</strong> The virus can be shed in the feces of infected dogs 4-5 days before clinical signs occur and for 10-14 days post clinical recovery. Transmission is through direct oral or nasal contact with virus-containing feces or indirect contact with virus-contaminated fomites (environment, people, equipment). The virus is extremely hardy and can remain infective for many months to years in the environment and on fomites.</td>
</tr>
<tr>
<td>Incubation:</td>
<td>Clinical signs generally develop within 5-7 days of infection but can range from 2-14 days. <strong>Unvaccinated or incompletely vaccinated dogs of all ages are susceptible.</strong></td>
</tr>
<tr>
<td>Clinical signs:</td>
<td>The virus attacks rapidly dividing cells, like the cells of the small intestines and bone marrow, causing bleeding, fluid and electrolyte loss and neutropenia. <strong>Clinical signs include vomiting, diarrhea (commonly bloody), anorexia, lethargy, fever and rapid dehydration.</strong></td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>Fecal antigen ELISA test</td>
</tr>
<tr>
<td>Treatment:</td>
<td>Supportive and symptomatic: intravenous or subcutaneous fluids, antibiotics for potential secondary bacterial infections/sepsis, antiemetics and antidiarrhea medications</td>
</tr>
<tr>
<td>Prevention:</td>
<td>Modified live vaccines are available (part of DAPP) and are considered a Core Vaccine. Vaccination is advised for all dogs. <strong>Isolation of sick patients and proper cleaning and disinfecting</strong> are essential to help limit environmental contamination and spread.</td>
</tr>
<tr>
<td>Cleaning and Sanitation:</td>
<td><strong>Gross matter should always be cleaned/removed first before disinfection.</strong> Sodium hypochlorite (household bleach) at a dilution of 1:32, potassium peroxymonosulfate (Trifectant) at a 1% dilution, and accelerated hydrogen peroxide (Accel or Rescue) at a dilution of 1:32 are all effective disinfectants with a 10-minute contact time. Bleach should not be used in combination with other products.</td>
</tr>
</tbody>
</table>

### Canine Infectious Respiratory Disease Complex (CIRDC) (aka infectious tracheobronchitis or “kennel cough”) with special emphasis on Distemper

| Agents: | **Multiple bacterial and viral pathogens acting synergistically.** Viruses: parainfluenza, adenovirus-2, respiratory coronavirus, herpesvirus-1, pneumonavirus, **distemper**, and influenza (H3N8 and H3N2). Bacteria: *Bordetella bronchiseptica*, *Mycoplasma spp.*, *Streptococcus zooepidemicus*. Due to high disease prevalence and low vaccine rates, every case of canine respiratory disease seen in communities RAVS serves should be considered a distemper suspect. |
| Transmission: | **All pathogens of CIRDC have a preclinical shedding period and are very contagious.** Most pathogens commonly spread through aerosolized particles from coughing and sneezing but can also be spread in other body excretions (feces, urine, blood). Fomite transmission is possible. **Clinical signs and shedding for most pathogens are typically 5-10 days with Bordetella, Mycoplasma and distemper having longer shedding periods (weeks to months).** |
| Incubation: | The incubation period for most CIRDC pathogens is typically 2-3 days but can range from 2 days (influenza) to up to 6 weeks (distemper). |
| Clinical signs: | Clinical signs usually include sneezing, nasal and ocular discharge, and, depending the pathogens involved, lower respiratory and/or systemic disease. |
**Distemper clinical signs:** watery to purulent ocular discharge, fever (commonly biphasic), nasal discharge, coughing, pneumonia, lethargy, reduced appetite, vomiting, diarrhea and neurological signs (myoclonus, nystagmus, head tilt, weakness, seizures [focal and/or generalized]). Clinical signs are highly viable and disease course depends both on immune response and viral strain. Some dogs that survive distemper may develop **hyperkeratosis of the paw pads and nose and/or enamel hypoplasia in incompletely erupted teeth.** They also can have residual neurological signs.

**Diagnosis:** Testing for CIRDC is complicated as there are several laboratory diagnostic tests available to screen for the various agents of CIRDC depending on the suspected pathogens involved, the samples collected and the timing of collection in the course of the disease. There are no quick cage-side tests available.

**Treatment:** Supportive and symptomatic: hydration, rest and good nutrition are important. Antibiotics (commonly doxycycline) are used for possible bacterial infections. Inhalant administration of antibiotics may be used if oral antibiotics are found to ineffective. Long-acting cefovecin (Convenia) is not recommended as it is not effective against *Bordetella* or *Mycoplasma*. Antitussives may be considered. For distemper patients with neurological signs, anticonvulsants and sedatives may be considered.

**Prevention:** Modified live vaccines are available for distemper, adenovirus-2 and parainfluenza (parts of DAPP) and are considered a **Core Vaccine**. Vaccination advised for all dogs. Modified live mucosal vaccines (either intra-nasal or oral) and subcutaneous antigen extract vaccines are available for *Bordetella*. They are considered a non-core vaccine. Killed vaccines are available for influenza (H3N8) and are considered a non-core vaccine.

**Cleaning and Sanitation:** Most CIRDC pathogens are not hardy and are readily inactivated by commonly used disinfectants except for adenovirus-2. It is a non-enveloped virus and thus requires sodium hypochlorite (household bleach) at a dilution of 1:32, potassium peroxymonosulfate (Trifectant) at a 1% dilution, or accelerated hydrogen peroxide (Accel or Rescue) at a dilution of 1:32 with a 10 minute contact time to inactivate it. Bleach should not be used in combination with other products.

**Additional Notes:** Cats and humans with respiratory disease or who are immunocompromised can become infected with *Bordetella bronchiseptica*. Influenza (H3N2) infections have also been reported in cats.

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**Tick-Borne Diseases of Dogs**

**Agent:** Various rickettsial bacterial organisms spread by tick bites: *Ehrlichia, Anaplasma and Rickettsia richettsii (Rocky Mountain Spotted Fever)*

**Transmission:** Transmitted via bites from infected ticks. Ticks carry the rickettsia for months after feeding on an infected animal. Blood transfusions from infected animals are also implicated.

**Incubation:** Ranges from 2 to 14 days

**Clinical signs:**

- **Acute disease clinical signs:** fever, depression, stiffness and reluctance to walk, decreased appetite or anorexia, coughing, lymphadenopathy and splenomegaly. Thrombocytopenia and mild anemia may be seen.

- **Chronic disease clinical signs:** marked splenomegaly, pneumonia, anterior uveitis, meningitis (causing ataxia, depression, paresis, and hyperesthesia) and severe weight loss or wasting. Due to marked thrombocytopenia, epistaxis, hematuria, melena and petechia and ecchymoses can be seen. Anemia or pancytopenia can be seen due to bone marrow hypoplasia.
Diagnosis: Diagnosis can be made based on clinical signs and response to treatment. Many laboratory tests are available.

Treatment: **Doxycycline is the treatment of choice** for most of these diseases however other drugs may be advised on a case-by-case basis.

Prevention: Tick control is the most effective method of prevention.

Additional Notes: **Zoonotic!** These diseases are life-threatening to both humans and dogs. **Several rickettsial diseases are zoonotic and infection in dogs indicates a heightened risk for human infections.** They are a significant public health issue in a number of the communities RAVS' works with in Arizona.

### Canine Transmissible Venereal Tumor (TVT)

**Agent:** Transmittable round cell tumor. Metastasis is uncommon (<5% of cases).

**Transmission:** **Direct contact with the mass,** either during mating, or by licking, biting and sniffing the mass.

**Clinical signs:** **Bleeding from the penis/sheath or vulva most common** but they also can be transplanted to adjacent skin, and oral, nasal or conjunctival mucosa. Tumors can be solitary or multiple and have a **cauliflower-like appearance with very friable tissue.**

**Diagnosis:** Made based on visible tumor +/- cytology

**Treatment:** Chemotherapy with vincristine is the treatment of choice and prognosis good. Spontaneous regression can occur.

**Prevention:** Most commonly seen in sexually active free-roaming dogs. Sterilization surgery is an important aspect of disease control and prevention.

### Feline Upper Respiratory Infection (URI)

**Agent:** Multiple bacterial and viral pathogens acting synergistically. Viruses: feline herpesvirus-1 (FHV-1), feline calicivirus (FCV). Bacteria: *Bordetella bronchiseptica, Mycoplasma spp, Chlamydomphila felis, Streptococcus zooepidemicus* and others. **Approximately 80-90% of cases of URI are thought to be caused by FHV-1 and FCV.**

**Transmission:** **All pathogens of URI have a pre-clinical shedding period and are very contagious.** Pathogens are spread via direct contact with large droplets from sneezing, indirect contact with fomites and contact with carrier cats. **A large percentage of cats will remain chronic carriers and shed pathogens.** FHV-1 shedding is activated by stress while FCV shedding is not influenced by stress; it can be continuous or intermittent regardless of stress.

**Incubation:** Usually 2-6 days.

**Clinical signs:** **Upper respiratory signs including sneezing, nasal congestion, ocular and nasal discharge (serous to purulent), conjunctivitis, fever, anorexia, and oral and corneal ulceration.** Can progress to lower respiratory tract infections/pneumonia. All pathogens can cause similar or overlapping clinical signs, but FCV commonly associated with oral ulceration or limping. FHV-1 is commonly associated with keratitis and corneal ulceration. Chlamydia and mycoplasma are commonly associated with conjunctivitis without other signs.

**Diagnosis:** Testing for feline URI is complicated as there are several laboratory diagnostic tests available to screen for the various agents of URI depending on the suspected
pathogens involved, the samples collected and the timing of collection in the course of the disease. There are no quick cage-side tests available.

Treatment:

As most infections are viral **supportive and symptomatic treatment focusing on hydration, rest and good nutrition are important**. Systemic antibiotics are used in cases of suspected bacterial infection; topical ophthalmic antibiotics may be prescribed for severe ocular signs. Antiviral treatment should be reserved for refractory cases or cases manifesting FHV-1 signs (keratitis, severe conjunctivitis, or corneal ulcers).

Prevention:

Modified live vaccines are available (part of FVRCP) and are considered a **Core Vaccine** thus vaccination is advised for all cats. Vaccine does not necessarily prevent infection but reduces severity of disease.

**Isolation of sick patients, stress reduction, adequate housing/preventing overcrowding, and proper cleaning and disinfecting are essential to prevent spreading.**

Cleaning and Sanitation:

Most URI pathogens are not hardy and are readily inactivated by commonly used disinfectants except for calicivirus. Calicivirus is a non-enveloped virus and thus requires sodium hypochlorite (household bleach) at a dilution of 1:32, potassium peroxymonosulfate (Trifectant) at a 1% dilution, or accelerated hydrogen peroxide (Accel or Rescue) at a dilution of 1:32 with a 10 minute contact time to inactivate it. Bleach should not be used in combination with other products.

### Feline Panleukopenia (FPV, “feline distemper”, “panleuk”)

**Agent:**

Feline parvovirus (non-enveloped DNA virus). Closely related to canine parvovirus.

**Transmission:**

**Very contagious!** The virus can be shed 2-3 days before clinical signs occur and for up to 14 days post clinical recovery. Transmission is through direct oral or nasal contact with virus-containing feces or indirect contact with virus-contaminated fomites (environment, people, equipment). **The virus is extremely hardy and can remain infective for many months to years in the environment and on fomites.**

**Incubation:**

Ranges from 2 to 14 days

**Clinical signs:**

- Peracute cases can be subclinical and sudden death is common. **Clinical infections commonly present with fever, depression, anorexia with vomiting and diarrhea leading to dehydration, hypothermia and septic shock.**
- Mortality can reach 60-90% in kittens. Infections of pregnant cats or newborn kittens can result in damage to the cerebellum and related problems with coordination and mobility (cerebellar hypoplasia).

**Diagnosis:**

Fecal antigen tests for canine parvovirus can be used to cross-detect FPV

**Treatment:**

Supportive and symptomatic: intravenous or subcutaneous fluids, antibiotics for potential secondary bacterial infections/sepsis, antiemetics and anti-diarrheal medications

**Prevention:**

Modified live and killed vaccines are available (part of FVRCP) and are considered a **Core Vaccine** thus vaccination is advised for all cats.

**Isolation of sick patients and proper cleaning and disinfecting** are essential to help limit environmental contamination and spread.

**Cleaning and Sanitation:**

**Gross matter should always be cleaned/removed first before disinfection.** Sodium hypochlorite (household bleach) at a dilution of 1:32, potassium peroxymonosulfate (Trifectant) at a 1% dilution, and accelerated hydrogen peroxide (Accel or Rescue) at a dilution of 1:32 are all effective disinfectants with a 10-minute contact time. Bleach should not be used in combination with other products.
### Feline Retroviruses: Feline Leukemia Virus (FeLV)

<table>
<thead>
<tr>
<th><strong>Agent:</strong></th>
<th>Feline leukemia virus (enveloped RNA retrovirus)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission:</strong></td>
<td>Direct spread via saliva of infected cats; indirect spread via fomites (feed and water disease, toys). Transplacental spread is also possible but it is more commonly spread via nursing and grooming. The virus can also be present in urine and feces, but that is less common.</td>
</tr>
<tr>
<td><strong>Incubation:</strong></td>
<td>Ranges from 1 to 3 months. Clinical disease may not show for years after infection. Kittens are more susceptible than adult cats.</td>
</tr>
<tr>
<td><strong>Clinical signs:</strong></td>
<td>FeLV can cause leukemia along with other types of cancer (lymphoma), anemia, and immune suppression increasing susceptibility to other diseases. Cats may have many years of a good quality of life before developing any clinical signs of disease, however approximately 50% of infected cats living in multiple cat household will die within 2 years of contracting the disease and this mortality rate increases to 80% after 3 years.</td>
</tr>
<tr>
<td><strong>Diagnosis:</strong></td>
<td>Blood antigen ELISA test. Note: Recently infected cats may test negative, thus retesting of cats is recommended 1-3 months after their last known exposure.</td>
</tr>
<tr>
<td><strong>Treatment:</strong></td>
<td>There is no cure. Treatment consists of adequate nutrition, stress reduction and management of secondary infections.</td>
</tr>
<tr>
<td><strong>Prevention:</strong></td>
<td>Killed and recombinant vaccines are available for FeLV. It is recommended for all kittens but is considered a non-core vaccine except for adult cats (over one year of age) who are high risk. Identification of positive cats and keeping them indoors and housed singly or with other FeLV positive cats is recommended to prevent the spread to other cats.</td>
</tr>
<tr>
<td><strong>Cleaning and Sanitation:</strong></td>
<td>FeLV is not durable and is inactivated by most commonly used disinfectants.</td>
</tr>
</tbody>
</table>

### Feline Retroviruses: Feline Immunodeficiency Virus (FIV)

<table>
<thead>
<tr>
<th><strong>Agent:</strong></th>
<th>Feline Immunodeficiency Virus (enveloped RNA retrovirus)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission:</strong></td>
<td>Direct spread via saliva of infected cats; more likely to occur in free-roaming male cats. Transmission from queen to kittens (in utero and via nursing). Unlike FeLV, kittens do not appear more susceptible to infection than adult.</td>
</tr>
<tr>
<td><strong>Incubation:</strong></td>
<td>Cats can become infected and remain asymptomatic for many years.</td>
</tr>
<tr>
<td><strong>Clinical signs:</strong></td>
<td>Clinical signs and associated secondary infections are variable and nonspecific.</td>
</tr>
<tr>
<td><strong>Diagnosis:</strong></td>
<td>Blood antibody ELISA test – does not distinguish between naturally infected vs. vaccinated cats</td>
</tr>
<tr>
<td><strong>Treatment:</strong></td>
<td>No cure available. Treatment is based on clinical signs of secondary infection.</td>
</tr>
<tr>
<td><strong>Prevention:</strong></td>
<td>Killed vaccines are available and is considered a non-core vaccine. It is recommended that FIV positive cats be kept indoors to prevent disease spread.</td>
</tr>
<tr>
<td><strong>Cleaning and Sanitation:</strong></td>
<td>FIV is not durable and is inactivated by most commonly used disinfectants.</td>
</tr>
</tbody>
</table>
Although safe and effective treatment and control methods exist for most internal and external parasites, many animals in the communities we serve suffer from preventable parasite infections for a variety of reasons including lack of access to preventive veterinary care and information. Geographical location, lifestyle, housing conditions and species also play a role in which parasites are likely to be of concern.

Internal and external parasites can cause great discomfort, transmit disease to animals and humans and significantly interfere with the relationship between people and animals. The presence of parasites on an animal can cause family and community members to distance themselves physically and emotionally from the animal. The ‘mangy’ dog will be perceived and treated differently than a dog who appears healthy. This perception may profoundly influence the level of care and attention an animal receives.

**Because of the impact on animal and human health, it is important that we encourage comprehensive parasite control as a priority in preventive health care.**

Recommendations for treatment and prevention are only effective if the client is able to comply. Knowledge of the available treatment options and awareness of the resources available to the client and the community are important in developing successful treatment recommendations.

**Note:** The following is a brief overview of some of the most common parasites seen in our clinics. While diagnosis is an important aspect of comprehensive parasite control in animal patients, in the field setting we often treat based on clinical signs. Diagnosis has been included in the overviews for a more complete review of these parasites. Treatment notes are more general and details of drug dosing for RAVS clinics may be found in the clinic formulary. Additional treatment protocol information will be discussed during on-site orientations or on a case-specific basis.

The Companion Animal Parasite Council is an excellent reference / resource for veterinary professionals for accurate and current information about common parasites affecting our patients ([https://capcvet.org/](https://capcvet.org/)).

### ENDOPARASITES

<table>
<thead>
<tr>
<th><strong>Coccidia</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agent:</strong></td>
</tr>
<tr>
<td><strong>Lifecycle:</strong></td>
</tr>
<tr>
<td><strong>Transmission:</strong></td>
</tr>
<tr>
<td><strong>Clinical signs:</strong></td>
</tr>
<tr>
<td><strong>Diagnosis:</strong></td>
</tr>
<tr>
<td><strong>Treatment:</strong></td>
</tr>
<tr>
<td><strong>Prevention:</strong></td>
</tr>
</tbody>
</table>
### Giardia

<table>
<thead>
<tr>
<th>Agent:</th>
<th><em>Giardia species</em> (flagellated protozoa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifecycle:</td>
<td>Trophozoites multiply by longitudinal binary fission. Encystation occurs as the parasites move towards the colon.</td>
</tr>
<tr>
<td>Transmission:</td>
<td>Fecal-oral of cysts either directly or indirectly (via fecal contaminated water or food). <strong>Shedding is intermittent.</strong></td>
</tr>
<tr>
<td>Clinical signs:</td>
<td>Most commonly dogs and cats will be asymptomatic and will spontaneously clear the infection. When clinical signs occur, acute mild diarrhea is most common, but severe diarrhea with dehydration or chronic small or large bowel diarrhea can be seen.</td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>ELISA fecal antigen test. Identification of motile trophozoites on direct fecal smear or non-motile cysts on zinc sulfate fecal flotation with centrifugation.</td>
</tr>
<tr>
<td>Treatment:</td>
<td>No FDA approved treatments for animals but commonly fenbendazole and metronidazole are used. A follow up fecal floatation with centrifugation may be done 24-48 hours after completion of therapy if clinical signs persist. The ELISA tests may remain positive even after successful treatment and should not be used as a guide to determine reinfection or failure of treatment.</td>
</tr>
<tr>
<td>Prevention:</td>
<td>Good husbandry; prevent exposure to feces contaminated environments. <strong>Cysts can exist for months in a moist/cool environment.</strong></td>
</tr>
</tbody>
</table>

### Roundworms (Ascarids)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Lifecycle:</td>
<td>Puppies are usually infected transplacentally before birth. Direct transmission requires ingestion of infective egg. Larva migrate to liver and lungs, are coughed up and swallowed, and mature in the small intestine. In older animals, larvae migrate to and become dormant in muscle and other tissue.</td>
</tr>
<tr>
<td>Transmission:</td>
<td>Fecal-oral, transplacental, transmammary routes.</td>
</tr>
<tr>
<td>Clinical signs:</td>
<td>Often asymptomatic. Young animals may show slow growth, poor hair coat, and be &quot;pot bellied&quot;. Diarrhea may be present and worms can pass in feces or vomit. Migration can damage the lungs and lead to coughing / pneumonia. Death can occur in severe cases.</td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>Fecal float to identify eggs. <strong>The vast majority of puppies and kittens are infected, and should be routinely treated, regardless of fecal results.</strong></td>
</tr>
<tr>
<td>Treatment:</td>
<td>Pyrantel pamoate is the drug of choice in young puppies. All puppies &amp; kittens should be treated every 2 weeks starting at 2 weeks of age until 12-16 weeks old. Fenbendazole also effective.</td>
</tr>
<tr>
<td>Prevention:</td>
<td><strong>Eggs are extremely resistant.</strong> Frequent removal of feces before eggs become infective is recommended.</td>
</tr>
<tr>
<td>Additional Notes:</td>
<td><strong>Zoonotic</strong> - can cause visceral and ocular larval migrans in humans</td>
</tr>
</tbody>
</table>
# Hookworms

**Agent:** *Ancyclostoma spp., Ancyclostoma caninum* is the most likely to cause disease.

<table>
<thead>
<tr>
<th>Lifecycle:</th>
<th>Eggs become infective 2-9 days after they are shed and are less resistant than those of roundworms. Peracutaneous invaders migrate to the lungs, are coughed up and swallowed, and develop in the small intestine. Worms remove a plug of tissue from the intestinal wall to feed on blood. Eggs can be found in the feces 2-3 weeks after infection. Larvae that infect paratenic/transport hosts migrate to various tissues and become dormant (hypobiosis / arrested development).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission:</td>
<td>Fecal-oral, transmammary (dogs), percutaneous, or ingestion of other animals with infective larvae in their tissues (cockroaches)</td>
</tr>
<tr>
<td>Clinical signs:</td>
<td><strong>Animals are most commonly asymptomatic.</strong> Can cause black, tarry diarrhea and severe blood loss which can be fatal in puppies. Respiratory disease and pneumonia can occur when large numbers of larvae migrate through the lungs.</td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>Fecal flotation to identify eggs.</td>
</tr>
<tr>
<td>Treatment:</td>
<td>Pyrantel pamoate is the drug of choice. Selemectin and fenbendazole also effective. <strong>All puppies and kittens should be treated every 2 weeks starting at 2 weeks of age and then placed on monthly preventatives as soon as label recommendations allow.</strong></td>
</tr>
<tr>
<td>Prevention:</td>
<td>Pregnant and nursing bitches should be treated to minimize transmission to offspring. Larvae can only survive in the soil for a few months in optimal conditions; easily killed with freezing.</td>
</tr>
<tr>
<td>Additional Notes:</td>
<td><strong>Zoonotic</strong> - can cause cutaneous larval migrans in humans</td>
</tr>
</tbody>
</table>

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# Whipworms

**Agent:** *Trichuris vulpis*

<table>
<thead>
<tr>
<th>Lifecycle:</th>
<th>Eggs initially passed unembryonated in feces and embryonate (become infective) in 9-21 days. Larvae hatch from eggs in small intestine and penetrate the mucosa where they live for 2-10 days before moving to the cecum to mature as adult worms. The prepatent period (time from infection to shedding) is about 3 months.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission:</td>
<td>Fecal-oral is only route of transmission.</td>
</tr>
<tr>
<td>Clinical signs:</td>
<td><strong>Frequently asymptomatic.</strong> Weight loss, bloody diarrhea, dehydration, and anemia are possible signs.</td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>Fecal flotation for identification of eggs.</td>
</tr>
<tr>
<td>Treatment:</td>
<td>Fenbendazole and milbemycin. <strong>Due to long period of maturation, deworming should be repeated three times at monthly intervals.</strong></td>
</tr>
<tr>
<td>Prevention:</td>
<td>Eggs are very resistant, especially in soil and can remain infective for years. <strong>Reduce exposure by prompt removal of feces.</strong></td>
</tr>
<tr>
<td>Additional Notes:</td>
<td>Infections rarely seen in cats in North America.</td>
</tr>
</tbody>
</table>
### Tapeworms

<table>
<thead>
<tr>
<th><strong>Agent:</strong></th>
<th><em>Dipylidium caninum, Taenia spp</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lifecycle:</strong></td>
<td>Eggs are passed separately or in proglottids and eaten by a flea, lice, mouse or other rodents, or other animal. Lifecycle requires an intermediate host. The pre-patent period for dogs and cats is 1.5-3 months.</td>
</tr>
<tr>
<td><strong>Transmission:</strong></td>
<td><strong>Ingestion of intermediate host is the only way a dog or cat becomes infected.</strong> Flea-borne <em>Dipylidium</em> accounts for most infestations in dogs and cats.</td>
</tr>
<tr>
<td><strong>Clinical signs:</strong></td>
<td><strong>Serious disease is rare. Mild diarrhea and unthrifty appearance are typical signs.</strong></td>
</tr>
<tr>
<td><strong>Diagnosis:</strong></td>
<td>Egg-laden proglottids may be seen on fecal floatation; <em>clinically, visible cestode segments may be seen in the perineal / perirectal region (i.e. “rice grain” looking segments on the fur)</em></td>
</tr>
<tr>
<td><strong>Treatment:</strong></td>
<td>Praziquantel is drug of choice.</td>
</tr>
<tr>
<td><strong>Prevention:</strong></td>
<td>Effective flea control and preventing ingestion of rodents is the best preventative.</td>
</tr>
<tr>
<td><strong>Additional notes:</strong></td>
<td>Zoonotic but infection from dog and cat species rare.</td>
</tr>
</tbody>
</table>

### Heartworm

<table>
<thead>
<tr>
<th><strong>Agent:</strong></th>
<th><em>Dirofilaria immitis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lifecycle:</strong></td>
<td>Microfilariae are released into the infected animal’s blood stream by adult female worms living in the heart, lungs and associated blood vessels. Mosquitoes ingest larvae when feeding. Over a 2-week period, the larva becomes infective and migrates to the insect’s mouth parts where they are passed to another dog during the next feeding. The larva migrates to the right ventricle of the heart by 2-4 months post-infection. The worm then takes 2-3 months to reach maturity and produce offspring. Pre-patent period is 6-7 months.</td>
</tr>
<tr>
<td><strong>Transmission:</strong></td>
<td>Must be transmitted by mosquito. No direct transmission.</td>
</tr>
<tr>
<td><strong>Clinical signs:</strong></td>
<td>Exercise intolerance, coughing, dyspnea, and slow chronic weight loss. Heart and lung damage result from obstruction of blood flow by the bodies of living and dead worms. Heart murmurs may be heard on physical examination.</td>
</tr>
<tr>
<td><strong>Diagnosis:</strong></td>
<td>Serum antigen test and/or identification of microfilaria.</td>
</tr>
<tr>
<td><strong>Treatment:</strong></td>
<td>Injectable arsenic compounds kill adult worms slowly (mefarsamine). Concurrent steroids help prevent complications and antibiotics (doxycycline) to treat possible co-morbid bacterial infection of <em>Wolbachia</em>. <strong>Strict cage rest is critical to prevent pulmonary thromboembolism from dying worms.</strong></td>
</tr>
<tr>
<td><strong>Prevention:</strong></td>
<td>Macrolide preventatives (ivermectin, milbemycin, selamectin, moxidectin) are the most commonly used preventatives.</td>
</tr>
<tr>
<td><strong>Notes:</strong></td>
<td>Though more common in dogs, cats can also be infected with heartworm. When discussing this disease with clients, ensure they understand this is NOT an intestinal worm and is instead transmitted by mosquitoes and is blood-borne. The American Heartworm Society is an excellent resource for clients and veterinary professionals to learn the most current information about this disease including geographic distribution and treatment recommendations.</td>
</tr>
</tbody>
</table>
## ECTOPARASITES

### Fleas

<table>
<thead>
<tr>
<th>Agent:</th>
<th><em>Ctenocephalides felis, C. canis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifecycle:</td>
<td>Fleas feed on host, mate, and then the females lay hundreds of eggs which drop off and pupate. Adult fleas emerge from the cocoons to restart the cycle. Entire lifecycle takes 3 weeks in a favorable environment. Fleas can go 2 months without feeding, and can reproduce explosively.</td>
</tr>
<tr>
<td>Clinical signs:</td>
<td><strong>Pruritus.</strong> Most serious result is when animals develop allergic reactions to flea saliva and self-mutilate due to the intense pruritus (flea allergy dermatitis [FAD]). Heavy infestations may result in anemia. In very small / young animals, anemia can be severe enough to be life-threatening warranting possible need for transfusion.</td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>Adult fleas or “flea dirt” seen during examination</td>
</tr>
<tr>
<td>Treatment:</td>
<td>There are various products available. Frontline® or Revolution® topical and Seresto® collars are very effective flea prevention products. <strong>Clients should be cautioned NEVER to use canine labeled products to treat cats.</strong></td>
</tr>
<tr>
<td>Prevention:</td>
<td>Comprehensive flea control should eliminate fleas on animals, eliminate existing environmental infestations and prevent re-infestation.</td>
</tr>
<tr>
<td>Notes:</td>
<td>Fleas can also spread other infections (tapeworms, <em>Mycoplasma</em>) including zoonotic diseases.</td>
</tr>
</tbody>
</table>

### Ticks

<table>
<thead>
<tr>
<th>Agent:</th>
<th><em>Dermacentor</em> spp.; <em>Rhipicephalus sanguineus; Ixodes</em> spp; <em>Amblyoma</em> spp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifecycle:</td>
<td>Ticks are blood feeders. After mating, the adult females engorge from feeding and drop off to lay their eggs in the environment. The small six-legged seed ticks attach to a host, feed, grow, and drop off to molt. They repeat these 1 to 3 times depending on the tick species before finally breeding. Life cycle is completed in a couple of months.</td>
</tr>
<tr>
<td>Clinical signs:</td>
<td><strong>Ticks transmit a number of rickettsial and bacterial agents which can cause serious disease in both animals and humans.</strong> Tick paralysis can result from an animal’s reaction to a feeding tick. In cases of severe parasitism, especially in very small patients, anemia can result.</td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>Commonly visible identification</td>
</tr>
<tr>
<td>Treatment:</td>
<td>Topical or oral acaricides is recommended. Frontline® or Bravecto® topical and Seresto® collars are very effective tick prevention products.</td>
</tr>
<tr>
<td>Prevention:</td>
<td>Comprehensive tick control should eliminate ticks on animals, eliminate existing environmental infestations and prevent re-infestation.</td>
</tr>
<tr>
<td>Notes:</td>
<td>Ticks can <strong>transmit several serious zoonotic disease</strong> (RMSF, Lyme disease, etc.)</td>
</tr>
</tbody>
</table>
### Sarcoptic Mange (“scabies”)

<table>
<thead>
<tr>
<th>Agent:</th>
<th><em>Sarcoptes scabiei</em> var <em>canis</em> mite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifecycle:</td>
<td>Clinical signs usually start 10 days to 8 weeks after contact with an infected animal</td>
</tr>
<tr>
<td>Transmission:</td>
<td>Direct contact with infected animals</td>
</tr>
<tr>
<td>Clinical signs:</td>
<td>Most common clinical sign is <strong>intense pruritus</strong>! Pruritic lesions of hair loss with <strong>erythema, excoriation, scale and crusts typically start on the ventrum, ears, elbows and hocks</strong>. If left untreated, signs become generalized and seborrhea, hyperkeratosis, and secondary pyoderma develop.</td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>Based on clinical signs +/- superficial skin scraping</td>
</tr>
<tr>
<td>Treatment:</td>
<td>Administration of isoxazolines, e.g. Bravecto or Simparica, to all dogs in a household/with contact of infected animal – see RAVS Formulary and Sarcoptic Mange protocol for specifics of treatment.</td>
</tr>
<tr>
<td>Prevention:</td>
<td><strong>Mites cannot survive for more than 2-3 days off of their host</strong>. Items such as bedding, clothing, and towels should be washed in hot water and dried using the hot cycle. Items that cannot be washed should be removed from contact with dogs/hosts for at least 72 hours.</td>
</tr>
<tr>
<td>Notes:</td>
<td><strong>Zoonotic</strong> – while the <em>Sarcoptes scabiei</em> var <em>canis</em> mite can cause pruritus and skin irritation in humans it cannot reproduce on humans and thus the mite will die within a couple days.</td>
</tr>
</tbody>
</table>

### Demodectic Mange

<table>
<thead>
<tr>
<th>Agent:</th>
<th><em>Demodex canis</em> or other spp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifecycle:</td>
<td><strong>Most Demodex spp are normal mammalian fauna – disease results from an overgrowth due to an underlying condition.</strong> Life cycle of egg to mite requires 20 to 35 days and occurs within the hair follicles and sebaceous gland ducts.</td>
</tr>
<tr>
<td>Transmission:</td>
<td><strong>Disease is not contagious!</strong> Neonates are thought to acquire mites from their dam via direct contact during nursing.</td>
</tr>
</tbody>
</table>
| Clinical signs: | **Localized form** is characterized by nonpruritic patchy alopecia on the head or limbs. It usually occurs in puppies < 6 months of age and most cases will spontaneously resolve without treatment.  
**In generalized demodicosis** the skin becomes reddened, oozes serum, and is complicated by bacterial infection. These may be very difficult to cure and are thought to occur because of an **underlying systemic or immune defect**. |
| Diagnosis | Demodicosis is diagnosed by microscopically examining samples obtained from deep skin scrapings or hair plucks. |
| Treatment: | **Most cases will spontaneously resolve without treatment.** For generalized or severe demodicosis that require treatment, comprehensive treatment should include a miticide, evaluation for any underlying disorders and appropriate treatment, antibiotics for secondary pyoderma and sterilization surgery.  
Products such as Bravecto® and Nexgard® are effective off-label treatments. |
| Prevention: | Quality nutrition and additional immune support (sterilization, parasite control, regular veterinary checks, etc.) |
## Earmites

<table>
<thead>
<tr>
<th><strong>Agent:</strong></th>
<th><em>Otodectes cynotis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lifecycle:</strong></td>
<td>Adults live in the ear canal and feed on epidermal debris. The lifecycle occurs entirely within the ear canal and requires 18-28 days.</td>
</tr>
<tr>
<td><strong>Transmission:</strong></td>
<td>Direct contact with infected animals. Cat to dog and vice versa spread is common.</td>
</tr>
<tr>
<td><strong>Clinical signs:</strong></td>
<td><strong>Headshaking, scratching at ears, inflammation of the canals and accumulation of copious amounts of ceruminous debris.</strong> Intense pruritus can result in self-inflicted wounds. Secondary bacterial and yeast (<em>Malassezia</em>) infections and abscesses are common.</td>
</tr>
<tr>
<td><strong>Diagnosis:</strong></td>
<td>Microscopic evaluation of aural discharge</td>
</tr>
<tr>
<td><strong>Treatment:</strong></td>
<td>There are many products labelled for the treatment of ear mites. Cleansing of the ear canal prior to aural treatment is recommended. Revolution® is an effective treatment.</td>
</tr>
<tr>
<td><strong>Prevention:</strong></td>
<td>All cats and dogs in a home should be treated at the same time if one pet is diagnosed with ear mites.</td>
</tr>
</tbody>
</table>

## Ringworm (Dermatophytosis)

<table>
<thead>
<tr>
<th><strong>Agent:</strong></th>
<th><em>Microsporum canis, Microsporum gypseum, and Trichophyton mentagrophytes</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lifecycle:</strong></td>
<td>4 days to 4 weeks</td>
</tr>
<tr>
<td><strong>Transmission:</strong></td>
<td>Contact with infected animals, contaminated objects, or soil-borne organisms. <strong>The most susceptible animals are young or geriatric animals, immunocompromised animals, and animals with pre-existing conditions that affect grooming or the skin barrier (flea allergies or other external parasites or excessive grooming). Cats are more susceptible than dogs.</strong></td>
</tr>
<tr>
<td><strong>Clinical signs:</strong></td>
<td>Most common appearance is circular hair loss with scaling, particularly around the face, ears, feet and tail. However clinical signs can range from large areas of hair loss with or without crusts or exudate to infections of the toenails and nail beds. <strong>Lesions may or may not be pruritic.</strong></td>
</tr>
<tr>
<td><strong>Diagnosis:</strong></td>
<td>Fungal culture, animal's history and clinical signs, Wood’s lamp examination and microscopic identification should be considered.</td>
</tr>
<tr>
<td><strong>Treatment:</strong></td>
<td>In most cases animals will spontaneously recover from ringworm within about 3 months. Topical therapy is aimed at preventing spread and speeding recovery. Lyme-sulfur dip is economical, safe and most effective treatment. Oral antifungals are used for some cases and itraconazole is the drug of choice.</td>
</tr>
<tr>
<td><strong>Prevention:</strong></td>
<td>Fungal spores are highly resistant and can persist in the environment for months to years. <strong>Gross matter should always be cleaned/removed first before disinfection.</strong> Sodium hypochlorite (household bleach) at a dilution of 1:32, potassium peroxymonosulfate (Trifectant) at a 2% dilution, and accelerated hydrogen peroxide (Accel or Rescue) at a dilution of 1:16 are all effective disinfectants with a 10 minute contact time.</td>
</tr>
<tr>
<td><strong>Notes:</strong></td>
<td><strong>Zoonotic!</strong> Particularly a concern in young children and immunocompromised. When discussing this disease with clients, ensure they understand this is not a “worm” at all but is instead a fungal disease that affects the skin.</td>
</tr>
</tbody>
</table>
INTRODUCTION
This anesthesia section describes basics of the preanesthetic, induction, monitoring, and recovery periods then introduces equipment, anesthetic agents, monitoring parameters, and the basics of addressing anesthetic complications. Clinic-specific protocols, volunteer responsibilities, and patient flow descriptions are found in Section 2 of the training manual though some reminders are noted throughout this section.

The goal in the administration of general anesthesia is to provide a stage of reversible unconsciousness with adequate analgesia and muscle relaxation for surgical procedures in such a way that it does not jeopardize the patient's health. Providing safe anesthesia requires knowledge, technical skill, and an astute awareness of the patient's status at all times.

The anesthetist is entirely responsible for patient care under anesthesia and must be continually aware of the patient's status. An anesthetist should never leave the patient unattended or allow themselves to become distracted by other activities. Vigilance at all stages of the anesthetic procedure can warn of an impending crisis, usually with adequate time to take preventive or corrective actions. Any questions or concerns should be brought to the attention of a supervisor immediately. It is far better to call a 'false alarm' prematurely than to hesitate and risk a patient's safety.

PREANESTHETIC PERIOD
This is the time immediately preceding anesthesia in which a patient history and physical exam is obtained, anesthetic risk assessments are made and verified, pre-anesthetic drugs are administered, and anesthetic supplies are prepared.

Fasting is not required in healthy adult patient. To avoid complications associated with hypoglycemia, pediatric animals (<4 months of age) should be given a snack and not have food withheld longer than 3-4 hours prior to anesthesia.

Pre-anesthetic Medication
Pre-anesthetic agents are used:
- To calm or sedate an excited or aggressive animal.
- To reduce or eliminate possible adverse effects of general anesthetics.
- To reduce the amount of general anesthetic required to induce anesthesia.
- To decrease pain and discomfort in the postoperative period.

Assessment and Preparation: Before any patient is anesthetized, they should be re-evaluated by the anesthetist. A patient's status can change in the time between admission and anesthesia. Clinics can be quite busy and it's possible for a PE finding to be missed during initial evaluation. There is no judgement if this happens - more eyes, ears, and hands evaluating the patient all benefit the patient's well-being.

All drug and fluid calculations, equipment, and supplies needed to induce and maintain anesthesia on a patient should be readily available and confirmed in working order before a patient is anesthetized.

SPECIAL NOTE: Preparing Anesthetic Equipment
- It is crucial that you understand the basic mechanisms of all standard anesthetic and monitoring equipment and you are familiar with the layout and functioning of the machine you will be using. It is impossible to trouble-shoot anesthetic complications unless you understand how the anesthetic equipment is assembled and how each part functions. Take time to familiarize yourself with the equipment BEFORE you have a patient anesthetized. If you are unfamiliar with the machine or need to review any part of the equipment function or setup, ask!
Surgical Fluid Drip Rate Calculations

RAVS REMINDER: Anesthetists will be responsible for calculating fluid administration and drip rates for each patient using manual fluid administration sets.

To calculate drip rates during surgery, you'll need the following information:

- Fluid dose in ml / kg / unit of time (e.g. 10 ml/kg/hr)
- Fluid drip set 'drops/ml' – Note: always check packaging of the drip set to be used, however most RAVS' clinic supplies are 15 drops/ml IV administration sets.

There are many ways to correctly calculate the drip rate for a patient. Below are some of the methods:

Method 1:

✓ Step 1: calculate **volume to be administered per hr** = weight (kg) x volume of fluid dose
  (e.g. 15 kg dog, getting 10 ml/kg/hr = 15 x 10 = 150 mls/hr)

✓ Step 2: **calculate mls per min** = ___ mls/hr ÷ 60 min/hr (e.g. 150 mls/hr ÷ 60 min/hr = 2.5 ml/min)

✓ Step 3: **calculate mls per sec** = ___ mls/min ÷ 60 sec/min (e.g. 2.5 ml/min ÷ 60 sec/min = 0.042 ml/sec)

✓ Step 4: **calculate drops per sec** = ___ mls/sec x 15 drops/ml (e.g. 0.042 ml/sec x 15 = 0.63 drop/sec)
  - Critically evaluate – can you administer the rate calculated?
  - Is it possible to give 0.63 drops every second? No.

✓ Step 5: **calculate 1 whole drop every ____ seconds** if answer in step 4 is less than 1:
  1 ÷ ___ drop/sec = 1 drop every ___ seconds (e.g. 1 ÷ 0.63 = 1.59… we cannot easily measure 1.59 seconds, so…round to next whole number - this patient would receive 1 drop every 2 seconds.)

Method 2:

```
150 ml x 1 hour x 1 min x 15 drops = 0.63 drops
1 hour 60 min 60 sec 1 ml 1 sec
```

If answer is less than 1, calculate the inverse: 1 ÷ ____ drop/sec = 1 drop every ____ seconds
(e.g. 1 ÷ 0.63 = 1.59… we cannot measure 1.59 seconds, so…round up to next whole number - this patient would receive 1 drop every 2 seconds.)

Another quick method to calculate the same as shown above is listed below:

For patients who need > 60 ml/hr, use a bag w/ calculated drip rate:

( ___ ml/hr x 15 gtt/ml ÷ 3,600 = ___ gtt/sec ), then 1 ÷ ___ gtt/sec = 1 drop approx every ___ seconds

Note: For patients who need ≤ 60 ml/hr, use a syringe bolus every 5 min:

( ___ ml/hr ÷ 12 = ___ ml/5 min)

*Terminology note: some equations in textbooks and on IV line label packaging list the drops as gtt/ml. The abbreviation gtt come from the Latin noun gutta ("drop"). Thus, gtt/ml can be read as drops/ml when calculating drip rates.
**INDUCTION**

Induction is achieved by administering anesthetic agents which cause an awake patient to enter an anesthetized state. Intravenous induction or intramuscular induction are the two most commonly used methods in most veterinary settings.

As soon as is safely possible, a patient’s airway should be secured by placement of the largest bore endotracheal tube (ET tube) which can be safely placed through the arytenoid cartilages. If IV access is not already secured, an IV catheter is placed.

**Close monitoring of the patient is critical throughout the induction period.** The heart rate, respiratory rate and depth, mucous membrane color and capillary refill time should be checked frequently. *Nothing is more important than patient safety.* If you need the clippers turned off to hear a heartbeat or have any question as to the patient's status, say so. Do not be afraid to speak up!

Once a patient is deemed stable, monitoring continues, and the patient is further prepared for surgery.

**MAINTENANCE**

During the maintenance period the anesthetist has two responsibilities. 1: **Monitor the patient closely** to ensure vital signs remain stable and 2) **maintain the animal at an appropriate anesthetic depth.**

*The key to effective and safe anesthesia is patient monitoring.* The anesthetist who closely monitors the animal under anesthesia will receive ample warning of potential problems as they arise.

**Patient Monitoring Basics**

Patient monitoring is a continuous process. The anesthetist should be aware of subtle changes in parameters and prepared to address any issues immediately as they arise.

Parameters to be assessed throughout anesthesia include:
- Respiratory rate, depth and character
- Heart rate, pulse rate and quality
- Mucous membrane color and capillary refill time
- Anesthetic depth/stage of anesthesia (jaw tone, eye position and palpebral reflex activity)
- Anesthetic and Oxygen flow rates
- Ancillary monitoring parameters: Pulse ox, blood pressure, body temperature, etc.

Assisted ventilation is used to prevent atelectasis and / or to provide breaths in a bradypneic or apneic patient.

Absolute numbers are important, but often the **trend of a change** is an early indicator of whether the patient is beginning to decompensate. Do not wait until a patient's monitoring parameters are in the critical range. The time to act is as soon as you notice a potential problem or trend.

**RECOVERY**

Recovery begins as soon as the surgical procedure is completed. Recovery of a patient is a **CRUCIAL phase**, and perioperative support and monitoring continues through this period. **If there is going to be a surgical complication, recovery is most often where it will be discovered.** Our patients are often compromised to start with so absolute diligence is needed in this area. **If at ANY time you are concerned about the status of a patient's recovery or any parameter, consult a supervisor.**

![Recovery is a crucial phase of the anesthetic process.](image-url)
PROCEDURE FOR ENDOTRACHEAL INTUBATION

PREPARATION

▪ Gather materials before inducing the patient. Select several endotracheal tubes of varying sizes and check them for leaks, holes or loose connectors. *(Induction Technicians will complete this step on RAVS clinics).*

▪ Determine appropriate length of the tube required by measuring the distance from the incisors to the thoracic inlet. **Properly placed, the end of the tube should be half-way between the larynx and the thoracic inlet.**

▪ When the animal reaches an appropriate plane of anesthesia, open the mouth to allow intubation. **The animal should not be showing any signs of resistance.** The animal is restrained in sternal recumbency with the head and neck extended in a straight line. The restrainer should hold the upper jaw stationary with the lips pulled dorsally and pull the lower jaw down by pulling the tongue forward and down. The restrainer should not push on the animal's ventral neck as this may obscure the laryngeal anatomy.

▪ **All patients should be intubated with the largest endotracheal tube that fits comfortably in the trachea.** Resistance to respiration (e.g. the work of breathing) is determined primarily by the diameter of the endotracheal tube. The larger size the ET tube, the less resistance.

INTUBATION

▪ A laryngoscope can be used to assist intubation by illuminating the pharyngeal area and moving the epiglottis aside to allow visualization of the glottis. The laryngoscope blade is first used to disengage the soft palate from the epiglottis, then gently placed at the back of the tongue to pull the epiglottis forward.

▪ Insert the endotracheal tube past the vocal folds and into the trachea. **This can be more challenging in cats due to their tendency for laryngospasm.** A small amount of lidocaine can be applied to the arytenoids to decrease the sensitivity. Timing the advancement of the tube to coincide with exhalation is necessary to allow successful intubation, especially in the cat. Use caution not to continually stimulate the arytenoids which can close off the airway and prevent the animal from breathing. If you are having difficulty, ask for assistance.

⚠️ The **endotracheal tube should never be forced through the vocal cords**, but gently rotated if resistance is encountered. **Non-traumatic intubation is very important.**

▪ With smaller tubes, a polypropylene urinary catheter can be used as a stylet to provide more rigidity and allow easier intubation. If a stylet is used, the tip of the stylet should not protrude past the tip of the tube to avoid damage to the trachea.

▪ Ensure that the tube enters the trachea and not the esophagus. If you cannot visualize the tube entering the trachea, do not assume it is in place. Double check or re-intubate.
Other ways to verify proper endotracheal tube placement:
- Cough reflex
- Feel air passing through tube when animal breathes
- Visualize reservoir bag and unidirectional valves moving during respiration
- Palpate a single firm tube in throat
- **Vocalization is impossible with tube correctly placed.**

Secure the tube in place with an orange tie around the tube and behind the animal’s head or on top of the muzzle.

View of the canine laryngeal region is seen at the photo to the right with the opening to the trachea (rima glottidis) visible.

Excellent photos of feline intubation are available online at: https://catvets.com/guidelines/practice-guidelines/anesthesia-guidelines

**CUFF INFLATION**

**BEFORE** inflating the cuff of the endotracheal tube, **check for leakage of anesthetic gas around the cuff by gently squeezing the reservoir bag and listening for air around the tube** – see photo to the right. The assistant (off screen) is monitoring the patient’s chest (to estimate breath size) because this patient is attached to a non-rebreathing system and a pressure gauge is not present. When a rebreathing circuit is attached to the patient, the pressure gauge should be monitored and not exceed 15 cm H₂O during ventilation.

If the tube is of an appropriate size, you do not hear a leak, and are able to adequately ventilate the patient, the cuff may not need to be inflated further.

If the cuff needs to be inflated, ventilate the patient while you are adding air slowly to the cuff. The cuff should be inflated just until you can no longer hear a loud hiss of air around the tube.

**KEY POINTS ABOUT CUFF INFLATION:**
- Over-inflation of the cuff can result in necrosis and sloughing of the tracheal lining.
- The subjective feel of the inflation balloon **is not an acceptable method** of evaluating appropriate cuff inflation.
- It is a good idea to check the seal on the ET tube again once the patient has been moved to a surgery table and is hooked up to the anesthesia machine in dorsal recumbency.
The following provides a very brief overview of the anesthetic agents most commonly used in RAVS’ small animal protocols. This is NOT a detailed monograph on the listed drugs, nor is it a comprehensive list of all available anesthetic and peri-anesthetic agents. Consult additional anesthesia texts or Plumb’s Veterinary Drug Handbook for more detailed information.

### ANESTHETIC AGENTS

#### OPIOIDS (AND REVERSAL AGENT)

- The opioids are a diverse group of naturally occurring and synthetic drugs used primarily for their analgesic activity. Opioids combine reversibly with specific receptors in the central nervous system, altering the transmission and perception of pain.
- The clinical effects of opioids vary between the mu opioid receptor agonists (morphine, hydromorphone), partial mu agonists (buprenorphine), and kappa agonists (butorphanol, nalbuphine), and depend on additional patient factors, including the presence or absence of pain, physical condition of the animal, concurrent drugs administered, and individual sensitivity.
- Caution should be used with most opioids in the following cases: head trauma, increased CSF pressure or other CNS dysfunction; severe renal disease or Addison’s disease; debilitated patients.

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<tr>
<th>DRUG</th>
<th>MODE OF ACTION</th>
<th>EFFECTS</th>
<th>METHOD OF USE</th>
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</table>
| Buprenorphine (Buprenex®) | • Partial mu agonist  
• Strong affinity for receptors and a dose dependent longer duration than morphine | • Moderate analgesia  
• Minimal, if any, sedative effect | • Can be administered IV, IM, OTM, SQ at higher dose  
• In cats, bioavailability when given sublingual or buccal is appropriate when dosed same as IV route- best used as subsequent dosing  
• Delayed onset – time to peak effect: 20-30 mins IV, 45-60 minutes IM  
• Duration of effect (4-12 hrs) influenced by dose | • May be difficult to reverse if undesirable effects occur (uncommon)  
• May be used at higher dosing via SQ routes for prolonged duration (usually in cats)  
• Schedule III controlled drug |
| Butorphanol (Torbugesic®) | • Mixed agonist/antagonist  
(kappa agonist, mu antagonist) | • Mild analgesia, moderate-strong sedative | • Can be administered IV, IM or SQ  
• Duration of effect 30-60 minutes in dogs  
1-3 hours in cats | • Short duration of action may require additional re-dosing or additional analgesics post-procedure  
• Schedule IV controlled drug |
| Nalbuphine | • Clinically similar to butorphanol - Mixed agonist/antagonist  
(kappa agonist, mu antagonist) | • Mild analgesia, moderate-strong sedative | • Can be administered IV or IM  
• Duration of effect 1-2 hours | • Short duration of action may require additional re-dosing or additional analgesics post-procedure  
• Currently non-controlled; Generally not available in other countries |
| Morphine Sulfate | • Pure mu agonist | • Potent analgesia and sedation  
• Minimal cardiovascular effects. Higher doses can cause bradycardia  
• Respiratory depression (usually not clinically relevant) | • Can be administered IV, IM or SQ  
• Duration of effect 2-6 hours  
• Can also be used for epidural analgesia  
• Reversible with naloxone | • Sedative synergism with morphine and acepromazine in the dog – Reduce acepromazine dose  
• May be used in cats requiring more pain control; patients should be closely monitored  
• May cause panting (due to resetting of thermoregulatory mechanism)  
• Often causes vomiting and defecation when given IM or SQ  
• Schedule II controlled drug |
| Naloxone (Narcan®) | • Opioid Reversal  
(Pure opioid antagonist) | • Binds to all receptors but highest affinity for the mu receptor | • May be given IV, IM, SQ, or IO; on RAVS clinics it is typically administered IV  
• Rapid onset of action when given IV (1-2 minutes).  
• Duration of Action usually persists for 45-90 minutes; may act for up to 3 hours | • Excessive dosage or rapid reversal following surgery may result in tachycardia, blood pressure changes, arrhythmias, pulmonary edema, and seizures (rare).  
• Dose should be titrated when able to avoid possible hyperalgesia  
• Extremely high naloxone doses may be needed to reverse buprenorphine  
• Currently not controlled |
**ALPHA-2 AGONISTS (AND REVERSAL AGENTS):** The alpha-2 agonists (e.g. dexmedetomidine, medetomidine, and xylazine) are used for dose-dependent sedation and to aid in pain control as they do have analgesia properties. They are used most often in combination with other anesthetic or analgesic agents. They are fully reversible.

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<tr>
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<tbody>
<tr>
<td>Dexmedetomidine</td>
<td>Alpha-2 adrenergic agonist</td>
<td>Dose-dependent sedation which can be profound and anxiolytic action</td>
<td>May be administered IM or IV. Onset of action following IM injection is 5 minutes and 1 minute following IV dose</td>
<td>May have the potential to cause severe cardiovascular and respiratory complications. Standard doses of these drugs are given only to young, healthy patients and careful monitoring is essential.</td>
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<td>Stimulation of these receptors</td>
<td>Moderate to profound analgesia.</td>
<td>Duration of sedation is 30-90 minutes</td>
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<td>causes a decrease in the level</td>
<td>Peripheral vasoconstriction resulting in increased systemic vascular resistance and increased blood pressure. Heart rate decreases to compensate for the increased blood pressure and maintain cardiac output</td>
<td>Effects are reversible with atipamezole</td>
<td></td>
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<tr>
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<td>of norepinephrine released in the</td>
<td>Lowered respiratory rates and a reduction in body temperature</td>
<td>Typically used at doses MUCH lower than the label recommends</td>
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<tr>
<td></td>
<td>brain resulting in sedation and</td>
<td></td>
<td>Commonly used in healthy animals in combination with opioid analgesic as a pre-anesthetic sedative and to help decrease dose of general anesthetic required.</td>
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<tr>
<td></td>
<td>analgesia</td>
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<td>Can be used in IM induction cocktails (e.g. TND, DKT)</td>
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<tr>
<td>Atipamezole</td>
<td>Alpha-2 Reversal agonist</td>
<td>Removes effects of Alpha-2 agents</td>
<td>Completely, permanently reverses dexmedetomidine effects</td>
<td>May reverse effects of dexmedetomidine, including analgesia - administration of another analgesic agent may be appropriate at the time of reversal.</td>
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<td>(Alpha-2 antagonist)</td>
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<td>Administered IM unless acute emergency situation/arrest in which case IV administration may be considered.</td>
<td>Currently not controlled</td>
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<td>For complete reversal, administer same volume atipamezole as dexmedetomidine</td>
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<td>Can be used at partial dose for partial reversal effect</td>
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**PHENOTHIAZINES:** Some examples of the phenothiazines are acepromazine, promazine, and chlorpromazine of which acepromazine is the most used in veterinary medicine. A well-known side effect is a tendency to cause hypotension due to alpha-1-adrenergic blockade. Therefore, its use is contraindicated during times of hypotension, anemia and shock.

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<tbody>
<tr>
<td>Acepromazine</td>
<td>Thought to depress portions of the reticular activating system causing sedation</td>
<td>Strong sedative/tranquilizer, Antiemetic effect and Vasodilatory effects</td>
<td>Used in healthy adult animals in combination with opioid analgesic as a pre-anesthetic sedative and to decrease dose of general anesthetic required</td>
<td>Increased potency in geriatric animals, neonates and animals with liver dysfunction</td>
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<td></td>
<td>Anticholinergic, antihistamine, antispasmodic and alpha-adrenergic blocking effects</td>
<td></td>
<td>Also used post-operatively to help aid in patient relaxation while anxiolytics or other analgesics are taking effect</td>
<td><strong>No analgesic effect</strong> thus painful patients should be treated with an analgesic instead as first choice medication</td>
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<td></td>
<td>May be administered PO, SQ, IM or IV (with caution)</td>
<td>Can cause significant hypotension.</td>
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<td>Duration of effect is 6-8 hours</td>
<td>Maximum total dose is 3 mg, regardless of body weight</td>
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<td></td>
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<td></td>
<td><strong>Not reversible</strong></td>
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</table>
Non-Steroidal Anti-Inflammatory Drugs (NSAIDS): These drugs are used to control pain and inflammation and are a commonly used to help control pain in elective spay/neuter surgeries in veterinary medicine. Examples of injectable NSAIDS in veterinary medicine include but are not limited to meloxicam, carprofen, and ketoprofen. Meloxicam is used mostly often on RAVS’ clinics.

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<tbody>
<tr>
<td>Meloxicam (Metacam®)</td>
<td>Inhibits inflammatory cascade by blocking cyclooxygenase (COX) enzymes</td>
<td>Antipyretic, analgesic and anti-inflammatory effects via inhibition of cyclooxygenase-2 (COX-2)</td>
<td>May be administered PO, IM or IV</td>
<td>Avoid in animals with GI, hepatic or renal disease and in dehydrated or hypotensive patients</td>
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<td>COX-1 inhibition effects platelet function and integrity of GI mucosa</td>
<td>Duration of effect is 24 hrs</td>
<td>Do not combine with other drugs known to alter hemostasis or cause gastrointestinal erosion (aspirin, corticosteroids, etc.)</td>
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<td></td>
<td></td>
<td>Not reversible</td>
<td>Notes: Other drugs in this class occasionally used include carprofen and ketoprofen.</td>
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<td>Different NSAIDS should never be used concurrently in the same patient.</td>
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<td>A washout period is advised between NSAIDS</td>
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**INDUCTION**

DISSOCIATIVES: Dissociative anesthetic agents interrupt the ascending transmission from the unconscious to conscious parts of the brain. Dissociative anesthesia is characterized by a cataleptic state in which the eyes typically remain open and muscles are more often rigid. Patient movement often occurs and can be unrelated to surgical stimulation, thus for this reason dissociatives are often combined with other drugs. (ie: phenothiazines, benzodiazepines, alpha2 adrenergic agonists).

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<tbody>
<tr>
<td>Ketamine</td>
<td>Disrupts pathways within the cerebrum and stimulates the reticular activating center.</td>
<td>Exaggerated reflex responses and increased muscle tone.</td>
<td>May be given IM or IV or orally (fractious cats)</td>
<td>Positive inotropic effect on the myocardium and increases heart rate, cardiac output, blood pressure, pulmonary artery pressure and central venous pressure</td>
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<td>Significant superficial analgesia, but poor visceral analgesia.</td>
<td>Primarily used as induction agent or to perform short procedures with little pain involved</td>
<td>May cause increased salivation.</td>
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<td>Increased heart rate</td>
<td>Concurrent use of a tranquilizing agent, such as diazepam, acepromazine, or xylazine, helps prevent excessive muscle rigidity, improves ease of intubation, and provides smoother recovery</td>
<td>Increased intracranial and intraocular pressures</td>
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<td></td>
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<td>Patients may exhibit apneustic respiration (inspiration followed by prolonged pause and short expiration)</td>
<td>IM injection may be painful</td>
<td>Hyperthermia may occur in dogs during recovery</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not reversible</td>
<td>Animals recovering from dissociative anesthetics often show exaggerated response to touch, light or sound and may show seizure-like activity. Avoid unnecessary stimulation during recovery</td>
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<td>Schedule III controlled drug</td>
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| Tiletamine (Telazol®) | Dissociative anesthetic similar to ketamine | Similar to ketamine though less pronounced apneustic breathing | May be administered IM, IV, or SQ | Positive inotropic effect on the myocardium and increases heart rate, cardiac output, blood pressure, pulmonary artery pressure and central venous pressure |
|                     | Sold only in combination with zolazepam - a benzodiazepine similar to diazepam | Onset of anesthesia 2-5 mins after IM injection | Duration of anesthesia is 20-30 minutes. | May cause increased salivation. |
|                     |                                                        | IM injection may be painful          | IM injection may be prolonged with IM injection (up to 5 hrs) | Increased intracranial and intraocular pressures |
|                     |                                                        | Not reversible                       | Tiletamine is not reversible, however the zolazepam portion of Telazol is reversible with flumazenil | Hyperthermia may occur in dogs during recovery |
|                     |                                                        |                                      |                               | Schedule III controlled drug                   |

Notes: Other drugs in this class occasionally used include carprofen and ketoprofen. Different NSAIDS should never be used concurrently in the same patient. A washout period is advised between NSAIDS.
**BENZODIAZEPINES:** Injectable benzodiazepines frequently used in veterinary medicine include diazepam, midazolam and zolazepam. They provide muscle relaxation and anticonvulsant properties with unreliable sedation. They are commonly combined with other induction agents.

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</table>
| Diazepam (Valium®) | • Hypnotic sedative-probably effects release of endogenous GABA, an inhibitory neurotransmitter | • Anti-anxiety and calming effects, good skeletal muscle relaxation.  
• Anticonvulsant activity  
• Minimal adverse cardiovascular and respiratory effects.  
• High margin of safety  
• No analgesic effects | • Can be administered IV, PO, or per rectum and intranasally in emergencies when IV route is not readily available  
• Generally used for anesthesia in combination with ketamine, an opioid or propofol.  
• Not water-soluble - incompatible with most other agents and should not be mixed in a syringe with any agent other than ketamine  
• Reversible with flumazenil | • Use cautiously in animals with hepatic or renal disease and in debilitated or geriatric patients  
• Propylene glycol base makes diazepam somewhat painful and un-predictably absorbed IM  
• Ketamine/diazepam mixtures are generally administered only IV  
• Schedule IV controlled drug |
| Midazolam (Versed®) | • Same as Diazepam | Same as Diazepam | (see tiletamine above) | (see tiletamine above)  
Telazol is a schedule III controlled drug |
| Zolazepam (Telazol®) | • It is manufactured in combination with tiletamine as the product Telazol® (see tiletamine above) | Zolazepam is a benzodiazepine and alone is similar in action to diazepam, however is only sold in combination with tiletamine | (see tiletamine above) | (see tiletamine above)  
Telazol is a schedule III controlled drug |
| Flumazenil (Romazicon®) | • Benzodiazepine reversal; competitive blocker at the benzodiazepine receptors in the CNS | Competitively inhibits the activity of benzodiazepine and non-benzodiazepine substances that interact with benzodiazepine receptors site on the GABA/benzodiazepine receptor complex | Administered IV, most commonly via an IV catheter  
Reversal typically seen within 2-5 minutes after administration  
Re-dosing may be required for full effect | Can cause injection site reactions and should be given via IVC whenever possible  
Currently not controlled |

**OTHER INDUCTION / MAINTENANCE AGENTS:** Other induction agents used in veterinary medicine include (but are not limited to) propofol, thiopental, etomidate, and alfaxalone. RAVS’ currently carries propofol for case-specific use.

<table>
<thead>
<tr>
<th>DRUG</th>
<th>MODE OF ACTION</th>
<th>EFFECTS</th>
<th>METHOD OF USE</th>
<th>PRECAUTIONS / NOTES</th>
</tr>
</thead>
</table>
| Propofol | • Unique hypnotic agent consisting of a phenol in a hyperlipid emulsion – method of action is unknown, but may affect the GABA system | • Very fast acting injectable agent without cumulative effect - rapid induction and recovery  
• No analgesic effects | • Must be administered IV.  
• Can be given as intermittent bolus or CRI for maintenance of anesthesia  
• As a bolus carefully titrate to effect, administering 25% of calculated dose at a time  
• Administration with IV benzodiazepines can decrease propofol need by 50%  
• Not reversible | • Rapid administration can result in respiratory depression/apnea, hypotension and reduced myocardial contractility; use caution in animals with cardiovascular/respiratory disease  
• Hyperlipid emulsion promotes bacterial growth. Once bottle is opened, use within 6-8 hours (Propofol 25 is labelled as stable for 28 days when refrigerated)  
• Currently not controlled |
ANESTHETIC MAINTENANCE

INHALANT ANESTHETICS (isoflurane, halothane, sevoflurane)

- Liquid anesthetic in the anesthetic machine is vaporized, mixed with oxygen and delivered to the patient by mask or endotracheal tube. The anesthetic travels to the alveoli of the lungs, where it diffuses into the bloodstream.
- Because of their relatively high lipid solubility, inhalation agents readily leave the circulation and enter the brain, inducing anesthesia.
- Anesthesia is maintained as long as sufficient quantities of the agent are delivered to the alveoli so that the blood, alveolar and brain concentration are maintained.
- Inhalant anesthetics induce unconsciousness, amnesia, muscle relaxation, blunting of autonomic reflexes and immobility. **Little to no analgesia** is provided (meaning when patient awakens, the pain pathways are fully intact).
- The mechanism of action is uncharacterized.

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</tr>
</thead>
<tbody>
<tr>
<td>Isoflurane</td>
<td>Fluorinated hydrocarbon. Metabolism=99% respiration (good for neonatal and geriatric patients)</td>
<td>Dose-dependent hypotension (can be significant) and decreased cardiac output (due to vasodilation and negative inotropic effects). Mild respiratory depression Good muscle relaxation, little or no analgesia Can cause some increased CSF pressure Depression of thermoregulatory centers (use care to avoid hypo/hyperthermia)</td>
<td>Administered via mask or endotracheal tube Most commonly used to maintain anesthesia after administration of an injectable induction agent but can be used to induce anesthesia. Return to consciousness with isoflurane alone may occur as rapidly as 1-2 minutes <strong>Not reversible</strong></td>
<td>May cause significant hypotension and respiratory depression at higher doses Anesthetist must be knowledgeable and familiar with anesthetic equipment used Isoflurane-only induction can take several minutes and can be quite stressful for the animal and is not routinely used Currently not controlled</td>
</tr>
</tbody>
</table>

**SPECIAL NOTE: PRE-ANESTHETIC ORAL DRUGS**

- While not part of RAVS’ injectable anesthetic drug list, certain oral sedatives or anxiolytics are often used before administration of injectable pre-anesthetics to reduce stress, lower dosing needs of anesthetic drugs and facilitate smoother patient recovery.

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<tr>
<th>DRUG</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Trazodone</td>
<td>5-HT antagonist/ reuptake inhibitor (SARI) that potentiates serotonin activity in the CNS</td>
<td>When given as a premed, may result in a MAC reduction of up to 17% May antagonize alpha 1-adrenergic receptors and reduce blood pressure</td>
<td>Administered PO More often used in dogs <strong>Not reversible</strong></td>
<td>Variability in patient metabolism Monitor for serotonin syndrome when combined with drugs such as metoclopramide, tramadol, and SSRI May affect ECG when used with ondansetron Currently not controlled</td>
</tr>
<tr>
<td>Gabapentin</td>
<td>Mechanism not entirely understood though inhibition of excitatory neurotransmitters via decreasing calcium influx is a current theory</td>
<td>Sedation with possible ataxia Analgesic effect: prevents allodynia and hyperalgesia Anti-convulsant activity</td>
<td>Administered PO More often used in cats to reduce fear during veterinary visits. May also be used in dogs for added sedation. Can have an additive effect when combined with opioids <strong>Not reversible</strong></td>
<td>Variability in patient metabolism Use with caution in patients with renal insufficiency Commercially available liquid human formulation (Neurontin) contains xylitol and should not be used Currently not controlled by the DEA however status is changing on a state-by-state basis - treated as controlled in several states</td>
</tr>
</tbody>
</table>
INTRODUCTION TO THE ANESTHESIA MACHINE

This section of the manual describes the anesthesia machine, re-breathing circuit, and non-rebreathing circuit. There are many different models and versions of machines as well as circuitry tubing available for use in veterinary anesthesia. Volunteers may be exposed to some variability in setup. Any questions about operation or assembly of the anesthetic machine/circuit should be directed to a supervisor.

PURPOSES OF THE ANESTHETIC MACHINE

- Provide oxygen
- Deliver precise amounts of anesthetic agent
- Remove CO₂
- Allow for assisted or controlled ventilation

BASIC COMPONENTS OF THE ANESTHETIC MACHINE

➢ Gas source - compressed oxygen
  ▪ Provides for the oxygen requirements of the patient and acts as a carrier gas for the inhalation anesthetic agent.
  ▪ Oxygen is stored as a compressed gas held under pressure in metal cylinders. Cylinders are color coded according to the gas contained, green indicates oxygen.
  ▪ Cylinder sizes are designated according to letters in older naming systems and a letter and number in newer naming systems. The letters (and numbers) correlate to tank size & capacity. H tanks are most-often used on RAVS clinics.
  ▪ Handle pressurized cylinders with respect. Dropping or knocking cylinders can damage them and result in their acting as a "missile", causing serious personnel or structural damage. Secure cylinders with racks or lay them on their sides to prevent tipping or falling.
  ▪ All pressure tanks have a stem with a valve that allows the flow of oxygen to be turned on or off. You should know where these valves are located. RAVS staff will be responsible for maintaining the oxygen tanks.

➢ Pressure regulator (pressure reducing valves)
  ▪ As oxygen moves from the high-pressure tank (at up to 2200 psi) into the anesthetic machine, the pressure is lowered by a regulator to provide a safe operating pressure (40-60 psi).
  ▪ Regulator also provides for constant flow as the pressure in the tank decreases.
  ▪ Regulators used at RAVS clinics mount on top of the oxygen tank. Do not attempt to adjust.

➢ Flowmeter:
  ▪ From the cylinder, pressure gauge and pressure-reducing valve, oxygen travels through a low-pressure hose to the flowmeter.
  ▪ Allows anesthetist to provide measured amount of oxygen to the patient.
  ▪ Flow rates are expressed in liters of gas per minute (L/min).
  ▪ Oxygen enters the flowmeter and is delivered to the vaporizer at a constant rate as indicated on the flowmeter dial.

Anesthesia machine at a surgery station. On RAVS’ clinics, the surgical anesthesia machines face outward, away from the patient, to allow for ease of monitoring and instructional oversight. In this photo, a circle (rebreathing) anesthetic circuit is being used. Photo credit: Lance Murphey.
RAVS REMINDER: The flow meter dials on most RAVS anesthetic machines do not contain a column with a floating silver ball when turned on. They are instead a small green dial with a black knob (yellow arrow). To verify oxygen flow, turn the flow meter on and either feel for air coming from the end of the breathing circuit, or attach a reservoir bag to the end of the circuit and hold the safety pop-off closed while watching for the reservoir bags to fill with oxygen. As a safety precaution, NEVER close the main pop-off valve to verify oxygen flow.

Note: Oxygen Flow Rates
- Recommended oxygen flow rates for patients on a non-rebreathing system are at least 200-300 ml/kg/min, with the minimum flow rate being 1 L/min.
- Patients on a circle (rebreathing) system are run at a flow rate of 20-50 ml/kg/min with a maximum of 2 L/min.
- In general, an oxygen flow rate of 1-2 L/min is appropriate for most patients.
- With some vaporizers, flow rates less than 1 L/min may not allow accurate delivery of the dialed vaporizer concentration.

➢ Vaporizer:
- Oxygen exits the top of the flowmeter and continues via a low-pressure hose to the vaporizer.
- The vaporizer is designed to convert liquid anesthetic to vapor and to add a controlled amount of vapor to the carrier gas flowing through the machine. If the oxygen flow is turned off, no anesthetic is delivered to the patient.
- All of the machines we use utilize out-of-circuit precision vaporizers. Out-of-circuit means that oxygen can still flow to the patient when the vaporizer is turned off. The precision vaporizer allows delivery of a precise amount of anesthetic vapor to the breathing circuit.
- The dial of the vaporizer is graduated in percent concentrations of inhalant in the inspired gas.
- A tube running from the “outlet” side of the vaporizer attaches to the breathing circuit and is called the “common gas outlet”. This tube is changed depending on the breathing circuit used. Ensure the correct tube is connected to the outlet side of the vaporizer; otherwise the patient will NOT be receiving oxygen or anesthetic gas!
- An indicator window at the base of the vaporizer indicates the amount of liquid anesthetic remaining. This should be checked before the machine is used and refilled if the level is below the half-way mark.

➢ Patient breathing circuit
- Delivers oxygen and anesthetic and removes carbon dioxide produced by patient
- Provides method for assisting or controlling ventilation
- Two basic types of breathing circuits are used:
  - Rebreathing or circle system-used for patients over 7 kg (15 lbs) body weight.
  - Non-rebreathing system-used for patients under 7 kg (15 lbs).

➢ Waste Gas Scavenger systems
- Eliminate excess anesthetic gases to minimize breathing by personnel.
- In the field we use a passive scavenging system, which consists of an activated charcoal (F-Air®) canister attached to the scavenging or exhalation hose.
  - As part of a circle (rebreathing) circuit, the canister is attached to a scavenging hose that is usually part of the 'pop-off' valve.
  - With a non-rebreathing system, the canister is attached to the exhalation tubing.
- IMPORTANT: The holes at the bottom of the canister must be left uncovered to allow filtered air to escape. The canister should be either taped to the table leg or laid on its side.
- The F-Air® canister must be changed after 8 hours of active use or weight gain of 50 grams.
PATIENT BREATHING CIRCUIT: Non-Rebreathing vs. Circle (Rebreathing) Systems

Oxygen/airflow through a non-rebreathing circuit (TOP circuit) and rebreathing circuit (BOTTOM circuit). Most RAVS anesthesia machines have a flowmeter dial rather than a column with a floating ball controlled by a needle valve. There is not an oxygen flush valve on most of our machines. (Photo credits: Anne Marie McPartlin and Shea Michelle).

PATIENT BREATHING CIRCUITS - REBREATHING (CIRCLE SYSTEM)

In a circle or rebreathing circuit, gases exhaled by the patient travel through the expiratory hose and enter the reservoir bag if needed, and/or exit scavenging hose or return to the patient. Gases are “rebreathed” after first traveling through the carbon dioxide canister then through the one-way inhalation valve. Fresh oxygen and anesthetic enter the circuit here from the vaporizer and mix with the patient’s exhaled gas.

The flow of gas through the machine is circular: reservoir bag → inhalation valve → inspiration hose → animal → expiration hose → exhalation valve → carbon dioxide canister → back to the inhalation valve.

➢ Used for patients weighing more than 7 kg (15 lbs).
➢ Methods:
  ▪ Closed system - Pressure relief valve is completely closed.
    □ Used only with low flow techniques in which oxygen delivery is calculated to meet metabolic needs. **We do not use closed system techniques in the field.**
  ▪ Semi-closed system - Pop-off valve is open or partially closed.
    □ Used with medium and high-flow techniques in which oxygen delivery exceeds oxygen consumption and excess gases are eliminated through pressure relief valve.
    □ Advantages of medium and high flow include safety to the animal and more rapid change in anesthetic concentration.
**Advantages of rebreathing circuit:**
- Economical: expired oxygen and anesthetic vapor are re-circulated and reused, using less oxygen and anesthetic agent compared with a non-rebreathing system.
- Humidification of inspired gas, preserving heat and moisture of the patient.

**Disadvantages of rebreathing circuit:**
- Resistance to gas flow, primarily caused by the one-way valves in the system, soda lime canister, and pressure relief valve can make it difficult for smaller patients to ventilate.

**Components of Rebreathing/Circle System**

- **Fresh gas inlet**
  - After passing through the vaporizer, the oxygen and isoflurane enters a low-pressure hose that delivers the fresh gas to the patient breathing circuit via a one-way inhalation valve.

- **Rebreathing bag (reservoir bag)**
  - Fresh gas entering the circuit is conveyed to an inflatable rubber reservoir bag.
  - The bag is gradually filled as gases enter the circuit and is deflated with inhalation.
  - The reservoir bag should have a minimum volume of 60 ml/kg of patient weight.
    - <7 kg (15 lbs) 1 liter bag
    - 7-18 kg (15-40 lbs) 2 liter bag
    - 18-55 kg (40-120 lbs) 3 liter bag
  - The reservoir bag is easier for the patient to breathe from than a continuous flow of air. It also allows the anesthetist to deliver oxygen (with or without anesthetic) by means of 'bagging'.
  - The bag should be maintained partly full. It should not be allowed to overfill as this can cause serious lung damage by creating excessive pressure in the breathing circuit.

**REMINDER:** If you notice an excessively FULL and TAUGHT rebreathing bag, IMMEDIATELY disconnect the patient (disconnect the patient’s ET tube) from the anesthetic circuit, then turn off the vaporizer, call for assistance, and check the patient’s heart rate and respiratory status.

- In general, if the reservoir bag is completely full either: 1) the pop-off valve is closed, 2) the patient is not breathing, 3) the oxygen flow is set too high, or 4) the bag is too small
- On the other hand, the bag should not be completely deflated as this defeats its purpose as a reservoir. Complete emptying of the bag indicates that: 1) the gas flow is inadequate or oxygen is not flowing, 2) the bag is too large, or 3) a leak is present in the system.

- **Inhalation unidirectional valve, breathing tubes, Y-piece & exhalation unidirectional valve**
  - Fresh gas entering the circuit passes through a one-way valve which allows flow in only one direction (toward the patient).
  - When the patient inhales, the inhalation valve opens, allowing oxygen and anesthetic to enter the hoses. These gases travel through the inspiratory hose to the Y-piece and are directed into the endotracheal tube to the patient’s lungs.
  - Exhaled gases travel from the patient through another hose. Where the exhalation hose attaches to the machine, there is an expiratory valve which prevents expired gases from returning to the patient without first passing through the CO₂ absorber.
➢ **Pressure relief valve (pop-off valve)**
  - Waste gases exit the anesthetic circuit and enter the scavenging system at the pop-off valve (yellow arrow).
  - The valve prevents the buildup of excessive pressure or volume of gases within the circuit.
  - Can be turned fully open, partly open, or closed off entirely, allowing varying amounts of gas to exit the system.

**SAFETY REMINDER:** In RAVS clinics, the primary pop-off valve is **left OPEN at all times**. A spring-loaded pop-off safety (blue arrow) allows the anesthetist to close the circuit to ventilate the patient without closing the actual pop-off valve.

*If the valve were to remain closed, the excess pressure in the circuit would eventually reach the animal's lungs, causing alveoli to distend, and if left unattended, WILL result in lung rupture and can result in patient arrest!*

➢ **Carbon dioxide absorbing canister:**
  - Any gases that do not exit the system through the pop-off valve are directed to the CO\(_2\) absorber canister **before being returned** to the patient.
  - The canister contains either soda lime or barium hydroxide lime. Calcium hydroxide in the absorbent removes carbon dioxide from the gases that percolate through the canister.
  - Soda lime or barium hydroxide lime granules become exhausted after several hours of use and will no longer absorb CO\(_2\).
  - **The use of depleted granules may result in excessive carbon dioxide delivery to the patient and hypercapnia.**
  - Exhaustion of the granules can be indicated by several means:
    - Color change (from white to blue or purple, depends on dye color). The color indicator reverts to its original color when not in use; therefore, exhausted granules should be changed immediately when noticed.
    - Soft and crushable granules are converted to hard and non-crushable granules (calcium hydroxide changes to calcium carbonate - limestone!)
    - Generally granules are changed after every 8 hours of normal use. In RAVS clinics they are typically changed mid-week, but may be changed more often if needed.

➢ **Pressure manometer**
  - The manometer measures the pressure of the gases within the anesthetic system (expressed in centimeters of water (cm H\(_2\)O)), which in turn reflects the pressure of gas in the animal's airway and lungs.
  - Pressures over 15 cm H\(_2\)O indicate a **build-up of air**, either because the pop-off valve is closed, or the oxygen flow rate is too high.
  - **REMINDER:** When bagging an animal, pressure on the manometer should NOT EXCEED 15 to 20 cm H\(_2\)O.
  - If a pressure manometer is not present, the anesthetist must rely on observation of the reservoir bag and patient to assess gas pressure in the system. In this case, when ventilating the patient, the reservoir bag should be compressed just enough to cause a slight rise in the patient's chest. All RAVS machines have a pressure manometer as part of the rebreathing circuit but do not on the non-rebreathing circuits.
PATIENT BREATHING CIRCUITS – NON-REBREATHING SYSTEM (NRB)
The non-rebreathing circuit is a physically simpler system. In this circuit, oxygen flows through a flowmeter and into the vaporizer. At this point, gases exiting the vaporizer go directly to a hose for delivery to the patient with no inhalation valve. Exhaled gases pass through another hose and may enter a reservoir bag, but do not enter a CO₂ absorber. The gas is then released into a scavenger.

➢ Used for patients weighing less than 7 kg (15 lbs): all cats, smaller dogs.
➢ Several types exist (e.g., Bain, Ayres T, Norman mask elbow, etc.)
   ▪ All are modifications of the same basic design
   ▪ Differ in site of fresh gas inflow, position of reservoir bag and location of exhalation port.
➢ On inspiration, fresh gas is inhaled from both the narrow tubing from the anesthesia machine and the corrugated tubing leading away from the endotracheal tube connector.
➢ Absence of soda lime means rebreathing must be prevented via high oxygen flow. Inadequate flow rates allow CO₂ to be re-breathed and may create respiratory acidosis.
➢ Minimum oxygen flows of at least 1 L/min will prevent significant rebreathing in most patients by flushing out expired gases during the pause between breaths.

Advantages of non-rebreathing circuit:
▪ Less resistance to breathing.
▪ Less mechanical dead space.
▪ Rapid manipulation of anesthetic depth: In NRB the fresh gas inlet is adjacent to the endotracheal tube connection; changes in flowmeter or vaporizer setting affect the inspired gas concentration almost immediately. (Volume of rebreathing circuit with 3-L bag is approximately 6 L. Volume acts as "buffer" to changes in anesthetic concentration)

Disadvantages of non-rebreathing circuit:
▪ High flow of dry cool gas is administered to the patient, which can cause significant heat and humidity loss. Can contribute to hypothermia, especially in small patients.
▪ Significantly higher waste of both carrier gas and anesthetic results in increased cost.

Components of Non-Rebreathing System
➢ Inhalation breathing tube
   ▪ Narrow bore tubing delivers fresh gas (oxygen and anesthetic) to the patient.
➢ Exhalation tube
   ▪ Exhaled gases exit the circuit through larger bore corrugated tubing.
➢ Rebreathing bag (reservoir bag)
   ▪ An open-ended or side-hole bag (0.5-1 liter) is attached to the corrugated tubing and allows artificial ventilation to be performed.
   ▪ On RAVS clinics, ventilation can be provided to the patient by occluding the palpable hole opening of the exhalation tubing with digital pressure where it attaches to the reservoir bag, giving a breath, then releasing digital pressure.
   IMPORTANT REMINDER: RAVS’ non-rebreathing circuits DO NOT contain a pressure manometer - it is critical to watch the patient’s chest rise so as not to over-inflate the lungs and cause barotrauma.
➢ Pressure relief valve
   (informative note only - RAVS’ non-rebreathing systems typically do not contain a separate valve)
   ▪ Some non-rebreathing circuits have a valve at the end of the reservoir bag. The valve can be turned fully open, partly open, or closed off entirely, allowing varying amounts of gas to exit the system. It is kept open during anesthesia, allowing gas to escape.
MONITORING THE ANESTHETIZED PATIENT

The administration and monitoring of anesthesia for surgical procedures is a complex and multifaceted skill that requires both knowledge and practice. The safety of your patient is dependent on your awareness and response to potential problems. A thorough understanding of the principles of anesthetic monitoring and awareness of normal and abnormal patient parameters is crucial to providing safe anesthesia. The most important thing to remember is to ASK QUESTIONS anytime you have a question or concern about a patient's status. Don't ever hesitate to ask for help.

It is the anesthetist's sole responsibility to monitor the safety of their patient at all times. An anesthetized animal should NEVER be left unattended for any reason. Vital signs and other monitoring parameters are recorded to the surgery record every 5 minutes throughout the procedure, but patient monitoring should be continuous. The anesthetist should be aware of subtle changes in parameters and prepared to address any issues immediately as they arise.

Remember when assessing the anesthetized patient:
1) YOUR eyes, ears, and hands are the 1st line of patient monitoring and 2) when evaluating monitoring equipment readings, subtle change and trends are often an early indicator of a problem and warrant consultation.

These training materials are intended as a basic review of these important topics. For more information please refer to one of the numerous anesthesia texts available. As you review these materials, keep in mind that anesthesia and surgery are clinical skills, not just academic pursuits. You are going to be DOING these things with the welfare of an animal in your hands, not just passing an exam. If you have questions about any of this information you are welcome to contact us prior to your trip.

PARAMETERS TO BE ASSESSED CONTINUOUSLY THROUGHOUT ANESTHETIC PERIOD
(RECORDED EVERY 5 MINUTES)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Respiratory</td>
<td>▪ Airway</td>
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<tr>
<td></td>
<td>▪ Respiratory rate, depth and character</td>
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<tr>
<td></td>
<td>▪ Oxygen saturation (SpO₂)</td>
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<tr>
<td>Cardiovascular</td>
<td>▪ Heart rate and rhythm (HR)</td>
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<td></td>
<td>▪ Pulse rate and strength</td>
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<td></td>
<td>▪ Mucous membrane color and capillary refill time</td>
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<td></td>
<td>▪ Arterial blood pressure</td>
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<tr>
<td>Body Temperature</td>
<td>▪ Also evaluate heating devices</td>
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<tr>
<td>Anesthetic depth/patient status</td>
<td>▪ Reflexes and muscle tone</td>
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<td></td>
<td>▪ Eye position and pupillary reflex activity</td>
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<td></td>
<td>▪ Heart and respiratory rates</td>
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<td></td>
<td>▪ Status of surgical procedure</td>
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<tr>
<td>Equipment function</td>
<td>▪ Anesthetic level</td>
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<tr>
<td></td>
<td>▪ Vaporizer and oxygen flowmeter settings</td>
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<td></td>
<td>▪ Pressure relief (pop-off) valve</td>
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ASSESSING MONITORING PARAMETERS

Respiratory

➢ Airway
  ▪ Check regularly that the endotracheal tube has not kinked, slipped out or been placed too deeply. Listen for accumulation of moisture in the endotracheal tube. This is especially true of cats where relatively small tubes are used; it does not take much moisture or mucus to occlude smaller tubes.

➢ Respiratory rate (RR), depth and character
  ▪ Normal RR: 10-20 breaths/minute (rates up to 40 may be seen occasionally)
  ▪ Normal inspiration lasts 1-1.5 seconds and expiration lasts 2-3 seconds
  ▪ Basic respiratory monitoring is based on clinical observations. The rate and depth can be assessed by observing movement of the chest or reservoir bag. Chest excursions should be assessed with both spontaneous respiration and assisted ventilation. Respiratory rate and character can be evaluated via esophageal stethoscope.
  ▪ The degree of compliance felt when manually ventilating the animal can provide important information about potential respiratory or mechanical dysfunction.
  ▪ With increasing depth of anesthesia there is a decrease in both the rate and tidal volume (volume of air taken in with each breath). When the animal hypoventilates, some alveoli may not adequately inflate. These alveoli partially collapse, leading to atelectasis. Periodic ‘bagging’ (every 5 minutes) throughout the procedure can prevent this.
    • To bag a patient - Depress the safety pop-off valve and gently squeeze the reservoir bag just enough to cause a slight rise in the chest (do not go above 20 mmHg on a rebreathing circuit). Release the safety valve and the pop-off valve will be open. Use of the safety valve prevents the pop-off valve from accidentally being left closed.

    ▪ An abnormally low respiratory rate (<8-10 bpm) is cause for concern and should be reported to the supervising technician immediately. Apneic animals who are otherwise maintained at an appropriate anesthetic level may need to be manually ventilated throughout the procedure at a rate of 10 bpm.
      • If the animal has a respiratory rate less than 10 bpm or appears to have stopped breathing: TURN THE VAPORIZER OFF and CALL FOR HELP. Under the direction of an anesthesia supervisor, an animal who is not breathing should be given one breath every 6 seconds. Periodically stop for a few seconds to assess and give the animal a chance to build up CO₂ and initiate a breath on their own. If the animal does not resume breathing, continue as above.

    ▪ An occasional increase in respiratory rate (tachypnea) and depth (hyperventilation) may be noted under anesthesia. True hyperventilation and tachypnea (as opposed to panting) are the body’s response to increased carbon dioxide in the blood or metabolic acidosis.
      • Hyperventilation may indicate that the CO₂ is not being adequately removed from the breathing circuit by the CO₂ absorber. Hyperventilation is also seen as a response to mild surgical stimulus (e.g. suspensory ligament manipulation).
      • An elevated respiratory rate may indicate a progression from moderate to light anesthesia and is often one of the first signs of arousal from anesthesia.
Breathing should be smooth and regular, with thoracic and diaphragmatic components. *Difficult or labored breathing may indicate the presence of an airway obstruction.*

Animals anesthetized with ketamine may exhibit an apneustic respiratory pattern, in which inspiration is followed by a prolonged pause before expiration.

Normal respiratory sounds are almost inaudible. Harsh noises, whistles or squeaks may indicate narrow or obstructed airways or the presence of fluid in the airways. Any concerns should be brought to the attention of an anesthesia supervisor.

**Oxygen saturation (SpO₂)**

- **Normal SpO₂**: 95-100%

  - The patient's SpO₂ is the percentage of oxygen-saturated hemoglobin and indicates how well the lungs are delivering oxygen to the blood.

  - The **pulse oximeter measures both SpO₂ and heart rate** and is monitored continuously.

  - A pulse ox reading of 90-95% indicates that the patient's hemoglobin is not fully saturated, and a respiratory or cardiovascular problem may be present.

  - The patient will not become hypoxic until the reading falls to 90% or less. It is hoped that the anesthetist will be able to correct the problem before this occurs.

  - Without pulse oximetry, *early hypoxia can be difficult to assess as cyanosis only becomes apparent if values fall below 85% saturation* and by this time, the patient may have been hypoxic for a significant amount of time!

  - As with any monitoring device, the pulse oximeter can sometimes fail or provide an inaccurate reading. Anytime the reading changes significantly, **evaluate the clinical status of your patient** before assuming that the reading is accurate or inaccurate.

**Cardiovascular**

- **Heart rate (HR) and rhythm**

  - **Normal HR**: Canine: 80-120 bpm; Feline: 100-180 bpm

  - Assess via auscultation; esophageal stethoscopes are often used at the surgery tables, though a regular stethoscope may also be used.

  - *Bradycardia* may indicate excessive anesthetic depth, a response to vagal stimulation or other causes. **RAVS REMINDER**: *Heart rates less than 80 bpm in dogs and 100 bpm in cats should be reported to the anesthesia supervisor immediately.*

  - *Tachycardia* may be a response to surgical stimulation and, in combination with other factors may indicate an inadequate anesthetic level. However, some cardiovascular response to surgical stimulation is normal.

  - **The presence of a beating heart does not necessarily mean that circulation is adequate.** Heartbeat should always be evaluated with the pulse strength and quality.

- **Pulse rate and strength/quality**

  - The pulse can be detected at several locations, including the lingual, femoral, carotid and dorsal pedal arteries. You should know a least 3 different places to evaluate a pulse.

  - *The pulse should be strong and synchronized with the heartbeat.*
Mucous membrane (MM) color and capillary refill time (CRT)

- **Normal**: mm pink, CRT < 2 sec
- Mucous membrane color is usually most easily assessed at the gingiva.
  - Pale mucous membranes may indicate blood loss or anemia or may result from poor perfusion or due to drug-induced vasoconstriction.
  - Purple or blue mucous membranes indicate cyanosis, a shortage of oxygen in the tissues. **Cyanosis during anesthesia is usually the result of respiratory failure or upper airway obstruction and must be addressed immediately.**
- Capillary refill time is the rate of color return to a mucous membrane after the application of gentle pressure and reflects tissue perfusion. Pressure on the mucous membranes compresses the small capillaries and blocks blood flow to that area. When the pressure is released, the capillaries rapidly refill with blood and the color returns, provided the heart is able to generate sufficient blood pressure.
  - A short CRT is not an infallible indication that circulation is adequate.
  - A prolonged CRT (> 2 sec) may indicate hypotension resulting from excessive anesthetic depth or circulatory shock. **CRT is usually prolonged in patients in whom the systolic blood pressure is less than 80 mm Hg.** Animals suffering from this degree of hypotension will usually feel cold and have pale mucous membranes.
  - Other factors that may cause prolonged CRT or poor perfusion include hypothermia, vasodilation and cardiac failure.

Arterial Blood Pressure

- **Normal BP**: 120/80 mm Hg (80-120 mm Hg systolic, 60-100 mm Hg diastolic).
- **Normal Mean Arterial Pressure**: 70-90 mm Hg
- Measurement of arterial blood pressure provides information regarding the adequacy of blood flow to the patient's tissue.
- Arterial blood pressure may be monitored using various methods such as a Doppler ultrasound probe coupled with a pressure cuff and sphygmomanometer or an automated oscillometric device (e.g., Petmap), which are most commonly used in RAVS clinics.
- The disadvantage of oscillometric detector is decreased accuracy and efficiency when used on hypotensive or small patients (less than 5 kg body weight).
- **RAVS REMINDER**: An anesthesia supervisor should be involved if the blood pressure is at or falls below 80/40, and/or the MAP is below 60 as organ and tissue perfusion is likely inadequate at this pressure
- **The most common cause of hypotension is excessive anesthetic depth.** Other causes include hypovolemia due to intra-operative bleeding or pre-operative dehydration, hypothermia or hypoxia.

Body Temperature

- Anesthesia will typically lower the body temperature and can lead to hypothermia, which can result in prolonged recovery from anesthesia as well as other complications. **Small puppies and kittens are especially vulnerable.**
- **Preventing heat loss** is the mainstay of body temperature management.
- Remember: the greatest loss in body heat occurs within the first 20 minutes of anesthesia.
- Cold surfaces and excessive use of cold scrub solutions should be avoided. During surgery, the protected heating pads should be set to ‘LOW’ (never higher!), and if needed ‘Snuggle Safe’ warming disks should be placed under a towel between the patient and surgery table to help the animal conserve body heat.
- Care should always be taken with any supplemental heat source to avoid burns or hyperthermia. Warming devices and hot water bottles should be wrapped in a towel or other barrier. **Body temperature should be monitored frequently and heat should be discontinued when the patient's temperature is 99-100°F.**
Anesthetic Depth/Patient Status
Throughout anesthesia, the anesthetist should monitor as many parameters as possible and weigh all available evidence before judging the anesthetic depth of the patient. **No one piece of information is unfailingly reliable** and each animal has a unique individual response to any given anesthetic protocol.

Although anesthetic stages and planes may appear easy to differentiate on paper, they are not well defined in every animal. The anesthetist must assess as many parameters as possible to come to a conclusion regarding the patient’s depth of anesthesia. **For any patient whether on RAVS or another clinical setting, the basic rule is that if there is any doubt about the level of anesthesia, one should decrease the vaporizer setting and monitor the animal until the anesthetic depth can be determined.**

In RAVS clinics, students should consult a supervising technician to assist in assessing the patient.

**Classic Stages of Anesthesia**
- **Stage I** - not anesthetized
- **Stage II** - excitatory phase, not anesthetized
- **Stage III**
  - Plane 1 - light anesthesia
  - Plane 2 - moderate anesthesia (surgical plane)
  - Plane 3 - deep anesthesia
  - Plane 4 - overdose
- **Stage IV** – respiratory / cardiovascular collapse - death

**Reflexes**
- Normal, conscious animals demonstrate predictable protective reflex responses to certain stimuli. These reflexes are progressively depressed at increasing depths of anesthesia. **Progressive return of reflexes indicates imminent arousal from anesthesia** and action must be taken if the desired goal is to keep the patient anesthetized.
- **Palpebral** (blink) - tested by lightly tapping the medial or lateral canthus of the eye and observing whether the animal blinks in response. Generally present throughout stages I and II, diminished in Stage III (surgical stage) and **lost in Stage IV.**
- **Swallowing** - Occurs spontaneously in awake animals. Usually stimulated by the presence of saliva or food in the pharynx. Monitored by observing movement in the ventral neck area. The swallowing reflex is **lost at a medium depth of anesthesia** and usually regained just before the patient recovers consciousness. The return of the swallowing reflex during recovery indicates that it is safe to remove the endotracheal tube.
- **Pedal** - Elicited by pinching a digit and observing whether animal flexes the leg, withdrawing the paw. With inhalants, the pedal reflex is **normally lost during induction.**
- **Corneal** - Tested by touching the cornea with a sterile object (a drop of water or saline can be used) and noting whether the animal blinks and withdraws the eye into the orbit. This reflex is not commonly tested unless it is necessary to determine if the patient is too deeply anesthetized. **Usually present until** stage III, plane 4 anesthesia (overdose/impending emergency!).
- **Laryngeal** - Stimulated when the larynx is touched by an object. The response is an immediate closure of the epiglottis and vocal cords. May be **observed during intubation if the animal is not sufficiently anesthetized** to allow the tube to be passed.

**Jaw tone** - With increasing anesthetic depth, skeletal muscles become more relaxed and offer little resistance to movement. **Jaw tone is one of the easiest ways to evaluate muscle tone.**
- Jaw tone is assessed by attempting to open the jaws wide and estimating the amount of passive resistance. **During anesthesia, it should be decreased but always present to some extent.** Extreme laxity of the jaw suggests excessive anesthetic depth.
- The degree of muscle relaxation is dependent not only on the depth but also on the particular drugs administered to the animal and the animal’s normal muscle tone.

**Eye position, pupil size and pupillary light response**
- In combination with other factors, the position of the eyeball and size of pupils may provide information regarding anesthetic depth. However, there is considerable variation among individual animals and anesthetic protocols.
Heart and respiratory rates
- As indicators of anesthetic depth, the patient's heart and respiratory rates are only valuable in combination with assessment of other factors (reflexes, muscle tone, etc.).
- In general, an abnormally low HR or RR may be associated with excessive anesthetic depth. Increased HR or RR may be the result of surgical stimulation or arousal.

Response to surgical stimuli
- Minor changes in heart rate during surgery are considered normal. The absence of such a response may indicate an unnecessarily deep level of anesthesia.
- Animals perceiving surgical stimulation may show an increase in heart rate. This does not necessarily indicate that the anesthetic depth is inadequate unless the increase in heart rate is considerable and/or other changes in other parameters are noted.
- Surgical stimulation may also induce a decrease in heart rate due to increased vagal tone. Increased respiratory rate and signs of voluntary movement by the patient, however, do indicate insufficient anesthetic depth and perception of pain.
- Increased tear production, salivation and sweating (observed on the foot pads) also indicate that the patient maybe perceiving painful stimuli and that the depth is inadequate.

Status of surgical procedure
- The anesthetist should maintain communication with the surgical team regarding progress of the procedure. REMINDER: In RAVS clinics, the supervising technician “Line Walker” should be the professional consulted for any patient-specific anesthetic adjustments.
- Familiarity with the procedure being performed allows the anesthetist to foresee changes in anesthetic requirements and adjust accordingly.

Equipment function
Regular evaluation of the anesthetic machine should become part of your standard monitoring routine. Equipment problems, either as a result of malfunction or human error are the cause of many common anesthetic complications. It is crucial that you are thoroughly comfortable with the setup and operation of the machine you will be using before you anesthetize a patient.

Vaporizer setting and anesthetic level
- Vaporizer setting does not in itself indicate the patient's anesthetic depth. The concentration of anesthetic gas received will vary with the oxygen flow rate and quality of ventilation received by the patient. The vaporizer may be adjusted as described below:
- In general, a relatively high anesthetic dose (2-2.5%) will be required for the first several minutes after induction. When a stable anesthetic plane has been reached, the vaporizer setting is lowered and adjusted to maintain an appropriate depth. Once the most stimulating part of procedure is complete, it is usually possible to decrease the vaporizer setting gradually lowering the dose as the procedure nears completion.
- IMPORTANT RAVS REMINDER: As a safety precaution, it is our policy that the isoflurane vaporizer is never set higher than 3%. If the patient needs to be more deeply anesthetized, consider injectable anesthetics to deepen anesthetic depth without the resulting significant hypotensive effects of increasing isoflurane levels. Alternatively, increasing the oxygen flow rate and manually ventilating will increase the uptake of isoflurane and deepen patient's anesthetic plane.
- Periodically monitor the level of isoflurane in the machine. This should be done as part of the pre-anesthetic machine check and several times throughout the procedure.

Oxygen flow meter setting
- In general, an oxygen flow rate of 1-2 L/min is appropriate for most patients.
- If the reservoir bag is overfilling and the animal is breathing normally, check that the pop-off valve is open, then reduce O₂ flow to maintain an appropriate volume in the bag.

Pressure relief (pop-off) valve
- The pop-off valve should always be in open position. Use of the safety pop-off valve while manually ventilating will prevent the pop-off valve from accidentally being closed.
## Assessing Anesthetic Depth

<table>
<thead>
<tr>
<th>Stage of Anesthesia</th>
<th>Behavior</th>
<th>Respiration</th>
<th>Cardiovascular Function</th>
<th>Response to Surgery</th>
<th>Depth</th>
<th>Eyeball Position</th>
<th>Pupil Size</th>
<th>Pupillary Light Response</th>
<th>Muscle Tone</th>
<th>Reflex Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage I</strong></td>
<td>Disoriented</td>
<td>Normal, may be panting RR 20-30 bpm</td>
<td>HR unchanged Hypertension</td>
<td>Struggle</td>
<td>Not anesthetized</td>
<td>Central</td>
<td>Normal</td>
<td>Yes</td>
<td>Good</td>
<td>All present</td>
</tr>
<tr>
<td><strong>Stage II excitable stage</strong></td>
<td>Excitement struggling vocalization</td>
<td>Irregular, may hold breath or hyperventilate</td>
<td>HR may increase Hypertension</td>
<td>Struggle</td>
<td>Not anesthetized</td>
<td>Central, possible nystagmus</td>
<td>May be dilated</td>
<td>Yes</td>
<td>Good</td>
<td>All present, may be exaggerated</td>
</tr>
<tr>
<td><strong>Stage III, Plane 1 light anesthesia</strong></td>
<td>Anesthetized</td>
<td>Regular RR 12-20 bpm</td>
<td>Pulse strong HR &gt;90 bpm Normal BP</td>
<td>May respond with movement</td>
<td>Light</td>
<td>Central or rotated, may be nystagmus</td>
<td>Normal</td>
<td>Yes</td>
<td>Good</td>
<td>Swallowing poor or absent, others present but diminished</td>
</tr>
<tr>
<td><strong>Stage III, Plane 2 surgical anesthesia</strong></td>
<td>Anesthetized</td>
<td>Regular, may be shallow RR 12-16 bpm</td>
<td>HR &gt; 90 bpm Increasing hypotension</td>
<td>HR and RR may increase</td>
<td>Moderate</td>
<td>Often rotated ventrally</td>
<td>Slightly dilated</td>
<td>Sluggish</td>
<td>Relaxed</td>
<td>Patellar, ear flick, palpebral and corneal may be present (but diminished), others absent</td>
</tr>
<tr>
<td><strong>Stage III, Plane 3 deep anesthesia</strong></td>
<td>Anesthetized</td>
<td>Shallow RR &lt;12 bpm</td>
<td>HR 60-90 bpm CRT increased; pulse less strong Increasing hypotension</td>
<td>None</td>
<td>Deep</td>
<td>Usually central, may rotate ventrally</td>
<td>Moderately dilated</td>
<td>Very sluggish or absent</td>
<td>Greatly reduced</td>
<td>All reflexes diminished or absent</td>
</tr>
<tr>
<td><strong>Stage III, Plane 4</strong></td>
<td>Anesthetized</td>
<td>Jerky</td>
<td>HR &lt; 60 bpm Prolonged CRT, pale mm Significant Hypotension</td>
<td>None</td>
<td>Overdose</td>
<td>Central</td>
<td>Widely dilated</td>
<td>Unresponsive</td>
<td>Flaccid</td>
<td>No reflex activity</td>
</tr>
<tr>
<td><strong>Stage IV</strong></td>
<td>Moribund</td>
<td>Apnea</td>
<td>Cardiovascular collapse</td>
<td>None</td>
<td>Dying</td>
<td>Central</td>
<td>Widely dilated</td>
<td>Unresponsive</td>
<td>Flaccid</td>
<td>No reflex activity</td>
</tr>
</tbody>
</table>
PATIENT MONITORING EQUIPMENT

**Important Reminder:** Monitoring equipment can provide valuable information and act as an extension of the anesthetist’s own senses; however, machines can malfunction or fail. The anesthetist **should physically check the patient at frequent intervals** to confirm machine readings are accurate. Many monitoring devices average signals over a period of time to obtain a reportable reading, resulting in a delayed response to changes in patient status. In addition, some changes, such as cyanosis and pallor cannot be assessed by a machine. THE most important monitoring technique is clinical assessment by a trained anesthetist.

**Esophageal stethoscope**
- Consists of a thin, flexible tube attached to a regular stethoscope.
- The tube is inserted through the patient’s mouth into the esophagus and advanced until an audible heartbeat is detected through the earpieces. Placement after the animal has been intubated avoids the possibility of the stethoscope accidentally entering the trachea.
- Allows rapid auscultation of heart and lung sounds despite surgical draping.

**Pulse oximeter (SpO₂)**
- Shines red and infrared light, via a clip-like probe, through a thin piece of tissue, such as the tongue, and measures the relative absorption of the two wavelengths.
- Oxygen saturation (ratio of oxyhemoglobin to deoxyhemoglobin) is calculated from programmed absorption curves and reported as the percent of hemoglobin which is oxygenated.
- Measures adequacy of arterial oxygenation, but **not a measure of ventilation or oxygen delivery**.
- The absolute accuracy of pulse oximeters seems to be lower for animals than humans, but the trends are still important. If pulse oximeter readings are abnormally low during anesthesia:
  - **FIRST,** assess your patient! **Do not assume that an abnormal reading is the result of equipment failure** until you have assessed all parameters and determined them normal.
    - Is adequate oxygen being delivered to the patient? Inadequate oxygen delivery may result from esophageal intubation, endotracheal tube blockage or equipment problem.
    - Is oxygen being transferred from the alveoli to the blood? This process may be impeded by inadequate ventilation or preexisting lung disease.
    - Is circulation adequate? Bradycardia, severe arrhythmias, or hypotension may decrease oxygen delivery. Impaired peripheral perfusion (low cardiac output, vasoconstriction, hypothermia) may interfere with readings and indicate issues that need to be addressed.
  - **THEN,** evaluate if the machine is working correctly. Readings may be affected by factors such as probe placement, external light sources and motion.
    - Readjust the probe. Especially in cats and other smaller patients, the probe may occlude the blood supply, and moving the probe to a different location on the tongue may help. Alternatively, the ear pinna or toe web can be tried.
    - Wetting the tongue is a popular fix; this likely works because the probe is removed and perfusion improves in the area, or the warm water improves perfusion to the site.
    - Check the power source and if all else fails, restart the machine: If you are certain that your patient is not having a problem, try turning the machine off for a few moments and trying again.
    - If you continue to have a problem with the machine, continue monitoring the patient and ask for assistance.
Blood Pressure

▪ Arterial blood pressure consists of three values:
  ▪ **Systolic pressure**: The pressure generated by ventricular contraction. This is the highest pressure exerted during the cardiac cycle and can be felt as the arterial pulse.
  ▪ **Diastolic pressure**: The pressure that remains when the heart is in its resting phase, between contractions, and is the lowest pressure throughout the cardiac cycle.
  ▪ **Mean arterial pressure (MAP)**: The average pressure measured over one complete cardiac cycle. Calculated as 1/3 the systolic pressure plus 2/3 the diastolic pressure.

▪ Blood pressure is measured indirectly using either an osilometric device or a Doppler ultrasound flow detector. Both instruments have advantages and disadvantages, and as indirect measurements can significantly differ from direct measurements, results should always be interpreted with caution. Again, trends may be more important than actual readings.

▪ Most patients anesthetized at RAVS’ clinics are monitored using oscillometric monitors. These measurements are generally very accurate in large and medium-sized dogs and most cats. They can be less accurate in very small animals and hypotensive patients.
  ▪ A Doppler monitor is available if needed to verify measurements or obtain readings on smaller animals and user training will be provided as needed at the clinic.

▪ Oscillometric monitor cuff use: An appropriately sized cuff is placed over any accessible artery, generally around a limb distal to the elbow or hock with the inflation tubing running in the direction of arterial flow (away from the body).
  ▪ The cuff should be ~40% the circumference of the limb around which it is placed. Too large a cuff can give falsely low readings; too small will show falsely elevated readings.

▪ Oscillometric devices work by detecting pressure oscillations within the bladder of the cuff placed over an artery. The cuff is connected via a pressure cable to the monitor. The monitor inflates the cuff until flow is occluded and then slowly deflates the cuff. As the pulse returns the systolic, diastolic and mean arterial blood pressures are reported. Poor pulse signals from poor flow, small arteries, movement or shivering will interfere with accuracy of these devices.

Electrocardiogram (ECG or EKG): Although we will not be using the ECG on most patients, it is available when needed and you should have a basic knowledge of its use.

▪ The ECG monitors the electrical activity of the heart. With each beat the atria and ventricles depolarize and repolarize; these actions are synchronized in each chamber and thus the action potentials from each fiber summate, producing a signal that is large enough to be measured at the body’s surface. The electrical signal is picked up by electrodes, amplified and displayed.

▪ The ECG is always measured as the difference in voltage between two electrodes. Depending upon the placement of the electrodes the ECG has different shapes. For anesthetic monitoring, a lead II trace, with positive P, R and T wave is usually chosen.
  ▪ For lead II, the leads placed on the right forelimb (white connector), the left forelimb (black connector) and the left hindlimb (red connector). If a green connector is present, it goes on the right hindlimb. Remember the mnemonic “white on right, smoke over fire” or “white on right; snow over grass, and then smoke over fire”.

▪ IMPORTANT REMINDER: The electrocardiogram monitors only the electrical activity of the heart. It will tell you nothing about the mechanical function of the heart or the state of the circulation. **A patient can have a NORMAL appearing ECG tracing but have NO FUNCTIONAL HEARTBEAT**. As such, electrocardiograms are not generally the first choice for anesthetic cardiovascular monitoring.

RESPONDING TO ANESTHETIC COMPLICATIONS

General anesthesia poses minimal risk to most patients when performed by a capable anesthetist using appropriate protocols and proper monitoring. **However, it is vitally important to remember any anesthetic procedure has the potential to cause the death of the animal.** Despite significant advancements in pharmacology & technology, the fundamentals of good patient monitoring and support of organ function are key to minimizing anesthetic risk and assuring a good outcome. Similarly, while knowledge of appropriate responses to an anesthetic emergency is essential, **it is even more important to understand why emergencies arise and how they may be prevented.**

**Common causes of anesthetic complications include:**

| Human error | · Failure to obtain and interpret an adequate history or physical exam  
| · Lack of familiarity with the anesthetic machine or agents being used  
| · Incorrect drug administration (incorrect drug, dosage, route or concentration)  
| · Failure to recognize and respond to early signs of patient difficulty |
| Equipment failure or misuse | · Carbon dioxide absorber exhaustion  
| · Empty oxygen tank  
| · Improper assembly of the anesthetic machine or breathing circuit  
| · Endotracheal tube problems  
| · Vaporizer problems  
| · Pop-off valve problems |
| Adverse effects of anesthetic agents | · Every agent has benefits and contraindications associated with its use.  
| · Reducing the potential for adverse effects depends on several factors:  
| o Assessment of the patient and any potential risk factors  
| o Familiarity with side effects and contraindications of different agents  
| o Appropriate protocol choice, often including multi-drug use for balanced anesthesia |
| Patient related factors | · Geriatric patients  
| · Pediatric patients  
| · Brachycephalic dogs/cats  
| · Trauma patients  
| · Systemic disease (cardiovascular, renal, hepatic disease)  
| · General poor condition |

Human error and equipment problems are generally preventable complications. Patient related complications can often be prevented by identifying potential risk factors and modifying the anesthetic plan to address the patient's special needs.

RESPONDING TO PROBLEMS DURING ANESTHESIA

**RAVS REMINDER:** consult an anesthesia supervisor immediately if you encounter any monitoring concerns. In general, the first step when evaluating an abnormal reading or concern with any given parameter is to evaluate other vital signs and anesthetic depth to form an overall assessment of patient condition and anesthetic status.

**COMMON ANESTHETIC CONCERNS**

- **Animal will not stay anesthetized**
  - Check **patient respiration.** Prolonged breath-holding or rapid, shallow respiration may lead to arousal as vaporized anesthetic is not entering the lungs. It may be necessary to periodically bag the animal with O₂/isoflurane until adequate ventilation is achieved.
  - Often a result of equipment problem: Verify placement and length of endotracheal tube and appropriate cuff inflation. Check **vaporizer, oxygen flow settings and level of anesthetic in the vaporizer.** Check **anesthetic machine:** follow the flow of gas through the machine and to the patient, checking each tube and connection.
**Excessive anesthetic depth**
- Signs include: RR < 8 bpm and/or shallow respiration; mucous membranes pale or cyanotic; CRT > 2 seconds; HR < 60 bpm in a dog or 100 bpm in a cat; hypothermia; flaccid muscle tone. These signs must be interpreted in light of all available information.
- *Excessive anesthetic depth is usually a result of a vaporizer setting or drug dose that is too high for the patient.* Occasionally the animal may have a pre-existing condition that increases their susceptibility to anesthetic overdose.

**Pale mucous membranes**
- May result from preexisting anemia, blood loss, anesthetic agents which result in vasodilation and hypotension, hypothermia or pain.

**Prolonged capillary refill time ( >2 seconds )**
- Suggests that blood pressure is inadequate to perfuse peripheral tissues.
- Hypotension is one of the most common anesthetic complications and should be suspected in any animal with a prolonged CRT.

**Dyspnea and/or cyanosis**
- Dyspnea indicates an inability to obtain sufficient oxygen using normal respiratory effort. Cyanosis indicates inadequate tissue oxygenation.
- The most common causes of respiratory distress during anesthesia include:
  - Equipment problems (empty oxygen tank, flowmeter turned off, damaged circuit)
  - Airway obstruction (ET tube blockage, laryngospasm, aspiration)
  - Respiratory disease (pleural effusion, pulmonary edema, diaphragmatic hernia)
  - Excessive anesthetic depth such that vital functions are compromised.
- Check SpO2 reading and quickly evaluate other vital signs. Evaluate anesthetic depth and equipment setup.
  - **Turn the vaporizer off.** Once airway obstruction has been ruled out, ventilate with 100% oxygen until mucous membrane color and SpO2 readings return to normal, and monitor closely to ensure cardiac arrest does not occur. Consult anesthesia supervisor for direction in when to turn the vaporizer back on.

**Tachypnea**
- Must be differentiated from dyspnea (where respiratory distress is present).
- In combination with tachycardia and increased muscle tone or spontaneous movement may indicate inadequate anesthetic depth.
- Can also be seen in deep anesthesia as a result of low blood oxygen and high CO2 levels or in response to hypotension. **Important point: Do not assume that the vaporizer needs to be turned up if a patient is tachypleinic.**
- Check CO2 absorber crystals to rule out hypercapnia.
- If all other vitals and anesthetic depth are within acceptable limits, continue to monitor-condition will generally correct itself in 1-2 minutes.

**Bradycardia  [HR < 80 bpm (dogs) or 100 bpm (cats)]**
- Common causes include increased vagal tone, drug induced bradycardia (alpha-2 agonists), or inhalant anesthetic overdose.
- If excessive anesthetic depth is present, reduce vaporizer setting and continue to monitor all parameters closely.
➢ Tachycardia [HR > 160 bpm (dogs) or 200 bpm (cats)]
   - Causes include light anesthesia, drug induced tachycardia (anticholinergics), preexisting conditions and hypotension.
   - An elevated heart rate is a common response to surgical stimulation and does not necessarily indicate that the patient is too light unless accompanied by increased respiratory rate, active reflexes or spontaneous movement.
   - If insufficient anesthetic depth, increase vaporizer setting.
   - If anesthetic depth is sufficient, the blood pressure should be monitored as an increased heart rate can often be seen as a result of hypotension. A systolic BP < 80 mmHg or MAP <60 mmHg indicates hypotension which must be addressed.

➢ Hypotension (systolic BP < 80 mmHg, MAP < 60 mmHg)
   - Normal arterial blood pressure is approximately 120/80 mmHg, with the normal mean arterial pressure between 70-90 mmHg.
   - Systolic pressure < 80 mmHg and /or MAP < 60 mmHg indicates inadequate perfusion and must be addressed.
   - The most common cause of hypotension is excessive anesthetic depth. Most anesthetic drugs produce a dose-dependent cardiovascular depression, which tends to decrease blood pressure.
     - Isoflurane can induce profound hypotension and is the most common cause we see for low blood pressure. If pressure readings are low, turning the anesthetic concentration down may result in rapid improvement.
   - Other causes include hypovolemia due to intra-operative bleeding or pre-operative dehydration, hypothermia, hypoxia or decreased surgical stimulation.

➢ RESPIRATORY ARREST
   - Brief periods of apnea may be seen as a result of IV anesthetic administration or after prolonged bagging with 100% oxygen (due to decreased blood CO₂ levels)
   - If the patient is not breathing, TURN OFF THE VAPORIZER, call for help.
     - If heart rate/rhythm, mucous membrane color and SpO₂ are normal, the patient does not generally require immediate treatment other than to support ventilation. Occasional breaths of oxygen (1 every 30 seconds) should be administered to prevent hypoxia, however, premature bagging can extend the period of apnea by reducing CO₂ levels, which act as the stimulus for the patient to resume breathing.
   - True respiratory arrest may result from anesthetic overdose, lack of oxygen flow or preexisting disease and requires immediate action. In this case, other vital signs are often abnormal and SpO₂ values rapidly fall below 90%.
     - If respiratory arrest occurs, a supervisor will take over. However, you should be aware of the treatment procedure advised by the supervisor and be prepared to assist as necessary.

➢ CARDIAC ARREST
   - If a patient is breathing, a heartbeat must be present. (The reverse is not necessarily true though!) If your patient is breathing spontaneously and you cannot hear the heart, readjust your esophageal stethoscope, listen with your regular stethoscope, and feel for a pulse. REMINDER: If a heartbeat cannot be auscultated or there are no visible respirations: TURN OFF THE VAPORIZER and call for help! It is better to have a false alarm than a dead patient. It should take no longer than 15 seconds to assess if a patient in cardiac arrest.

In an arrest, a staff supervisor will take over. The student’s job is to monitor carefully and keep notes on what is being done/drugs being administered, etc. The staff member running the code will instruct you in what to do. Students should have a basic understanding of the CPR techniques outlined and be able to follow instructions to assist in resuscitative efforts as needed. Student questions will be addressed once the emergency has been addressed and the patient has been stabilized.
Cardiopulmonary Resuscitation: Response Protocol

**Warning Signs of Impending Cardiac Arrest**
- Hypotension, weak pulses, increasingly irregular pulses
- Progressive hypothermia
- Cyanosis
- Decreasing respiratory rate and depth
- Sudden unexplained deepening of anesthesia

**Diagnosis of Cardiac Arrest**
- Apnea or agonal gasping
- Absence of a pulse or audible heartbeat
- Loss of palpebral and corneal reflexes
- Eyes fixed, wide open
- Pupils dilated and unresponsive

The goal of CPR is to deliver oxygen to the lungs by artificial ventilation, then transport the oxygen to body tissues by external cardiac compression. Support is best administered by a team of 3 - 5 people performing the following tasks under the direction of the lead veterinarian or technician:

- Airway management
- Breathing
- Cardiac compression
- Venous access
- Drug administration
- Vital Sign Monitoring
- Event Recording

**Available resuscitative drugs:**
- Epinephrine
- Atropine
- Lidocaine

**Available reversal agents:**
- Naloxone
- Flumazenil
- Atipamazole

**RAVS staff are always involved in managing any cardiopulmonary arrest and will utilize a field-modified version of the RECOVER Initiative’s standardized algorithm shown here:**

**Unresponsive, apneic patient**

**CPR (1 cycle = 2 minutes)**
- Compressions: 100-120/min, lateral, 1/3-1/2 chest width
- Ventilate: 10/min, Vt = 10ml/kg, I:Time = 1:1
- Initiate Monitoring: ECG and ETCO2

**Evaluate Patient Check ECG**
- **Vfib**
  - Continue CPR while charging defibrillator
  - Give 1 shock
  - Resume CPR immediately for 1 cycle

- **Asystole / PEA**
  - Resume CPR immediately for 1 cycle
  - Low dose epinephrine or vasopressin q 3-5 mins
  - Consider atropine if ?? vagal tone

**ROSC**

**Evaluate Patient Check ECG**
- **Vfib**
  - Continue CPR while charging defibrillator
  - Give 1 shock
  - Resume CPR immediately for 1 cycle
  - Give epinephrine or vasopressin q 3-5 mins
  - Consider amiodarone or lidocaine if refractory

- **Asystole / PEA**
  - Resume CPR immediately for 1 cycle
  - Low dose epinephrine or vasopressin q 3-5 mins
  - Consider high dose epinephrine after 10 mins
  - Consider atropine

**Compression Rate: Think of song “Stayin’ Alive”**

**Bag patient every 6 seconds.**

**Reverse all anesthetic drugs possible.**

ECG and ETCO2 monitoring may or may not be readily available.

RAVS does not have a defibrillator available for use on animals. If warranted a precordial thump will be utilized.

Reprinted with permission from the Veterinary Emergency & Critical Care Society (veccs.org) RECOVER Initiative CPR Algorithm.
RECOVERY - MONITORING AND ADDRESSING COMPLICATIONS

Recovery is the most crucial area of the clinic. If there is going to be a surgical complication, recovery is most often where it will be discovered. Absolute diligence is needed in recovery. Refer to Section 2 of the manual for RAVS’ recovery monitoring protocol and release criteria.

- As anesthetist you will be responsible for the welfare of your patient and will act as the patient’s advocate from the time of pre-medication through recovery.
- Animals in recovery should be placed on a covered heating pad and covered with a blanket until the body temperature is normalized.
- Animals should be placed with the neck extended so the ET tube is not bent or kinked. Recovering animals requiring a kennel recovery (i.e. potentially fractious or extremely fearful patients) should be placed facing forward in their cages with the tongue protruding to allow easy visualization of the animal's mucous membrane color.
- Vital signs should be monitored in the recovering animal every 15-20 minutes or as appropriate until the patient is sternal. Refer to the anesthesia and physical exam documents and/or quick reference guides for normal vital sign parameter ranges in our patients.
- Once a patient is considered stable, they should then be monitored as needed until ambulatory and able to return to a holding kennel or released to the client.

RESPONDING TO ADVERSE EVENTS IN RECOVERY

Reminder: If at any time you are concerned about the status of a patient's recovery or any monitoring parameter, consult an anesthesia supervisor.

Slow Recovery: Animal not extubated within 15 minutes post op

➢ Notify Recovery Lead or anesthesia staff. Patient’s vital signs and overall status should be assessed. If a patient is deemed medically stable and there is no evidence of post-operative bleeding, reversals or partial reversal agents may be elected.

Hyperactivity/Vocalization:

➢ **Should a patient enter a distressing, excitatory or dysphoric phase after extubation:** remain calm & do not get bitten - cover pet’s head/body with a towel if possible.
   - The Recovery Lead and/or other RAVS staff will respond right away with an injectable sedative to help calm patient and smooth recovery (most commonly dexmedetomidine but medication choice will be tailored to specific patient needs).
   - Quietly attempt to calm and comfort the animal. Remove all stimuli possible such as lights or noise. Excessive touching/petting may aggravate the situation. Do not attempt to overly restrain.
   - Animals who are particularly sensitive to the noise and activity in the recovery area should be moved to a quieter location if possible.
Hypothermia: Rectal Temp < 98°F
➢ Place a heating pad on the LOW setting under the animal's bedding and cover the animal with a blanket or towel. ‘Snuggle Safe’ warming discs can also be placed under bedding. Check the animal's temperature frequently and remove external heat sources when the temperature is between 99-100°F. Continue to monitor to be sure the temperature remains in the normal range.
➢ Check chart to see if reversal agent has been administered. Check with Recovery Lead to see if agent should be administered.
➢ It is normal for the post-anesthesia body temperature to be slightly decreased. However, hypothermia is the most common cause of delayed recovery and should be monitored closely. Hypothermia is also one of the first signs noted in patients who are hemorrhaging internally.

Hyperthermia: Rectal Temp > 103°F
➢ Elevated body temperature can occur as a result of anesthetic drugs, patient stress, and environments with high ambient room temperature. Patients who are exhibiting signs of stress should be calmed or moved to a quieter environment when possible. In rare cases of opioid induced hyperthermia (more common in cats), partial reversal may be considered. Consult Recovery Lead for assessment.
➢ Direct a fan on low toward the animal. Exam gloves filled with cold water, or ice packs wrapped in a light towel can be placed on the animal (especially on inguinal and axillary regions).
➢ The Recovery Lead may opt to continue IV fluids in recovery as appropriate.
➢ Check the animal's temperature every 5 minutes and remove external cooling sources when the temperature is between 100-102°F. Continue to monitor to be sure the temperature remains in the normal range.
➢ If the animal is at all dysphoric or hyper-aroused, do not struggle to obtain repeated temperature readings. Consult Recovery Lead for assessment.

Bradycardia: Canine HR < 60 bpm; Feline HR < 100 bpm
➢ Stimulate activity by gently rubbing the torso and extending limbs. Avoid forcefully patting the animals' chest or head and do not stress or over-stimulate the animal.
➢ Consult Recovery Lead or other anesthesia supervisor. Patient's other vital parameters and overall status should be assessed. If it is determined that there is no evidence of post-operative bleeding, reversals or partial reversal agents may be elected.

Tachycardia: Canine HR > 120 bpm; Feline HR > 180 bpm
➢ Rule-outs for tachycardia include but are not limited to pain, stress, post-operative bleeding and drug-induced tachycardia.
➢ Consult Recovery Lead or other anesthesia supervisor. Patient's other vital parameters and overall status should be assessed. Treatment is based on overall patient status and specific exam and/or diagnostic findings.

Vomiting and Regurgitation:
➢ If vomiting, regurgitation, and/or retching are noted, immediately lift the rear legs and place the head down towards the ground to allow vomit to flow down and out to prevent animal from inhaling it. Make note of the time, and of the volume and consistency of vomit (watery or undigested food or foreign material). Alert Recovery Lead or other anesthesia supervisor.
Any animal less than 16 weeks of age is considered ‘pediatric’ on RAVS’ clinics and will be considered an expedited surgical and anesthesia patient. If you are inexperienced with anesthesia or recovery in young patients, or have any additional questions, please consult a staff veterinarian or technician. While anesthesia and surgery in younger animals is very similar to that in adult animals, there are some specific considerations to keep in mind when anesthetizing and recovering these patients:

- **Stimulation:** Handling before surgery should be minimized to prevent excitement prior to sedation. Excited animals will resist being restrained and become more difficult to sedate.
- **Anesthetic Protocols:** There are many different drug protocols in the literature for pediatric anesthesia. Specific protocols used will be discussed during anesthesia orientation sessions. Protocol considerations in pediatric patients include:
  - Avoidance of phenothiazine tranquilizers (such as acepromazine) in animals less than 4 months old should be considered due to potential to cause hypotension and heat loss due to peripheral vasodilation. Acepromazine is not used in RAVS pediatric anesthetic protocol.
  - A one-time dose of select NSAIDs in pediatrics 8 weeks or older is becoming more routinely used as part of a multimodal analgesia approach. A single NSAID dose may be administered to pediatric patients on a case-by-case basis as directed by RAVS staff.
  - Pediatrics may be more sensitive to fluid overload while they also have higher fluid requirements. Pediatrics will receive the standard surgical fluid rate of 10 ml/kg/hr unless their medical status warrants a different rate.
- **Anesthetic Depth:** Pediatric patients will respond more quickly to changes in isoflurane levels. They will have a more rapid induction and recovery and can become too light or too deep very quickly. Close attention to anesthetic depth is essential.
  - **Jaw tone** is a less reliable indicator of anesthetic depth in pediatric animals as it will be lost early in anesthesia.
  - Unlike the adult patient, changes in heart rate and respiratory rate are generally the most reliable parameters in monitoring anesthetic depth in young puppies and kittens – keeping in mind that high heart rates are normal in young animals. Follow trends!
- **Heart Rate:** Normal pediatric heart rates under anesthesia:
  - Dogs 120-180 bpm / Cats 150-180 bpm (up to 200+ bpm may be seen)
  - Cardiac output in the pediatric animal is primarily rate dependent as the heart is less able to increase contractile force or stroke volume. This means that bradycardia can be a serious problem and should be addressed immediately.
- **Respiration:** Normal pediatric respiratory rate = 15-35 bpm
  - Young animals have an oxygen consumption rate 2-3 times that of the adult animal thus increased respiratory rates are required to meet oxygen demands.
- **Hypoglycemia** can cause anesthetic complications and slow recovery.
  - Any animals < 4 months of age should be fasted no longer than 3-4 hours.
  - A small meal (1-3 Tbsp of canned food) should be fed at admission or 3-4 hours prior to pre-medication (RAVS REMINDER: Feeding time should be recorded on the medical record and on the surgery board.)
  - If slow to recover, rub small amounts of Karo syrup or 50% dextrose on the gums.
  - A small meal should be offered within an hour after anesthetic recovery (as soon as patient is sternal and able to move around).
- **Hypothermia** can be a serious problem for smaller patients.
  - A slightly smaller area of hair at the surgical site should be clipped
  - Over-wetting during surgical scrub should be avoided
  - Supplemental heat source should be used before, during, and after surgery
    - ‘Snuggle-safe’ warmers covered by a blanket or towel on the surgical table
    - Heating pads set on low can be used during recovery
    - Warm IV fluids may be administered
  - Monitor temperature closely during recovery

** ALWAYS WEAR EXAM GLOVES when handling pediatric patients.**
The information presented here is not designed to be an all-inclusive course on surgery. There are numerous textbooks and websites on small animal surgery. Several are listed in the “References” section of these pages. It is expected that all volunteers participating in surgery at RAVS clinics are familiar with basic surgical techniques and surgical anatomy.

The objective of this section is to guide you in aspects of spay/neuter procedures and general surgery that we feel are particularly important. The specific techniques listed are those used in RAVS clinics. All volunteers participating in surgical procedures at RAVS clinics must be familiar with these techniques. There are many safe and effective approaches to spay/neuter surgery. However, in order to standardize teaching it is important that all volunteers know and utilize the specific preventive techniques referenced here. Variations may be discussed with the veterinarian in charge at the time of the clinic.

It is important that all students, regardless of prior surgical experience, be familiar with the basic procedure, anatomy, and instruments to be used before participating in surgery. It is crucial that you practice essential surgical skills on a phantom/model as much as possible before performing any procedure on a live patient.

- Surgical teaching cases are for refining skills previously practiced on a model. We owe it to our patients to have practiced over and over before performing any live animal surgery. Trying new skills is exciting, but it is up to all students to respect patient welfare as the top priority.
- You will get much more out of the experience and will be allowed to do more if you have practiced ahead of time. Those who have prepared will get more responsibility and will learn much more. Those who have not practiced will spend more time watching others.
- Due to the nature of our patient populations, many of the surgeries students will be scrubbed in on will be very challenging for even experienced surgeons. The level of student participation is based on the patient’s anesthetic and surgical needs, the primary surgeon’s comfort level, and students’ skills assessment level.
- If you are nervous, don’t worry, you won’t be alone in a surgery – students will have plenty of direct supervision, mentorship and support from the volunteer veterinarians and RAVS staff. We will be right there to support and teach.

A veterinary student and mentoring veterinarian review a spay procedure video before scrubbing in to their next surgical case.

A mentoring veterinarian reviews proper skin incision placement with the student before the incision is made.

Veterinary students work one-on-one with experienced veterinarians in surgery. Surgical teams will discuss appropriate learning goals for each procedure based on student assessment skill level and patient status.
PRE-SURGICAL PREPARATION OF THE PATIENT

Proper patient positioning and surgical site preparation allow for a safer, more efficient surgery and aids in minimizing risk of surgical site infection, respectively. Please reference Section 2 of the manual for notes regarding specific related volunteer responsibilities of the surgical team.

Hair Removal – Surgical clip is completed at induction by the anesthesia team, before the animal is moved to a surgery table.

Positioning – The patient is placed in dorsal recumbency with the head toward the anesthetic machine in appropriate position for lighting and instrument access; the anesthetist should ensure the patient is connected properly to the anesthesia machine and that all monitoring equipment is in place.

➢ Limbs are tied to help stabilize the patient. In deep-chested dogs, it may help to cross the forelimbs, securing each tie to the opposite side of the table.
➢ Secure each limb with a loop and a half-hitch, being careful not to over-tighten ties as nerve damage or other complications can result.
➢ The goal of securing the limbs is to prevent the patient from shifting during the surgery, however overly stretching the limbs can make surgery more challenging and may cause patient discomfort post-operatively.

Skin Preparation - Start skin preparation as soon as the animal is on the surgery table to allow for maximum scrub and contact time between antimicrobials and the skin.

➢ Scrub skin with chlorhexidine scrub and alternate with dilute chlorhexidine solution. Repeat both steps a total of 3 times after all gross debris has been removed.
➢ Begin each scrub in the center of the scrubbed area, over the planned incision site, and scrub in a 'bulls eye' pattern toward the periphery, never going back to the center with the same gauze sponge. The skin preparation should be thorough but gentle to avoid unnecessary skin trauma.
➢ The final application of chlorhexidine solution is allowed to remain on the skin.
➢ Avoid soaking the patient; this increases risk of hypothermia.

When possible, an assistant opens the first layer of the surgical pack and uses sterile technique to drop a blade and suture on the sterile field. Perform this step first, then begin patient prep, so that the surgeon team can begin prepping their instruments while the patient is scrubbed.

PREPARING FOR SURGERY

General Tips
➢ As everyone prepares for surgery, the student should focus on Plan A (textbook description) for the procedure - knowing the anatomy, procedure and instruments.
➢ Plan B (or C) is the job of the volunteer veterinarians and/or RAVS staff veterinarians. If the student needs to move to an observer role during a complication or a challenging procedure, there is still much learning to be gained through close observation.
➢ During hands-on training, if you have done 3 maneuvers and not accomplished your objective - stop and ask for help. Trauma and complications result from multiple small or misplaced maneuvers. (for example, finding the uterus)
➢ Be aware – there is a lot going on in a small space; this can be a challenging environment in which to maintain asepsis. Be vigilant and remain aware of what’s happening around you.
➢ Always think ahead – this mindset is preventative and more efficient which lends to fewer complications and more time for surgery experience.
Gowning and Gloving
➢ Sterile gloving is a mainstay of maintaining a sterile surgical field. A new pair of sterile gloves should be worn for every surgical procedure. Students should ensure their glove size is accurate - surgery will be more challenging in mis-sized gloves.
➢ Veterinarians will gown for all abdominal procedures, and veterinary students will gown for all abdominal procedures and canine neuters. Students are not required to gown for feline neuters. Students should practice closed gloving and open gloving until the techniques can be performed efficiently without contaminating gloves +/- gown.

Draping the Patient
➢ Drapes are accordion folded in the surgery packs and are not fenestrated
➢ The drape is fenestrated after it is placed on the patient. Palpate the patient’s anatomy through the drape to help determine placement of fenestration. *Drape should be cut with the Mayo scissors, not the Metzenbaum scissors.
➢ There should be a continuous sterile field from the cranial end of the drape to the instrument tray.
➢ Drapes are placed in one motion and then either used, removed, or more drapes added to achieve the desired effect. Once the drape is placed, it should not be repositioned toward the surgical site as this will carry contaminants onto the prepared skin.

Instrument Organization and Posture:
➢ Organizing instruments in the same manner for every surgery and keeping them organized during surgery facilitates efficiency.
   ▪ With the exception of feline neuters, we ask that scalpel blades be placed onto blade holders. This is to help eliminate the risk of a blade mistakenly entering the surgical site.
   ▪ It is good practice to attach hemostat to any gauze located near an incision to eliminate the risk of gauze accidentally falling into the incision. Any used or “waiting” gauze should be immediately removed from the surgical field as blood-soaked gauze can easily fall into an incision.
➢ Practicing good posture (stand tall, on both feet, head out of light, elbows by your side, moving just wrists and hands) will improve visualization of the surgical site and decrease strain on the surgeon.

Note the differences between the surgeon’s good posture (left) and poor posture (right). Good posture improves visualization of the surgical site and decreases musculoskeletal strain on the surgeon.
BASIC SURGICAL TECHNIQUE

Incision

➢ We encourage all students to gain practice making the skin incision. Models cannot replicate live tissue, and this is a great opportunity to begin learning this important skill.
➢ Use the “fingertip grip” rather than the “pencil grip” of the scapel handle to make skin incisions. This allows for maximum cutting edge contact and pressure, making a straighter incision with less skin trauma.
➢ Use your free hand to spread skin to create a smooth surface and tension while cutting.
➢ Keep the blade perpendicular to the skin and draw it along the line of the planned incision.
➢ Skin tension and blade pressure should be adequate to smoothly part the skin so that subcutaneous fat appears in the trough of the incision as it is made.
➢ Try to open the skin in one continuous smooth stroke. Making multiple lacerations traumatizes the skin and results in a jagged incision.
➢ Begin with a relatively smaller incision that can always be extended if necessary.

➢ Note on incision placement for spays: Spay incisions are generally made between the umbilicus and pubis.
  ▪ In dogs the incision is made somewhat more cranial than in cats. In adult dogs especially with an active reproductive history, the incision is often made very near or on the umbilicus.
  ▪ It is critical that the umbilicus is clearly identified prior to choosing the incision site. Surgical patients must be clipped all the way to the xiphoid to ensure that this important landmark can always be identified and so that cranial extension of the incision can be made if necessary.
  ▪ Proper incision placement, based on species, age, body type, and sexual status is the key to successful use of a smaller incision.

➢ Note on incision size: We strive for small incisions because larger incisions do have significant downsides, however we are not asking anyone to perform keyhole incision surgeries. Remember, you can always make an incision longer if need be to safely perform a procedure.

Hemorrhage Control Tips During Skin Incisions:

➢ Female dogs in heat, pregnant, or post-partum, some male dogs, and dogs with tick disease may have more skin hemorrhage than other animals.
➢ The assistant should be prepared with mosquito forceps and gauze to control hemorrhage that may obscure the surgeon’s view while the incision is made.
➢ Most ‘bleeders’ will stop with pressure from a gauze sponge. Blot; don’t wipe the tissue, as wiping will disturb new blood clots. With larger skin vessels mosquito clamps may need to be applied. This can only be done when the vessels can be seen. The surgeon holds the skin with thumb forceps. The assistant blots the blood that is obscuring the surgeon’s view; then surgeon places a mosquito hemostat on the offending vessel.
➢ Do not place hemostats on large chunks of tissue or on the epidermis. This causes undue trauma and is ineffective at controlling hemorrhage. Hemostats can be removed after several minutes or an encircling ligature or mattress suture may be placed with 4-0 or 3-0 suture right away.
➢ A small splash of epinephrine diluted 1:10 may also be utilized. Take care when using this method in very small or very young animals to avoid over-doses.
Tissue Handling: “Gentle is the name of the game!”

- All students should gain practice identifying tissue types and handling tissue appropriately. Gentle tissue handling improves patient comfort in the post op period and lessens the chances of more serious complications such as intra or post-operative hemorrhage.
- Depending upon the cases assigned and level of surgical experience, students may learn how to find the uterus using either the spay hook or your fingers; palpate +/- stretch or break down the suspensory ligament, exteriorize testicles, and utilize clamps to mobilize tissue and/or control/prevent hemorrhage.
- Please discuss with your veterinarian which learning goal(s) you wish to focus on for a particular procedure so they can work with you to ensure adequate surgical time is available for you to learn/practice the identified techniques.

Additional notes for students who will be handling suture in the live patient: The following techniques all have applications in soft tissue surgery. The goal is for you to practice each technique until you can complete it without looking at your hands. First use a piece of string to “figure out” the sequence of hand motions required to tie the knot. Then use outdated suture, string or fishing line to develop skill and speed. You do not need to have a surgery lab to learn these. As with any technical skill, you will need to practice. Practicing in distracting situations, such as while watching TV, is a good idea.

- **Square knot** – basic knot for securing ligatures and suturing
- **Surgeon’s knot** – for knots being tied under tension
- **Modified Miller’s/Strangle knots** – very useful friction knot for ligatures under tension and in difficult to reach places or on large structures (ovarian pedicles, uterine body, spermatic cords)
  - If you are unfamiliar with the friction knots (Modified Millers/strangle knots), please discuss with a RAVS veterinarian or volunteer veterinarian familiar with these knots. They are an extremely useful skill to have in your surgical toolbox!
- **Instrument tie** – use of needle holders to tie any of the above-mentioned knots
- **Recognize slip knots** and understand how to prevent / correct them.

These knots may also be covered during clinic orientations though you won’t be assessed on them:

- Aberdeen knot
- Hand-ties

Suture Patterns – The fine details of suturing can be more difficult to practice in vitro, as it is hard to reproduce the feel and texture of skin and other tissues, but the essential techniques and coordination needed to perform surgical procedures can be practiced on any model. Students should know and practice basic suture patterns on cloth, banana skin, or a suture practice model until very comfortable with the steps in completing the pattern and the muscle memory to be able to demonstrate the necessary skills without stopping to think through each step of the pattern.
Students will be responsible for knowing the simple continuous pattern. Other patterns may be discussed and/or used including but not limited to:

- Simple Interrupted
- Cruciate and Buried Cruciate
- Buried horizontal intradermal pattern
- Colorado or Modified Colorado closure

It is important to understand how to bury knots at the beginning and end of patterns.

Reminder: The surgical training videos available on the RAVS website provide visual instruction on many of these techniques and tips on how to avoid common mistakes when suturing and ligating along with tips on how to suture/ligate more efficiently.

APPLICATION OF SUTURING PATTERNS IN SPAY AND NEUTER SURGERY

Body Wall Closure – Proper body wall closure is essential to prevent dehiscence. The suture must be anchored in the external rectus sheath approximately 4-10 mm from the edge of the incision. Knots should be tied carefully, with 6 “throws” and the first two throws should not be tied with “crushing” pressure to avoid damaging the anchoring tissue. The last 4 throws should be very snug, and the final “throw” should be ‘cinched’ tightly to prevent untying. For most of our surgical cases, the veterinarian will be closing the body wall, however students should be familiar with which layer is the external rectus sheath by holding this tissue layer briefly to understand how to identify it.

- **Simple continuous body wall closure** – Most commonly used to close linea and body wall. This pattern creates a good “seal”, has greater bursting strength than interrupted patterns, and is faster to complete. There is no evidence that it results in greater complications than interrupted patterns. Knots must be tied securely, and tension must be repeatedly checked during suturing or gapping of the incision will result.

- **Interrupted body wall closure** – This can be done as simple interrupted or cruciate pattern. Sutures should be placed 5-10 mm apart. These patterns are more commonly used in very small incisions.

- Important: *Do not include fat or muscle in body wall closure*. The external rectus sheath is the holding layer in all ventral body wall closures, and it is imperative that this tissue layer is clearly visualized when closing.

Subcutaneous Closure

- This layer is closed to decrease ‘dead space’ which can result in seroma formation and does not have significant “holding power”. It is often not necessary to close this layer in animals with minimal subcutaneous tissue, such as pediatrics.

- We do not advise tacking the subcutaneous layer to the body wall, as this creates an unnatural adhesion and can cause the patient more discomfort in the post-operative period.

- This layer may be closed in a simple continuous, simple interrupted or cruciate pattern.

- We recommend that short incisions (< 6 cm) be closed with a cruciate or simple continuous pattern. Longer subcutaneous closures should be closed with simple continuous.

- Subcutaneous knots should be paced so that the knots are ‘buried’. This is easily achieved by starting the stitch next to the body wall (deep), exiting the fascia closer to the skin (superficial), then reversing the sequence on the other side of the incision (i.e.: superficial to deep). This leaves the free ends of the suture material below the subcutaneous fascia when the knot is tied, and the knot ends up being covered.

- Subcutaneous sutures must not stick up through the skin closure, regardless of which skin closure technique is used.
Skin Closure

➢ This is the layer with which most novice surgeons have the most difficulty.

➢ In the majority of cases, we close skin with buried or intradermal sutures, making it unnecessary to remove the skin sutures after healing. When a buried pattern is used, the knots beginning and ending the pattern MUST be completely hidden by the overlying skin and the wound edges must be firmly opposed.

➢ Once you have mastered basic knot tying and suture patterns, your biggest challenge will be burying knots on your skin patterns, thus practice this as much as possible. We do utilize the connected Colorado technique often to aid in knot burial and to lessen the amount of suture in a patient, however knowing how to properly bury skin pattern knots is important.

➢ While we do use tissue glue, this compound is designed only to seal skin and is not a substitute for good suture technique.

➢ RAVS tip: Students who’ve assessed into the blue level category and who desire to practice skin closure should remember to discuss with your veterinarian ahead of time. The veterinarian will work efficiently to move through the procedure to allow time for this.

   ▪ Studies have shown that in high volume settings, incisional closure can take 40% of the entire time of the surgery.

   ▪ Gentle tissue handling during closure will dramatically help to lessen a patient’s likelihood of licking at their surgery sites in the post-operative period.

   ▪ Use of a local splash block can also aid in post-operative comfort.

Tattoo Your Patient! “The thin green line”

➢ ALL spay/neuter patients should receive a tattoo, always, regardless of what other methods may be used (i.e. ear tipping, ear notching, etc.). Current standards are to place an ~1 to 1.5 cm dermal (partial-thickness) green tattoo immediately upon completion of surgery.

➢ Recommended tattoo locations:

   ▪ Canine spay / Feline spay: next to incision or immediately cranial or caudal to incision (useful in patients with significantly developed mammary tissue).

   In patients with multi-pigmented skin, choose a lighter pigmented area for better contrast.

   ▪ Canine neuters: lateral to the incision in the inguinal area

   ▪ Feline neuters: abdominal ventral midline; midway between umbilicus and pubis

➢ Avoid placing tattoo ink IN the main surgical site. Tattoo ink is NOT sterile and should not be placed into an incision where the material can migrate into deeper tissues.

➢ A very small amount of tattoo ink goes a VERY long way! Use the backside of the scalpel blade or the corner of the OK strip to lay a small amount of ink into the tattoo incision, then hold the skin closed and cover with a thin layer of tissue glue.

NOTE: Veterinary students should thoroughly review the textbook version of how to perform basic spay and neuter surgeries. You may be quizzed on the steps needed to complete these procedures. Commonly used references are listed below.

REFERENCES:

1. Fossum, Theresa Welch. Small Animal Surgery
3. Tobias and Johnston. Veterinary Surgery -Small Animal
HIGH QUALITY SPAY / NEUTER & PREVENTIVE SURGICAL TECHNIQUES

Due to the compromised nature of many surgical patients we see in the field, the RAVS surgical team regularly employs a variety of preventative surgical techniques to minimize tissue trauma and minimize risk of intra-operative or post-operative hemorrhage while maintaining efficiency in an educational setting. General tips along with commonly used procedure-specific techniques are listed here. Questions about surgical techniques are encouraged and should be directed to RAVS staff in the field.

GENERAL TIPS and LIGATURE TECHNIQUES

➢ Tissue is handled gently to minimize tissue trauma throughout the procedure. This includes using instruments gently and only when necessary to safely accomplish a task in the procedure.

➢ Pedicles, uterine horn or body, and spermatic cords are double-ligated because our patients are compromised, and surgeries can be challenging. Many of our patients will quickly return to their usual active outdoor roaming lifestyle.

➢ Ligatures are placed and tightened on tissue when NOT under tension to ensure truly tight ligatures. Pushing hands towards the patient while tightening a ligature can achieve this.

➢ On thick or friable tissue, proximal (deeper) ligatures are tightened until tissue blanches to provide adequate hemostasis without accidentally causing suture to cut through tissue. Second ligatures are placed more distally (superficial) and are thoroughly tightened.

➢ When creating the first knot of a ligature, first throws are quickly locked by second throws to prevent ligatures from loosening before the knot is fully created and protecting the appropriate ligature tension. Using friction knots, like the Miller’s or Surgeon’s knots, accomplishes this goal.

➢ Ligature tails are purposefully left long (1/4 – 1/2 in) on the most distal of the two ligatures to assist in visualization and retrieval of ligated structures if a complication arises.

➢ Ligated tissue is checked for appropriate hemostasis when NOT under tension to ensure true hemostasis has been achieved.

FELINE NEUTER

➢ Drapes may be utilized to aid in surgical site asepsis.

➢ A closed technique via 1 or 2 scrotal incisions and autoligation are used for feline castration.

➢ The testicle is held caudally in the scrotum to create pressure on the skin when making the scrotal incision and to ensure the penis or urethra is not lacerated.

➢ The smallest workable incision is made to decrease potential pain for the patient.

➢ When exteriorizing the spermatic cord and creating the modified figure 8 knot, the surgeon’s arms are stabilized, and hands work close to the scrotum to avoid excessive tension on and tearing the spermatic cord.

➢ A figure 8 knot is used on the spermatic cord.

➢ The figure 8 knot provides more security than a half hitch. The knot is carefully tightened down – pushing it towards the patient to protect the vasculature, until it feels like gristle, to avoid the knot loosening.

➢ A healthy tag of tissue is left when cutting away the testicle so the mosquito hemostat is less likely to lose hold of the tissue and prevent knot slippage when blood pressure returns to normal after anesthesia.

➢ If the spermatic cord tears, an encircling ligature is placed to ensure hemostasis. RAVS Reminder: notify Surgery Lead if this happens.
CANINE NEUTER

- A *closed* technique via a prescrotal incision is used for adult canine castration.
- When making the pre-scrotal incision, the testicle is held central and cranial and pushed up into the skin to provide tension when making the skin incision. Stabilizing the testicle under the pressure of the blade prevents accidental laceration of the penis.
- The smallest workable incision is made to decrease potential pain. *Aiming the caudal pole of the oval shaped testicle towards the incision allows for a smaller incision while still allowing safe exteriorization of the testicle.*
- When exteriorizing the spermatic cord, the fascia is stripped on the caudal side of the spermatic cord by the cremaster muscle to avoid creating micro-tears in the vasculature on the cranial side of the spermatic cord. If breaking down fascia is challenging, a clamp can be placed along the caudal aspect of the cord to aid in retraction while a hemostat, blade edge, or scissors are carefully used to initiate fascia breakdown on the caudal edge.
- The spermatic cord is crushed with hemostats, and the crush points double ligated.
- Oozing subcutaneous or skin vessels are clamped with mosquito hemostats and twisted or ligated or cauterized with a cautery pen. Oozy subcutaneous tissue may be closed with a mattress suture. Care is taken to lift subcutaneous tissue onto the needle tip rather than diving the needle tip into the subcutaneous tissue in order to avoid accidentally suturing the urethra.
- Subcutaneous and skin layers may be closed in one layer or two layers to eliminate dead space and decrease the chance of a hemoscrotum.
- Scrotal pre-closure tacking sutures may be used to decrease dead space in a large pendulous scrotum in order to reduce the chance of a hemoscrotum. Care must be taken to ensure the suture does not exit the epidermal layer of the scrotum.
- A scrotal wrap may be placed post-surgery to help decrease dead space in the scrotum and prevent hemoscrotum.

SPECIAL NOTE: CRYPTORCHIDS

- Under anesthesia, the abdominal, inguinal, and scrotal areas are palpated to potentially identify the undescended testicle. Any palpated structures are evaluated on the contralateral side to avoid accidentally removing a lymph node instead of an undescended testicle.
- In cats, the penis is examined for barbs. Also, cranial to caudal digital pressure under the fat pads can assist in identifying an inguinal testicle in a male cat.
- To decrease length and number of incisions in abdominal cryptorchids, a caudal paramedian skin incision is generally used on abdominal cryptorchid canines and caudal medial skin and body wall incision is used on all abdominal cryptorchid cats. In dogs, if a paramedian body wall entry is also used, blunt dissection through the muscle layers can help prevent excessive body wall bleeding. A midline entry into the body wall may be helpful in bilaterally cryptorchid dogs.
- *The undescended testicle is always found and removed BEFORE removing the descended testicle.* If the undescended testicle is not found on exploration, the descended testicle is NOT removed.
CANINE AND FELINE SPAY

- Incision sizes are large enough to safely perform the procedure, but small enough to limit unnecessary pain and exposure in a MASH-style surgical environment. Incision size will vary depending on veterinarian experience and the patient’s reproductive status. Guidelines are listed here for reference:
  - **Cats:** A 2-3 cm incision is made in the middle third of the abdomen.
  - **Dogs:** A 3-5 cm incision is made on ventral midline.
  - **Puppy Spay:** Middle third between umbilicus and pubis
  - **Adult Dog Spay** (young dog): Cranial third between umbilicus and pubis
  - **Older Dog Spay** (multiparous, post-partum, etc.): Cranial third between umbilicus and pubis.

In many of these dogs, we often start the incision over the umbilicus to allow for less tension when exteriorizing ovaries.

- When entering the abdomen, *forceps are used to dramatically tent the linea*. A scalpel blade oriented parallel and inverted is used to make the stab incision in order to avoid lacerating the spleen or bladder. When extending the incision, forceps or hemostat jaws are used as a guide to prevent abdominal content damage by the scalpel blade; alternatively, the linea is lifted dorsally and scissors used to extend the incision.

**RAVS Reminder:** Generally, we ask veterinarians to enter the abdomen. Students who have met the criteria to be at the black level for surgery may work with their mentor veterinarian on this skill.

- The *spay hook is generally used on the right side of the patient* to avoid damaging the spleen, however in cats, if the uterine horn is not captured by the spay hook on the right side of the abdomen it can be fruitful to carefully sweep the hook from lateral to medial just cranial to the bladder. The spleen tends to be less obtrusive in cats than in dogs allowing careful use of the spay hook on the patient’s left side if other location searches fail. Remember – GENTLE and careful use of the spay hook is necessary to prevent damaging internal organs.

- To provide enhanced exteriorization of the ovarian pedicles, the surgeon or assistant *pushes down on the body wall rather than pulling up on the ovarian pedicle to prevent tearing the pedicle.*

**In Dogs:**
- The ovarian pedicle is oriented straight rather than twisted, and upward and caudal-medial traction are carefully applied to the ovaries when breaking down suspensory ligaments to ensure *digital pressure on the suspensory ligaments is as far away as possible from the uterine vessels*. If stretching the suspensory ligaments allow satisfactory exteriorization of the ovaries, it is not necessary to completely tear the ligaments.
- Ovarian pedicles and uterine horns or uterine body are double ligated because our patients are compromised so surgeries are challenging, and many of our patients will quickly return to their usual active outdoor roaming lifestyle.

**In Cats:**
- Pedicles may be ligated with suture, or autoligated (“pedicle tie”) by veterinarians experienced and proficient in the technique. We encourage veterinarians not proficient at the technique and all students to practice on models and observe the technique in a live patient. Black level students and veterinarians interested in learning the technique should speak to the RAVS Surgery Lead about mentorship on models and in the live patient.
Bainbridge or Carmalt clamps are used on friable ovarian pedicle tissue. Minimizing the number of clamps used while ligating the ovarian pedicles, or if experienced in the technique, using the ovarian cut-away technique, may decrease accidental tearing of tissue by clamps, increase ease of ligature creation, and increase security of ligatures. We encourage veterinarians not experienced in the cut-away technique and all students to observe the cut-away technique in live patients. Black level students and veterinarians interested in learning the technique should speak to the RAVS Surgery Lead about mentorship in the live patient.

Broad ligaments are torn and ligated en bloc or incorporated into the uterine body ligature, after cutting the round ligaments, to prevent oozing from the numerous small vessels present in the broad ligament in many challenging spays. They may be autoligated in cats when indicated.

Clamps are not used on the uterine horns or uterine body prior to ligation to prevent the clamps from tearing the turgid or friable tissue. The proximal ligature is tied with just enough tension to blanch the uterine tissue and then the distal ligature is fully tightened. If the distal ligature tears the uterine tissue, the vessels generally do not tear so will be ligated, while the proximal ligature will minimize oozing from the torn uterine body tissue.

A clamp is placed following ligating and tissue transected, ensuring an adequate distal tissue tag.

In heat, pregnant, post-partum, friable, older, tick disease positive, or generally challenging uterine bodies are double ligated with Miller's knots and the uterine vessels are ligated individually on the left and right (stick ties) distal to the encircling ligatures. Stick ties provide focused hemostasis for the primary vasculature in case the uterine body tissue tears because it is friable or shrinks when the ovaries and hormone supply are removed resulting in encircling ligatures that are too large for the involuting uterine tissue.

Prior to closing the abdomen, gutters are swabbed with gauze attached to a hemostat or visualized to scan for blood. If blood is found, the incision is initially extended and the source is investigated by visualizing all areas previously ligated, following clots to potential complications, and re-ligating potential sources. Reminder: On RAVS clinics the Surgery Lead should be notified if abdominal bleeding is present.

The incision is closed in 3 layers or in 2 layers with a technique that minimizes dead space in an effort to prevent incisional hematomas or seromas.

Belly bands are applied to patients with oozy internal procedures. Belly bands are removed 1-2 hours later, once the patient is deemed stable by the Recovery Lead. Incisional pressure wraps are applied to patients with oozy subcutaneous and skin vessels. Incisional pressure wraps are removed prior to release from recovery.

SPECIAL NOTE: PEDIATRIC SPAY/NEUTER SURGERY

Pediatric surgeries are only performed by RAVS staff or volunteer veterinarians experienced in HQHVSN surgery to decrease patient time under anesthesia. Students are encouraged to observe these surgeries.

High volume techniques (pre-scrotal or scrotal incision and single ligation or autoligation for puppy neuters, keyhole incision and single ligation for pediatric spays, pedicle ties for kitten spays, ovariectomies in puppy and kitten spays) are utilized as appropriate for the individual pediatric patient.
SECTION 4: APPENDIX

Rural Area
Veterinary Services
**SURGERY PATIENTS**
- Trazodone (dogs) and gabapentin (cats) administered to animals 5 months to 6 years old
- Flea/tick & dewormer treatments administered at exam
- Neckband with animal name / last name for all dogs
- Vaccines needed highlighted on Ax page of record
  - DAPP/FVRCP +/- Rabies (vax administered in Ax)
- Medical Record: Complete Exam & Tx Record
- Meloxicam: Rx for all dogs, female cats 5 mos to 6 yrs
  - Record in meds TGH chart, write Rx label, to be filled later.
- Ax Cleared: DVM or RAVS staff sign Ax clearance (pg 3)*
- Cage Card: Animal name/ last name, letter/number
- Pediatrics (< 16 weeks) receive a snack
  - note PED on Sx board and snack time
- Client to check in with IC before leaving

**WELLNESS / MEDICINE ONLY PATIENTS**
*(not having surgery)*
- Vaccines administered during appointment
  - vaccine labels go on RAVS medical record
- Rabies certificate/tag completed at time of exam
- Flea/tick & dewormer administered at exam
- Treat in house and/or dispense any meds if needed
- Complete all paperwork at time of appointment
- Client does not need to check in with IC before leaving

**Consult DVM before vaccinating if:**
- Pregnant, history of vaccine reaction, any abnormal exam findings, aggression, or extreme fear.

---

**Vaccine Protocols**
< 4 weeks of age: consult RAVS staff

**DAPP (DOG) / FVRCP (CAT)**
- 4-19 weeks of age: revaccinate every 4 weeks until adult canines come in (≥ 20 weeks of age)
- ≥ 20 weeks of age: Due in 1 year (adult canine teeth present)
- Pregnant dogs and cats (if not being spayed) - vaccinate with client consent after DVM consultation.

**RABIES - Dogs and Cats**
- 4-11 weeks of age - No certificate issued. Next rabies due at 12 weeks of age. Consider as unvaccinated.
  - Write “< 12 wks” on rabies tag # line of record
- ≥12 weeks of age and vaccination given is first rabies, due in 1 year and 1 year rabies certificate issued.
- If record of a previous rabies vaccination given at ≥12 weeks old and at least 6 months ago, a three-year rabies certificate can be issued, EVEN if the patient is currently overdue for vaccination.

Rabies Certificate: ALWAYS check 3yr Lic/Vacc box □ (product label) – RAVS does not order 1yr lic vaccines
- Date vaccinated = today’s date

---

**CANINE PARASITE TREATMENT**

**Deworming: PYRANTEL**
- Dogs/puppies ≥ 2 weeks old = Receive one dose pyrantel orally today.
- Next dose due:
  - > 20 weeks old= 1 year
  - Nursing moms and pups ≤ 20 weeks of age = Dispense second dose to give in 2 weeks

**Flea/Tick:**
- Dogs/ puppies ≥ 20 weeks old = SERESTO COLLAR
  - Collar is good for 8 months.
- Puppies 8-20 wks: apply topical fluralaner (Bravecto)
  - Next dose due 90 days.
  - Fluralaner can also be used for treatment of mange in dogs
- Puppies 4-8 wks: apply topical Revolution

~ use dosing charts on caddies ~

---

**FELINE PARASITE TREATMENT**

**Deworming + Flea/Tick:**

**SELAMECTIN** *(Revolution)*
- All cats ≥ 4 weeks old.
- One dose topically between shoulder blades today.
- Next dose due in 30 days
- Send home one dose to repeat in 30 days only if treating ear mites (see protocol binder)

**Deworming Only (< 4 weeks of age): PYRANTEL**
- Kittens 2-3 weeks old = One dose orally today (cats/kittens ≥ 4 weeks deworm with Revolution).

~ use dosing charts on caddies ~

---

**Notes**
**DISINFECT BETWEEN FAMILIES...REMEMBER THE FOMITES!**
WEAR GLOVES AT ALL TIMES WHILE HANDLING PUPPIES OR KITTENS!

Aging Puppies and Kittens
- Deciduous teeth usually smaller & sharper than adult
- Eruption times vary by individual, even within litters
- Adult teeth often erupt later in small dogs than large
- Age is always an estimate unless the actual DOB is known; err on the side of vaccinating

**PUPPIES:**
- 8 weeks: all deciduous teeth present
- 12 weeks: deciduous teeth may have some spacing
- 16 weeks: first adult incisors erupting
- 20 weeks: all adult incisors present
- 20-24 weeks: adult canine teeth present

**KITTENS:**
- Grow about 1 pound per month for first 5 months
- 8 weeks: all deciduous teeth present
- 12 weeks: inner (I1) incisors missing or adult erupting
- 16 weeks: adult incisors present
- 20 weeks: adult canines, premolars, molars erupting
- 6 months: all adult teeth present

**ALERTS**
DVM consult required
- Any TPR value outside normal range
- Age < 16 weeks or > 6 years
- History of vaccine reaction
- Any significant exam abnormalities (dehydration, diarrhea, heart murmur, URI, pregnancy, etc) or history of recent illness (decreased appetite, etc)

**Important Ax/Sx Alerts**
- Trauma history (in past year)
- Reproductive alerts: pregnant, in heat, cryptorchid, TVT, multiparous, nursing (note age and # pups/kits staying in clinic w/ mom)
  - Puppies & kittens <4 weeks need to stay with mom

Reminder: Fill out ALERTS line of AX PAGE in med records; also critical alerts written on Sx Board

**TPR NORMALS**

<table>
<thead>
<tr>
<th></th>
<th>DOG</th>
<th>CAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp</td>
<td>100.5-102.5 °F</td>
<td>100.5-102.5 °F</td>
</tr>
<tr>
<td>HR</td>
<td>80-160 bpm</td>
<td>110-220 bpm</td>
</tr>
<tr>
<td>RR</td>
<td>15-30 bpm</td>
<td>20-40 bpm</td>
</tr>
<tr>
<td>MM/CRT</td>
<td>pink/&lt; 2 sec</td>
<td>pink/&lt; 2 sec</td>
</tr>
</tbody>
</table>

**Checklist Before Client Leaves**

- Review history
- Confirm phone # is correct and if client can receive text message for go home time.
- Is age correct on first page? (note Yrs vs Mos vs Wks)
- “Declaration and Consent” line signed
- All lines of PE completed – nothing left blank
- Circle estimate vs. actual weight
- Highlight vaccines to be given at Ax (page 3)
- Alerts on Ax sheet (page 3) and Sx board
- Trazodone or gabapentin given and recorded in record - 5 mos to 6 yrs old
- Snacks for pediatrics given and written on Sx board (time also written on Ax Alert line)
- Any meds prescribed to go home - written on record, Rx label completed on empty baggie - placed into plastic sleeve - kept with record.

**REMEMBER THE FOMITES!**

Notes

03/2024
RAVS Anesthesia Cheat Sheet - Students

**CANINE PATIENT:**
Prior to getting cleared for ax

- Get to know your patient
  - review history, PE, alerts
  - then premeded
- Pre induction TPR (after premed)
- Calculate fluid rate
- +/- place IVC (2 pokes, 1 leg rule)

**FELINE PATIENT:**
Prior to getting cleared for ax

- Get to know your patient
  - review history, PE, alerts
- Pre induction HR and RR only!
  (only repeat temp if abnormal on intake)
- Calculate fluid rate
- No premeded!
- IM induction w/ RAVS Staff or induction technician.

---

### Calculating Fluid Rates

**Standard surgical rate = 10 ml/kg/hr**

- > 60 ml/hr = bag w/ drip rate (X ml/hr x 10 gtt/ml ÷ 3,600 = X gtt/sec)
- 1+X gtt/sec = 1 drop every Y seconds
- ≤ 60 ml/hr = syringe bolus every 5 min (X ml/hr ÷ 12 = X ml/5 min)

---

### How do I choose a circuit and reservoir bag?

- Rebreathing circuit = > 7 kg
- Non-rebreathing circuit = ≤ 7 kg
- Reservoir Bag – minimum volume = 60 ml/kg

---

### Anesthetic Monitoring - Normal Values

<table>
<thead>
<tr>
<th>HR</th>
<th>Dog: 80-120 bpm  /  Cat: 100-180 bpm (pediatrics at higher end of these ranges)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR</td>
<td>10-20 bpm</td>
</tr>
<tr>
<td>SpO2</td>
<td>95-100%</td>
</tr>
<tr>
<td>mm/CRT</td>
<td>pink, &lt; 2 sec</td>
</tr>
<tr>
<td>BP</td>
<td>Systolic 80-120 mmHg / Diastolic 60-100 mmHg (MAP 70-90 mm Hg)</td>
</tr>
<tr>
<td>Temp</td>
<td>99.5-102.5 °F</td>
</tr>
</tbody>
</table>

---

### Sx Time Limits

(minutes)

- Dog Spay – 45
- Dog Neuter – 20
- Cat Spay – 30
- Cat Neuter – 10
- **Total Ax Time – 60**

---

### Assessing Anesthetic Depth

- Reflexes
- Jaw Tone (decreased, but always present)
- Eye Position, pupil size, PLR – surgical plane = rotated ventromedially
  (central eye position can mean either too light or too deep)
- Response to surgical stimuli
- Status of surgical procedure
- NOTIFY LINE WALKER IF ANY CONCERNS

---

### Standard DOG (> 4 mos) Anesthetic Protocol

Premed: Morphine 0.5 mg/kg + Dexmedetomidine 5 mcg/kg IM
Induction: Ketamine 5 mg/kg + Midazolam 0.25-0.5 mg/kg IV

---

### Standard Adult CAT and Any PEDIATRIC (≤ 4 mos) Anesthetic Protocol

IM induction cocktail: TTD (telazol, butorphanol, dexmed)
TTD 0.03 ml/kg (adult cats), TTD 0.02 ml/kg (pediatrics)
+ Buprenorphine 0.02-0.03 mg/kg IV at induction

---

### Remember...

Never struggle with a patient to place an IVC. 2 pokes 1 leg rule applies for all. Consult Ax Lead for difficult patients.

IVC may be placed at induction if timing appropriate (2 pokes, 1 leg rule applies when placing IVC

- Dogs must have a slip lead when heading to induction.
- Cats must have a figure 8 harness at all times and be carried to induction in their carrier.

At induction: **monitor patient at all times.** Record vitals, drugs, completed procedures. Verify induction checklist is complete.

During procedure: **monitor patient at all times.** Record vitals and fluid administered every 5 min. Never leave your patient.

Deflate ET tube cuff before moving from surgery to recovery.

Recovery: **monitor patient at all times.** Remove ET tube once swallow reflex returns.

Recovery Lead will inform when you can transfer your patient to the recovery team and move onto your next patient.

Keep heat support in mind for all!

An **expedited case** means the induction technician will intubate and place IVC. Anesthetist should monitor and assist as directed.

---

### IVC/Intubation @ Induction Table

Your...

- 1st patient = technician intubates and places IVC (if not already placed), student monitors, learns flow
- 2nd patient = student may attempt catheter – 2 pokes/1 leg rule applies; technician intubates
- 3+ patients = student chooses IVC or intubation (for cat intubation: must have prior intubation experience)
### Student Anesthetist Skills Review

Depending on prior experience, assignment schedule and case load you may have the opportunity to learn/practice a number of important technical skills related to anesthesia during the clinic. Use this list to identify learning goals and track your progress.

<table>
<thead>
<tr>
<th>Skills</th>
<th>Prior Experience</th>
<th>RAVS Practice</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax machine assembly, track flow of gas</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>Breathing circuit selection and setup</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>Ax machine leak test</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>IM injection</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>IVC placement - Dog</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>IVC placement - Cat</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>Intubation - Dog</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>Intubation - Cat</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>Esophageal stethoscope placement</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>PetMap monitoring equipment placement</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>Other: ____________________________________</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
<tr>
<td>Other: ____________________________________</td>
<td>0–1–2–3</td>
<td>□ □ □</td>
<td></td>
</tr>
</tbody>
</table>

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### IMPORTANT! – So We’ll Say it Again

- Never leave your patient
- Never turn the vaporizer above 3%
- Trends are more important than absolute values
- A MAP of < 60 mm Hg = inadequate organ/tissue perfusion
- Typical O₂ flow meter setting = 1-2 L/min
- Minimum flow meter setting for non-rebreathing circuit = 1.5 L/min
- Never close the pop off valve (always use safety pop off valve)
- If a patient is NOT breathing or has NO heartbeat – remain calm, turn off vaporizer and CALL FOR HELP.
- When in doubt – ASK FOR HELP from an anesthesia supervisor.

---

### RECOVERY ALERTS

Notify Recovery Lead or RAVS staff if you identify any clinical signs outside normal parameters:

- Hypothermia: Rectal Temp < 98°F
- Hyperthermia: Rectal Temp >103°F
- Bradycardia: K9 HR < 80 bpm/ FE HR <100 bpm
- Tachycardia: K9 HR >160 bpm/ FE HR >200 bpm
- Vomiting/drooling - can occur in unconscious animals!
- Emergence delirium/dysphoria/pain = 3 different issues with 3 different solutions - need to recognize the difference!
- Pale mm/prolonged CRT (>2 sec) / poor pulse quality
- Patient still intubated >15 min post-op
RAVS Surgery Cheat Sheet – Students

Student Levels and Learning Goals

Active Observer (Green)
- No suturing
- No ligating or figure 8 knots
- Do not enter abdomen or break down suspensory
- Can make skin incisions, locate uterus/use spay hook, exteriorize testicles, handle and/or cut tissue, cut suture

Assistant Surgeon (Blue)
- Suturing and ligating (second of two ligatures; DVM performs the first) + all Green level skills
- Do not enter abdomen, break down suspensory, or close linea

Mentored Surgeon (Black)
- Student is primary surgeon with DVM oversight and assistance (remember time limits)
- May enter abdomen, break down suspensory, and/or close linea

Remind DVM of level and discuss learning goals prior to Sx.

Surgery and Anesthesia Time Limits

Anesthesia time: 60 minutes or less
Surgical time (maximums not goals)
- Canine Spay: 45 minutes or less
- Canine Neuter: 20 minutes or less
- Feline Spay: 30 minutes or less
- Feline Neuter: 10 minutes or less

**Ax time supersedes surgical time**
(i.e. extended induction process = less surgical time)

Remember closure takes time, so if this is a learning goal, be sure your mentoring veterinarian is aware of this before the procedure begins.

Medical Record

The medical record MUST ALWAYS STAY WITH THE PATIENT.

Surgery student is responsible for two things on medical record in every case:
1. Surgery report
2. Remind your DVM to review / initial surgery report as soon as they are able.

If medications are dispensed, these areas also completed:
- Treatment Record (pg 2) – Rx/meds dispensed and reason (this page stays with RAVS).
- Rx label filled out, placed on baggie and put into plastic sleeve with record. To be filled later by Receiving team.

Gowning / Gloving for Surgery

Students:
- Gown for all surgeries except cat neuters
  (new gown / procedure)
- Sterile gloves for all procedures
  (new pair / procedure)

Veterinarians:
- Gown for all abdominal procedures
  (new gown / procedure)
- Do not need to gown for dog or cat neuters unless desired.
- Sterile gloves for all procedures
  (new pair / procedure)
Autoclaves
They really are your friends! 😊

- Use white boards / clock / timers to track and communicate
- ASK Sx Lead or Sx Staff to clarify a step or troubleshoot
- Ensure there is adequate distilled water in outer canister before starting (inner canister handles should be floating flush to top edge of outer canister)

STEPS TO AUTOCLAVE

1. Load / place huck towels (1 or 2) on top of packs; apply lid ensuring metal hose is placed into inner canister square column and arrow/indent match up
2. High heat, Open vent (~20 min)
3. High heat, Close vent (~20 min)
4. Green (+/- low red) range (variable time – see below)
   - Don’t need to do anything to the autoclave on this step…just record time/start timer as long as pressure has been reached
     - Instruments/Mixed contents (45 min)
     - Gowns only (35 min)
     - May need to adjust heat slightly if far into red range; or may need to check electricity or retighten connectors if not reaching pressure
5. Heat Off, Vent Open (~10 min) – wear gloves!
6. Unpack then Reload

Pack Wrap Reminders

Gowns
- Gowns are wrapped with a SINGLE pack wrap
- Add a steri-strip (OK strip)
- Ensure gown is turned correct direction before folding; “dress the table”

Surgical packs
- Surgical packs are wrapped with TWO pack wraps (folded separately)
- Add to EVERY pack:
  - Gauze squares
  - Drape
  - Steri-strip (OK strip)

Pouches (single instruments and cat neuter pouches)
- Add a steri-strip (OK strip)
- Add 2 gauze squares to cat neuter packs
  (other individual instruments do not need gauze)
- Add small pre-fenestrated drape to cat neuter packs

NOTES:
COMPONENTS OF THE SURGICAL PATIENT RECORD

ALL PAGES
Patient ID Number (dogs) or Letter (cats) - Recorded by Receiving Team
- Corresponds with the patient number or letter on the surgery board. It is the responsibility of the Receiving Team to record patient ID in the hashtag box of EVERY page of the medical record

PAGE 1 – Client Consent & Patient History
Client Information / Patient Information - Recorded by Intake or Receiving Team
- Client name / Phone # (where client can be reached day of clinic) / Address (PO boxes ok)
- Patient name / Age (include years, months, or weeks) / Breed (list as client requests)
Consent for Treatment/Anesthesia/Surgery Recorded by Intake or Receiving Team
- Consent/release must be signed for every individual animal before we can initiate treatment.
- Additional Consent: See receiving protocols – not required for all patients
Patient History Recorded by Intake or Receiving Team
- Patient history - Intake support or Receiving Team will complete with information obtained from the client interview. Additional details should be obtained for any ‘Yes’ response.

PAGE 2 – Physical Exam & Treatment Record
Physical Exam Record - Recorded by Receiving Team +/- Consulting DVM
- Exam findings recorded by the Receiving Team and consulting veterinarian(s)
  – consulting DVM should also make notes in the Examined by DVM section of the record
Treatment Record - Recorded by Receiving Team
- All procedures, anti-parasitics and other treatments administered recorded here
  (exception: trazodone/ gabapentin – see Anesthesia Record*)
Medications and Items Dispensed - Recorded by Receiving Team +/- Consulting DVM
- Medications dispensed to go home with the patient are also recorded here.

PAGE 3 – Anesthesia Record
Anesthesia Record / Report - Vaccine Highlights by Receiving Team / Recorded by Anesthetist
- Alerts - history or exam findings that may impact anesthesia or surgery. 
  Recorded by Receiving Team
- Ax Cleared line must be signed off by RAVS staff before patient may be induced.
- This page includes induction and ancillary drugs administered, vaccinations due/given 
  (vaccine labels placed at bottom of page), machine setup, patient monitoring, fluids, etc.
- Trazodone / Gabapentin administered in receiving are recorded on this page.
- Any anesthetic complications or unusual details are recorded in the notes section.

PAGE 4 – Surgery & Recovery Record
Surgery Report - Recorded by Student Surgeon (or DVM if expedited case)
- Primary surgeon provides a brief report including any complications and explanation for 
  required assistance or extended surgery time.
- When a veterinary student is involved, the student will complete the surgery report and the 
  associated veterinarian signs off on the report.
Recovery Record - Recorded by Anesthetist +/- Recovery Lead or Recovery Support
- Initial recovery notes completed by the student anesthetist. Monitoring parameters are 
  recorded by the recovery team until the patient is returned to a kennel.
Post-Op Medications - Recorded by person administering medication
- Any post-procedure drugs are recorded here
Discharge Exam - Recorded by exam assistants from Receiving Team or RAVS staff
- Any post-procedure drugs are recorded in the appropriate section

PAGE 5 – Animal Care Record / Discharge Instructions
Animal Care Record - Receiving, Anesthesia, and Surgery Teams record respective sections
- Information provided to the client when the patient is discharged. Use lay terminology.
- Indicates procedures performed, vaccines and treatments administered and recommendations 
  for further care. All treatments recorded by person administering.

➢ Rabies Certificate – Required for any patient vaccinated for rabies
**SAMPLE MEDICAL RECORD (SPAY)**

**RURAL AREA VETERINARY SERVICES**

**CONSENT FOR ANESTHESIA AND SURGERY**

<table>
<thead>
<tr>
<th>Clinic Location:</th>
<th>Date:</th>
<th></th>
</tr>
</thead>
</table>
| I, (Owner's name) | (Phone#)(__) | (Alt)(__)
| of (Address) | Street # | City | State | Zip |

**being a person over eighteen years of age, hereby authorize RAVS personnel to perform on the following animal; surgical sterilization, vaccination and additional procedures deemed necessary, as determined by medical evaluation. If my animal is being spayed or neutered s/he will have a small tattoo mark to indicate that s/he is sterilized. I understand that the examination received by my animal is a basic presurgical screening and is not intended to detect all illnesses or injuries that may be present.**

**Animal's name ___________________________ Dog / Cat / Other_________ Male / Female**

**Age (include wks / mos / yrs)**

**Sterilization procedure requested: Spay / Neuter Other procedure(s)_________**

**Declaration & Consent: I am the legal owner/guardian of the above-mentioned animal. I realize that there are inherent risks to any medical intervention, surgical or anesthetic procedure that can include death and these risks have been explained to me. I agree to indemnify the Humane Society of the United States and/or its affiliates, its volunteers, and staff from any loss or liability. I understand that, as part of this clinic, veterinary students will be treating my animal, including physical examination, vaccinations and treatments, anesthesia and surgery. All students will be under the direct supervision of a licensed veterinarian.**

**Signed: ___________________________ Date: ______________**

**Additional Consent: I understand that the following factors may increase the risk of potentially serious complications during anesthesia/surgery and elect to proceed with the procedures in the best interest of my animal: [list factor(s)]_________**

**Client RAVS Staff ________________________**

**NO HISTORY AVAILABLE □ **

**PATIENT HISTORY – CLINIC USE ONLY**

<table>
<thead>
<tr>
<th>Hx taken by:</th>
<th>____________</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long has client cared for this animal?</td>
<td>&lt; 1 month / 2 - 11 months / 1 - 3 years / &gt; 3 years</td>
</tr>
<tr>
<td>Where is this animal housed?</td>
<td>Mostly indoors / Mostly outdoors / Both indoors and out</td>
</tr>
<tr>
<td>Has the animal ever been treated at our clinics (RAVS) before? When:</td>
<td>YES NO</td>
</tr>
<tr>
<td>Has this animal ever been to a veterinarian (other than RAVS) before? If yes, when</td>
<td>YES NO</td>
</tr>
<tr>
<td>Reason:</td>
<td></td>
</tr>
<tr>
<td>Has this animal been vaccinated before? When was last vaccine received?</td>
<td>YES NO</td>
</tr>
<tr>
<td>What vaccines were given at that time?</td>
<td>Rabies DAPP FVRCP Unsure Other</td>
</tr>
<tr>
<td>Has the animal ever had a reaction to a vaccination?</td>
<td>YES NO</td>
</tr>
<tr>
<td>In the past several months, has the animal had any signs of illness? Resp: Coughing / Sneezing Eye/Nose Discharge GI: Vomiting / Diarrhea / Stool not observed Eating: More / Less / Same as usual Weight: Gain / Loss / No Change Activity: More / Less / Same Describe:</td>
<td>YES NO</td>
</tr>
<tr>
<td>Has the animal ever had any injuries or trauma?</td>
<td>YES NO</td>
</tr>
<tr>
<td>Injury: Hit by Car Injured by another animal Other:</td>
<td></td>
</tr>
<tr>
<td>Please describe (WHEN, what happened):</td>
<td></td>
</tr>
<tr>
<td>In the past month, has the animal had contact with any other animal that has died or had signs of illness?</td>
<td>YES NO</td>
</tr>
<tr>
<td>Please describe:</td>
<td></td>
</tr>
<tr>
<td>In the past month, has the animal been given any medications, home remedies or flea/tick medications? Please list:</td>
<td>YES NO</td>
</tr>
<tr>
<td>If the patient is a female: Has she ever had puppies/kittens? How many litters has she had? When was her last litter born? Has she ever had a miscarriage (lost pregnancy)? When was her last heat cycle? Might she be pregnant (per client)?</td>
<td>YES NO</td>
</tr>
<tr>
<td>What time did the animal last eat? Free-fed/Unsure &lt;8 hr &gt;8hr</td>
<td></td>
</tr>
<tr>
<td>Are there any other questions the client has about this animal’s health or behavior?</td>
<td>YES NO</td>
</tr>
</tbody>
</table>

**Record Ok: ___________**

**03/2024**

**Page 1 (3/24)**

**[Discharge (RAVS Staff):] ___________**

**136**
MEDICATIONS AND ITEMS DISPENSED

**TREATMENT RECORD** (mark only after treatment has been completed)

- **External Parasites:** □ No parasites noted □ Fleas or flea dirt □ Ear mites □ Ticks: 1-10 / > 10 / > 50
  - Mange -- □ Sarcoptes / □ Demodex -- Dx based on: □ Clinical signs / □ Microscopic ID

**External Parasites:**
- No parasites noted
- Ear mites
- Ticks: 1-10

**BCS:** 9

**Wt:** 7.5 kg (est. or actual)

**Temp:** 104°F

**Pulse:** 140 bpm

**Resp:** 44 bpm

**MM/CRT:** 0.8 / 0.8

**Βehavior:** Gentle / Social

**BCS:** 9

**Wt:** 7.5 kg

**Temp:** 104°F

**Pulse:** 140 bpm

**Resp:** 44 bpm

**MM/CRT:** 0.8 / 0.8

**Examined by:** DVM

**Time:**

**Examined by technician:** RVT

**Time:**

**Notes:**

**Examined by veterinarian / staff technician:** DVM/RVT:

**DVM/RVT Notes:**

**Examined by:** DVM

**Time:**

**Examined by technician:** RVT

**Time:**

**Notes:**

**External Parasites:**
- No parasites noted
- Ear mites
- Ticks: 1-10

**Mange -- **
- Sarcoptes / Demodex -- Dx based on:
  - Clinical signs / Microscopic ID

**DVM/RVT:**
- Examination by veterinarian
- Examination by technician
- Notes

**Medications and Items Dispensed**

- **Pyrantel PO:** 50 mg/ml
  - 1 syringe PO in: 1 d / 2 wks / 4 wks
  - Deworming
  - Staff

- **Meloxicam (circle) tablet / suspension:**
  - 7.5 mg
  - 1.5 mg/ml
  - 1 syringe PO in: 1 d / 2 wks / 4 wks
  - Analgesia
  - Staff
**ANESTHESIA / PROCEDURE RECORD**

**Alerts:**

**Age:**

**Animal Name:**

**Last Name:**

**Ax Cleared:**

**INDUCTION PROCEDURES NEEDED** (To be highlighted by Receiving Team, checked off by Induction when completed)

- ☐ Rabies ☐ 1yr / ☐ 3yr Tag #: __________ or ☐ <12 weeks
- { Previous Rabies Hx: Date Rcvd _______ Good Until ________ }
- ☐ Other Tx: ________

**PREMED**

<table>
<thead>
<tr>
<th>Time: _______</th>
<th>By: ___________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine (____mg/ml): _______ ml SQ / IM / IV</td>
<td></td>
</tr>
<tr>
<td>Dexmedetomidine (0.5mg/ml): _______ ml SQ / IM / IV</td>
<td></td>
</tr>
<tr>
<td>Trazodone / Gabapentin (circle one) _______ mg PO Time: _______ By: _______</td>
<td></td>
</tr>
<tr>
<td>Other: ________ mL Route: ________</td>
<td></td>
</tr>
</tbody>
</table>

**ANCILLARY DRUGS**

| Penicillin (300K u/ml): _______ ml SQ | Time: _______ |
| Meloxicam (____mg/ml): _______ ml SQ | Time: _______ |
| Cerenia (10mg/ml): _______ mL SQ / IV Time: _______ |

**REGIONAL BLOCK**

- ☐ Intra-testicular: _____________________ (drug)
- ☐ Intra-peritoneal: _____________________ (drug)

| _______ ml drug + _______ ml saline = total vol _______ |

**Maintenance Anesthetic:** ☐ isoflurane/O₂

**Other CS**

<table>
<thead>
<tr>
<th>Time: _______</th>
<th>By: ___________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buprenorphine (____mg/ml): _______ ml IM / IV</td>
<td></td>
</tr>
</tbody>
</table>

**IVC Size_____g / location:______________________**

**ET tube size:__________ System: NRB / Circle**

**Total Ax Time: ________min**

**Total fluid admin in Sx: ________ ml**

**AX NOTES:**

<table>
<thead>
<tr>
<th>Time</th>
<th>*O₂ (L/min)</th>
<th>Iso (%)</th>
<th>SpO₂</th>
<th>BP [sys/dias/ (MAP)]</th>
<th>HR</th>
<th>RR</th>
<th>Temp</th>
<th>MM/CRT</th>
<th>Fluids</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

**Anesthetist:**

<table>
<thead>
<tr>
<th>Time</th>
<th>*O₂ (L/min)</th>
<th>Iso (%)</th>
<th>SpO₂</th>
<th>BP [sys/dias/ (MAP)]</th>
<th>HR</th>
<th>RR</th>
<th>Temp</th>
<th>MM/CRT</th>
<th>Fluids</th>
<th>Notes</th>
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</table>

**Pre-Induction Assessment:**

<table>
<thead>
<tr>
<th>Time</th>
<th>*O₂ (L/min)</th>
<th>Iso (%)</th>
<th>SpO₂</th>
<th>BP [sys/dias/ (MAP)]</th>
<th>HR</th>
<th>RR</th>
<th>Temp</th>
<th>MM/CRT</th>
<th>Fluids</th>
<th>Notes</th>
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</table>

**Induction**

<table>
<thead>
<tr>
<th>Time</th>
<th>*O₂ (L/min)</th>
<th>Iso (%)</th>
<th>SpO₂</th>
<th>BP [sys/dias/ (MAP)]</th>
<th>HR</th>
<th>RR</th>
<th>Temp</th>
<th>MM/CRT</th>
<th>Fluids</th>
<th>Notes</th>
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</tbody>
</table>

**Plan:**

<table>
<thead>
<tr>
<th>Time</th>
<th>*O₂ (L/min)</th>
<th>Iso (%)</th>
<th>SpO₂</th>
<th>BP [sys/dias/ (MAP)]</th>
<th>HR</th>
<th>RR</th>
<th>Temp</th>
<th>MM/CRT</th>
<th>Fluids</th>
<th>Notes</th>
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</tr>
</tbody>
</table>

**Tot Vol Admin**

<table>
<thead>
<tr>
<th>Time</th>
<th>*O₂ (L/min)</th>
<th>Iso (%)</th>
<th>SpO₂</th>
<th>BP [sys/dias/ (MAP)]</th>
<th>HR</th>
<th>RR</th>
<th>Temp</th>
<th>MM/CRT</th>
<th>Fluids</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

* A Begin Anesthesia  ∀ End Anesthesia  $ Begin Surgery  Ø End Surgery  R Arrival in Recovery

**Vaccine Labels**

---

03/2024
# _______  Weight ________ kg

### SURGERY REPORT

(Click all applicable boxes)

**Student Surgeon:**

**DVM:**

**Reviewed:**

**Total Sx Time:** _____ min. (explanation req’d if > RAVS limit)

<table>
<thead>
<tr>
<th>SPAY</th>
<th>In Heat</th>
<th>Pregnant</th>
<th>Post-Partum</th>
<th>Friable</th>
<th>Skin Oozing</th>
<th>Intra-Op Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCISION</td>
<td>Ventral Midline</td>
<td>Other:</td>
<td>Length: _____ cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEDICLE</td>
<td>Ligature qty:</td>
<td>L (1/2)</td>
<td>R (1/2)</td>
<td>Surgeon’s</td>
<td>Miller’s</td>
<td>Transfix</td>
</tr>
<tr>
<td>BROAD LIGAMENT</td>
<td>Ligature type:</td>
<td>L</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UTERINE BODY</td>
<td>Ligature location:</td>
<td>Body</td>
<td>Horns</td>
<td>Surgeon’s (1/2)</td>
<td>Miller’s (1/2)</td>
<td>Transfix (1/2)</td>
</tr>
<tr>
<td>LINEA</td>
<td>Continuous</td>
<td>Interrupted</td>
<td>Cruciate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBCUTANEOUS</td>
<td>None</td>
<td>Continuous</td>
<td>Interrupted</td>
<td>Cruciate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRADERMAL</td>
<td>Cont. Buried Intradermal</td>
<td>Glue</td>
<td>Other (note)</td>
<td>CO linked</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**POST SURGERY:**

- Tattoo
- Belly Bandage
- Cold Compress

Follow-up Requested: YES / NO

SX NOTES – Include any intra-operative complications that were resolved:

---------------------------------------------------------------

### RECOVERY RECORD

Recovery Monitor: ____________

**Treatment Needed in Recovery**

- Tx Needed: ____________
- Tx Needed: ____________

<table>
<thead>
<tr>
<th>Time</th>
<th>Temp (°F)</th>
<th>HR</th>
<th>RR</th>
<th>MM/CRT</th>
<th>NOTES</th>
</tr>
</thead>
</table>

Extubation: ________  Post-Sx Snack: ________ (no int / + / ++ / +++)

**Recovery Release:** ________

- Smooth Recovery
- Dysphoria
- Painful
- Drooling
- Other Concern: ___________________

### POST-OP MEDICATIONS

<table>
<thead>
<tr>
<th>Drug</th>
<th>Amt</th>
<th>Route</th>
<th>Time</th>
<th>Notes</th>
</tr>
</thead>
</table>

**EXAM PRE-DISCHARGE**

- Time: ________
- By: ________
- T: ________
- P: ________
- R: ________
- MM/CRT: ________

- Appetite: ________
- Attitude: ________
- Pulses: ________
- Vulva: ________
- Incision: ________

### ADDTL PT NOTES:

---------------------------------------------

03/2024
The rabies certificate is a legal document and may be necessary to save an animal’s life if they have bitten a person or another animal. Possession of a rabies vaccination certificate is the client’s only proof, besides veterinary records, that their animal has been vaccinated. The information on a rabies certificate must, therefore, be specific and accurate as well as clearly legible.

Client & patient information should exactly match the information on the patient’s medical record.

The following must be filled in on the rabies certificate.

1. Tag Information:
   - Tag number: Each animal (dogs and cats) receives a year-specific rabies tag with a distinct tag number.
     - The tag number is recorded in 2 locations – the treatment record (see record samples below) and the rabies certificate/vaccination and care record (see sample above).

2. Client Information:
   - Legal Owner of animal. Be sure spelling is correct and legible.
   - Address and zip code of owner. A street/physical address is preferred but P.O. Box is acceptable.
   - Telephone number: The owner's telephone number with area code.

3. Animal Information:
   - Species: Mark appropriate box for ‘dog’ or ‘cat’.
   - Sex: Mark appropriate box. If ‘Altered’ (spayed or neutered), check this box.
   - Age: Enter age and mark appropriate box. Look at the animal’s teeth and estimate age if uncertain.
   - Size: Mark appropriate box.
   - Breed: Ensure this matches the medical record.
   - Colors: Be specific! Cream or grey/brown tabby is better than tabby. This information along with breed, sex, and age may save an animal’s life if they have bitten a person or other animal.
   - Name: Fill in animal’s name. Check spelling with client.

4. Vaccine Label Information:
   - Producer: Fill in the first 3 letters of the vaccine manufacturer you are using. (e.g. Boehringer Ingelheim = “BOE”; Elanco = ELA)
   - Vaccine Name: Imrab (Boehringer Ingelheim); Nobivac (Merck); Rabvac 3 (Elanco)
1yr Lic/Vacc or 3yr Lic/Vacc: Mark appropriate box (always mark 3 yr). This depends on the type of vaccine used, not the animal’s age or previous vaccination history: i.e. Rabvac-3 is licensed as a 3-year vaccine. If it is given for the first time to a 3-month-old kitten, the kitten will need to be vaccinated again in 1 year but the vaccine is still a 3 year vaccine. **All rabies vaccines used on RAVS field clinics are licensed as 3-year vaccines.**

Serial Number: Fill in the vaccine serial number which is on each vaccine vial. The vaccine expiration date, which must be in-date, does not get recorded anywhere on the rabies certificate!

5. Animal Vaccination Date Information:
   - Date: Fill in date vaccine is given.
   - Vaccination expires: Fill in when animal must be re-vaccinated. This will either be in 1 or 3 years from the date vaccine is given and depends on animal’s age and previous vaccination history.

6. Veterinarian Information:
   - Signature: RAVS staff veterinarian must sign or signature stamp used.
   - Checkbox with license number: On RAVS, this is generally the Trip Lead. Make sure the check box is selected that matches the signature and both are visible on each copy.

Each rabies certificate will produce TWO copies: The YELLOW copy is given to the client. The WHITE copy (retained for our records) is filed at Intake in a folder with that days date on the front.

Reminder: There are two places where the Rabies tag number should be recorded:
1) The patient’s Rabies Certificate/ Discharge Record (above), and
2) RAVS’ medical record: see locations for surgery and wellness records below

2a – surgical record

2b – wellness record
RAVS SOCIAL MEDIA POLICY

Sharing your RAVS experience on social media can benefit the community in so many ways – creating awareness of our efforts and the need for veterinary care in the communities we serve, providing context for potential volunteers, and updating donors and other supporters. Sharing also comes with the responsibility of knowing that anything you post online in association with RAVS is permanent and is a direct reflection on the program. This policy is intended to provide guidelines for staff and volunteers when posting via personal or organizationally approved pages about the RAVS program. This is meant to supplement and is not intended to replace the HSUS policy in effect entitled *Social Media Guidelines for HSUS Employees and Volunteers*.

**Transparency:** Be honest about who you are, and what your affiliation is with the RAVS program. Be clear that any opinions expressed are your own and do not reflect the opinions of RAVS, The Fund for Animals, HSUS or its affiliates.

**Respect:** Be respectful in all communications and do not engage in any interactions that may be perceived as offensive, obscene, or threatening. Please notify a RAVS staff member if you notice or are asked to engage in any potentially offensive communications.

**Sharing:**
- Never post confidential information about the RAVS program, staff, volunteers, clients, or donors.
- Photos of clients or any tribal resident *may not be taken or posted* without explicit written consent (i.e. a signed RAVS Photo Release).
- Photos of RAVS staff or volunteers should not be taken or posted online without the subject’s verbal consent. Please do not tag anyone in photos. You may tag the RAVS program page, however, please take care in drafting message content and ensure the content is professional and positive.
- We encourage photos of our canine and feline patients however remember that any photos posted online can be viewed or shared by others, regardless of the privacy settings of the page on which they are posted and may reach unintended audiences. Many procedures and anesthesia/surgery settings that veterinary professionals know to be a part of normal professional life can be taken out of context by someone not trained in the field. We request certain types of photos not be shared in online platforms. These include:
  - Images of animals in lateral recumbency (i.e. in a post-surgical recovery setting). These animals are being closely monitored, however often do not appear alive in still photos.
  - Images containing blood or body parts. While academically interesting to many veterinary professionals, these images may make others uneasy.
  - Animals under anesthesia, especially views of the head with an endotracheal tube present. Again, while these animals are being closely monitored, these images can be confusing or disturbing for some.
  - In photos where animals are being handled or restrained, the overall image should be one of low-stress handling.
  - You may wish to view photos on the [RAVS Facebook page](#) to see examples of photos appropriate for online sharing.
- Pay attention to the overall image of anything you might share – if you knew nothing about the animal welfare or veterinary fields how would you view what is happening? What interpretations could you make? Try to be objective and sensitive to perceptions when considering photo choices for sharing.

**Safety:** Please make use of profile privacy settings to keep your personal information safe.

**Profiles:** GoFundMe Charity fundraising pages as with other social media content can reach a wide audience of clients, donors and general animal lovers. Please choose an appropriate profile photo and content for your fundraising pages. Profile photos should be of a mature nature and reflect the mission of the RAVS program. We appreciate constructive, positive dialogue that can be generated by spreading the word about our program and animals in need. We appreciate all volunteers adhering to this policy and trust everyone to use good judgement. When in doubt you are encouraged to consult a RAVS staff member for guidance.

03/2024