

# RURAL AREA VETERINARY SERVICES



HUMANE SOCIETY  
VETERINARY MEDICAL  
ASSOCIATION

# VOLUNTEER TRAINING MANUAL

# HSVMA-RAVS VOLUNTEER TRAINING MANUAL

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# **THE HUMANE SOCIETY VETERINARY MEDICAL ASSOCIATION RURAL AREA VETERINARY SERVICES**

The Humane Society Veterinary Medical Association Rural Area Veterinary Services program (HSVMA-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 2008, RAVS became the field services division of the HSVMA, an affiliate of 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 nearly 8,000 animals in rural communities where no other regular animal services exist. On each visit, we prevent unwanted litters; teach essential animal care skills and ease animal suffering-treating everything from parasite infections in dogs to work-related injuries in horses. Since 2003 the program has provided over \$22 million in veterinary services, all at no cost to the communities or families we serve.

A typical RAVS field clinic will include 30 veterinary student volunteers and 15 veterinarians and technicians who travel together for 1-2 weeks, often moving daily to a new community. Highly portable, everything the team needs to turn a local gymnasium or community center in to 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 potentially 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 still 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 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 professional 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.

# **HSVMA-RAVS**

## **VOLUNTEER REQUIREMENTS AND EXPECTATIONS**

Being a HSVMA-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 9 or 10 PM with extremely 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. Our hosts are generally able to provide vegetarian and non-vegetarian food. However, vegan food is not usually available and you should plan to bring supplemental food if needed. In some communities primarily vegetarian food is served and those who feel they need to have animal products should be prepared to bring some back-up supplies as well. In other words, if you have any particular dietary requirements, you should be prepared to supply yourself. 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 team will consist of 40-50 people (6-8 veterinarians, 6-8 veterinary technicians/assistants, 25-30 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 a RAVS staff Trip Leader. 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 a 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 intake. 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 of the various duties required to support a field clinic including cleaning, inventory, packing, paper work, 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 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

**Crowdrise** (veterinary students): All veterinary student volunteers are required to meet a minimum fundraising commitment for each clinic they will be participating in. See the Trip Details link on the web schedule page for each clinic for specific trip requirements. Veterinarians, technicians/assistants and non-veterinary volunteers are not required to participate in the volunteer sponsorship campaign but are welcome to join in and help support their team. Start your volunteer sponsorship page immediately to accept your trip assignment. Minimum fundraising commitments are due 30 days prior to your trip.

**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. We highly encourage you to arrange ride-shares with others on your clinic team both to conserve resources and to reduce the number of vehicles travelling with the caravan.

Travel details for each trip are listed on the Schedule page of the website. All volunteers are required to submit their travel information, including flight or vehicle information no later than 30 days prior to their scheduled trip. Don't wait! Providing this information as early as possible will help us to coordinate trip logistics and make preparations for your team.

**Study Online Volunteer Training Manual** (all volunteers)

**Submit Online Training Evaluation** (all volunteers): The online training evaluation will be made available for each group 60 days prior to your trip. 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 surgery training materials for assessment details. The better prepared you are, the more opportunities you will have in the clinic so plan plenty of time for pre-trip practice.

**Obtain Necessary Supplies/Equipment** (*see What to Bring below*)

### 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 (15 pair)  
(*vet 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!

## **HSVMA-RAVS SAFETY POLICY**

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

By participating in a HSVMA-RAVS clinic, you are agreeing to release The Humane Society of the United States, The HSVMA, 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 vaccination for rabies and a titer check within the past two years. 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 HSVMA-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 Leader in charge immediately. HSVMA-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 disinfect 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 HSVMA-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.

## HSVMA-RAVS VOLUNTEER TRAINING PROGRAM

Each HSVMA-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

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.

If you have any difficulty accessing the information, have questions about the material, or concerns about a specific protocol, please contact us by email ([ravs@hsvma.org](mailto:ravs@hsvma.org)) well before your scheduled trip.

### Pre-Trip 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 tech students: All materials except surgery sections
- Veterinarians: All materials except anesthesia sections
- 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 defined by the results of this assessment. Detailed requirements for the practical are outlined in the surgery section of the Volunteer Training Manual. 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 introduction orientation, daily orientations in each clinic area and evening rounds to answer questions, discuss cases or review relevant clinical or professional topics of interest. There is a lot of information to take in over a relatively short period of time – get ready to fill your brain and then put that knowledge to use!

### Note for Veterinary 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 able to work within our established teaching guidelines.

Protocols in a field teaching clinic must take in to 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.

## **HSVMA-RAVS CLINIC POSITION DESCRIPTIONS TEAM COMPOSITION**

The size and makeup of each HSVMA-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 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.
  
- **HSVMA-RAVS Staff**
  - Include veterinarians, technicians and clinic coordinator.
  - Assist Trip Lead in clinic coordination/operations.
  - Oversee activities of all clinic volunteers.
  
- **Volunteer Veterinarians**
  - Under the direction of RAVS staff oversee 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 section leaders in each clinic area (Intake, 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 need. Veterinarians will most often be assigned to the intake or surgery teams. Veterinary technicians and assistants are most frequently asked to work in anesthesia or recovery but may be assigned to intake or other areas as need. During the course of each trip, student volunteers will rotate through most areas of clinic operations (intake/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 and volunteers are expected to work wherever they are most needed.



## CLINIC POSITIONS

### Receiving

- **Intake Coordinator**
  - First contact with clients. Explain services and encourage clients to take advantage of appropriate services.
  - Coordinate 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, responsible for examination of patients and administration of appropriate vaccinations, parasite treatments, etc. Maintain medical records and communicate findings to clients.
- **Discharge** - Intake teams are also responsible for discharging surgery patients.
  - Verify completeness of medical record, review findings and treatments with client and provide post-surgery instructions.
  - Have patients cleared by supervisor prior to release.

### Surgery

- **Surgery Veterinarians** – Perform surgery, supervise and train student surgeons according to standard RAVS surgical protocols.
- **Student Surgeons** - Perform, assist, or observe procedures as appropriate. Responsible for cleaning and wrapping used surgery pack. Write surgery report. Responsible for ensuring that entire medical record is accurate / complete before patient is discharged.

### Anesthesia

- **Anesthesia Coordinator/Triage** – Staff technician responsible for coordinating anesthesia cases. Distributes premeds, assigns anesthetists to cases, coordinates IV catheter placement and evaluates patients prior to induction
- **Anesthesia Support Crew** - Assist in evaluation of anesthetic patients. Administer pre-medications. Place IV catheters or restrain for IV catheter placement. Provide pre- and post-surgical patient support as directed by anesthesia coordinator.
- **Anesthetist** – Veterinary students responsible for anesthesia of surgery patients, from post pre-med evaluation through recovery. Act as patient advocate.
- **Induction Leads** – Technician responsible for overseeing induction process. Distribute induction drugs, supervise and assist students with induction, intubation, initial monitoring and preparation of surgery patient.
- **Induction Crew** - Assist anesthesia staff with induction and preparation of surgery patients.
- **Anesthesia Monitoring Lead (Line-Walker)** – Technician or veterinarian overseeing student anesthetists during surgery. Supervises and assists with monitoring and case management. Addresses anesthetic concerns and complications during procedures.
- **Recovery Lead** – Technician or veterinarian overseeing recovery area. Supervises and assists student anesthetists with patient monitoring and addressing post-procedure complications. Releases animals from recovery area.
- **Recovery Crew** – Part of anesthesia team. Responsible for care and monitoring of patients until fully recovered and discharged.

## **CLINIC RECEIVING PROTOCOL**

The clinic receiving process involves the initial client registration, acquisition of medical history, physical examination, anesthetic/surgical risk assessment, vaccination, treatments and client education.

Many of the animals in the communities we serve may be in very poor physical condition. Poor nutrition and internal and external parasite infestation 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. The economic and other constraints (remote locations, availability of veterinary care and animal care products, etc) on an individual or community 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 of the options. It is our job to explain what diagnostics and treatments are available and the costs, risks and benefits of each. The client must be allowed to determine which alternatives are feasible and must be 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.

## **RECEIVING PROCESS**

### **Outline of Receiving Process**

Intake Coordinator:

- 1) Greet client and determine services needed.
- 2) Record client/patient information to Clinic Registration List and maintain running tally.
- 3) Assign Health Assessment Teams to clients/patients in order of registration.

Health Assessment Team:

- 4) Greet client
- 5) Review consent form and verify services requested
- 6) Obtain patient history
- 7) Perform physical exam / record findings
- 8) Communicate findings and treatment options to client and address concerns or client questions
- 9) Administer vaccinations / de-worming / additional treatments / record
- 10) Complete rabies certificate
- 11) Complete appropriate sections of Animal Care Record (discharge form)
- 12) Add patient to surgery board / record patient number on record
- 13) Review medical record for completeness/accuracy
- 14) Kennel animal and provide client with estimated pickup time

## Initial Registration – 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 process. This role is generally handled by a staff member or experienced volunteer. The Intake Coordinator will:

- **Greet client** and determine what type of animals they are bringing in.
- **Explain the services** offered and determine the animal/client's needs.
- **Record** appropriate client/patient information on Clinic Registration List
- **Maintain running tally of services requested.** This will allow us to accept an appropriate number of patients and prevent clients from waiting only to find the schedule is full.
- While clients are waiting for their animal to be examined, volunteers should take advantage of the opportunity to talk informally with clients about their animals. We want clients to have a positive experience and to feel comfortable leaving their animals in our care.
- **Important Notes:**
  - Pre-registrations for the next day are not 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.
  - Clients will need to wait with their animal until a physical exam has been completed and the animal has been cleared for surgery.
- When a Health Assessment Team is available, they consult the Intake Coordinator for the next client/patient. Intake teams are assigned to a client/family and will handle all of the animals in that family.

**Physical Exam - Health Assessment Teams** - Teams of 2, responsible for examination and assessment of patients and administration of appropriate vaccinations, treatments, etc.

- Consult Intake Coordinator and identify the next client in line.
- **Greet client.** Take animal (and client if possible) to as quiet a location as possible. If the client cannot be present for the examination, ask them to wait so that you can determine if the animal is a candidate for surgery/vaccination and communicate your findings to them.
- If the client has not already completed the appropriate paperwork, assist them in doing so.
  - Female/Spay-Pink Form; Male/Neuter-Blue Form; Vaccinations Only-White 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 INDIVIDUAL ANIMAL ADMITTED FOR SURGERY MUST HAVE A COMPLETED AND SIGNED CONSENT FORM.**
  - Clients should not complete the medical record paperwork on their own as some may have limited literacy and many do not understand what information is being requested.
  - Obtain a daytime and evening contact phone number where the client can be reached 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.
- 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 particular questions or concerns. Verify vaccines the animal has previously received, determine what vaccines or treatments are currently needed.
- Perform a thorough **physical examination** on the animal. Be careful and accurate, but remember that we will often treat over a hundred animals in a day, so efficiency is important.
- 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 lead receiving veterinarian.
- Accurately and thoroughly **record** physical examination findings.
  - If you have any questions or concerns about an animal's condition, consult a supervisor.
  - Any findings that may impact anesthesia or surgery (heart murmur, cryptorchid, pregnant, etc) should be noted on the 'alerts' section of the anesthetic record.
- **Communicate** findings to the client. Explain any health concerns and recommendations and address any other questions or concerns the client may have.
- **Any significant abnormalities or alerts must be evaluated by a supervisor before the animal is vaccinated or admitted for surgery.**
- Administer appropriate **vaccinations and anti-parasitic treatments.** (see *Vaccination Protocols*)
  - Records vaccinations/treatments in record and sign

- Verify that all pages of the medical record are complete and sign the physical exam record.
  - Complete a **rabies certificate** as appropriate. Put the rabies certificate and tag in a plastic bag attached to the medical record clipboard.
  - If the animal is not being admitted for surgery, complete the 'Animal Care Record' sheet and go over it with the client before releasing the animal.
- If the animal is being admitted for surgery, write the appropriate information on the **surgery board** under the next available number/letter. Be sure to write this number on the top of each and every page of the record.
- Move the animal to an available kennel. Place the clipboard on the kennel.
  - If an animal has displayed potential aggression to humans or animals, the crate should be labeled with a CAUTION sign and the anesthesia lead consulted for pre-medication prior to kenneling.
- After an animal has been examined and cleared for surgery, explain the clinic/surgery process to the client and provide an estimated time for pick-up. It is important that clients understand that this pick up time is not guaranteed and that a number of variables may effect the time their animal is ready to go home (surgery schedule, priority medical/surgical cases, individual variation in anesthetic recovery, etc.). Some animals may not be ready until very late in the evening.

## **DISCHARGE**

- The Intake Coordinator will also act as the point person for discharging animals after surgery.
- Receiving teams will be responsible for assisting with discharge.
- See Discharge Protocol for additional information

# HSVMA-RAVS PREVENTIVE MEDICINE PROTOCOL

The standard RAVS core wellness care protocol includes vaccination, deworming and administration of a flea prevention product. All vaccines should be given as low (distal) on the leg as possible. Although RAVS supports triennial vaccination when appropriate, given the high risk of disease exposure and lack of available follow-up in the communities we serve, adult animals seen at RAVS clinics are generally vaccinated yearly for DHPP or FVRCP

**Do not vaccinate if:** Temperature >103.5F, animal is emaciated, severely dehydrated, lethargic, pregnant or has other abnormalities on physical examination. In these situations, please consult a RAVS staff veterinarian for a vaccination plan.

Adult dogs and cats > 11 years of age, with previous history of annual (or triannual) DHPP or FVRCP vaccination, may not need to be re-vaccinated. Consult the lead receiving veterinarian before vaccinating senior patients so that risks and benefits can be discussed with the client.

## VACCINATION

### ➤ Adult Dogs and Older Puppies > 20 weeks

- **DHPP (MLV)** – subcutaneous injection, interscapular area
  - Adult dogs receive a modified live DHPP vaccine SQ in the interscapular area.
  - If the dog has no prior vaccination history, DHPP should be repeated in 4 weeks.
  - Booster in one year after the dog has received at least 2 initial vaccines 4 weeks apart.
  - Eruption of adult canine teeth can be used as a general indicator of 20 weeks of age mark.
- **Rabies (KV)** - subcutaneous injection, right hind thigh
  - Dogs 12 weeks and older receive a SQ killed virus rabies vaccine in the right rear leg.
  - Booster is needed in 6-12 months. See note below regarding rabies vaccine boosters.

### ➤ Puppies (6-20 weeks)

- **DHPP (MLV)** - subcutaneous injection, interscapular area
  - The first DHPP can be administered at 6 weeks of age.
  - Puppies should receive booster vaccinations every 4 weeks until adult canines begin to erupt (approximately 20 weeks of age).
  - In certain high-risk communities as directed by RAVS staff, boosters may be recommended every 2-3 weeks.
  - After 20 weeks of age, dogs should receive their next vaccine in one year.
- **Rabies (KV) { > 12 weeks }** - subcutaneous injection, right hind thigh
  - Dogs 12 weeks and older receive a SQ killed virus rabies vaccine in the right rear leg.
  - Booster is needed in 6-12 months. See note below regarding rabies vaccine boosters.
  - If age is uncertain, eruption of first adult incisors can be used as indicator of age for first rabies vaccination.

### ➤ **Pregnant or Nursing Bitch:**

- Unless other concerns exist, vaccinate as per standard protocol for dogs six months of age or older using modified live DHPP and killed virus rabies vaccines. While vaccination of pregnant animals may not be routinely recommended in typical urban 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.

➤ **Adult Cats and Kittens > 20 weeks old**

- **FVRCP (MLV)** - subcutaneous injection, right foreleg over lateral humerus.
  - Adult cats receive a modified live FVRCP vaccine SQ low on the right foreleg over the lateral humerus.
  - If the cat has no prior vaccination history, the FVRCP should be repeated in 4 weeks.
  - Booster in one year after the cat has received at least 2 initial vaccines 4 weeks apart.
- **Rabies (KV)** - subcutaneous injection, **right** hind lateral thigh
  - Cats 12 weeks and older receive a SQ killed virus rabies vaccine in the right rear leg.
  - Booster is needed in 6-12 months. See note below regarding rabies vaccine boosters.

➤ **Kittens (6-20 weeks)**

- **FVRCP (MLV)** - subcutaneous injection, **right** foreleg over lateral humerus
  - The first FVRCP can be administered at 6 weeks of age.
  - Kittens should receive booster vaccinations every 4 weeks until adult canines begin to erupt (approximately 20 weeks of age).
  - After 20 weeks of age, cats should receive their next vaccine in one year
- **Rabies (KV) { > 12 weeks }** - subcutaneous injection, right hind thigh
  - Cats 12 weeks and older receive a SQ killed virus rabies vaccine in the right rear leg.
  - Booster is needed in 6-12 months. See note below regarding rabies vaccine boosters.
  - If age is uncertain, eruption of first adult incisors can be used as indicator of age for first rabies vaccination.

➤ **Nursing Queens**

- If nursing kittens are less than 4 weeks of age, vaccinate queen with a *killed* virus FVRCP vaccine and killed virus rabies vaccine.
- If the kittens are over 4 weeks of age, vaccinate queen as per standard protocol using modified live FVRCP and killed virus rabies vaccines.

➤ **Pregnant Queens**

- If the cat is being spayed, vaccinate as per standard protocol for adult cats using modified live FVRCP and killed virus rabies vaccines. If the cat is not being spayed, discuss with the client the fact that the safety of vaccinating pregnant animals has not been confirmed. Vaccinating pregnant animals is not typically recommended unless the benefit outweighs the risk. Vaccinating against rabies is a life-saving measure and public health concern and may be considered in pregnant animals.

**Rabies Vaccine Boosters:**

Dogs and cats should have a booster for their initial rabies vaccine within 6-12 months after the first vaccination. If the booster is given within this time frame, the booster will then be a three-year rabies vaccine and a three-year rabies certificate can be issued. If the booster vaccine is past 365 days from the first vaccine, the booster vaccine is good for one year and a one-year rabies certificate will be issued.

If a dog or cat has received an initial rabies vaccine and booster series per vaccine manufacturer's recommendations (e.g. booster within a year of initial rabies vaccine) and is overdue for a booster, no matter how far overdue, the animal should be revaccinated with a rabies vaccine licensed for three years. Immediately after the booster, the animal is considered currently vaccinated and should receive its next booster in three years. A three-year rabies certificate can be issued.

The volume of rabies vaccine to be administered to all dogs and cats is one (1) milliliter.

Maximum immunity following the first rabies vaccine given to a dog or cat is not achieved for approximately 28 days. Newly vaccinated animals are not fully protected against rabies for 1 month following vaccination! Maximum immunity following the second rabies vaccine is reached in a few days.

## **ECTOPARASITE / ENDOPARASITE CONTROL**

### **Fleas / Ticks**

- Apply selamectin (Revolution®) topically on the skin between the shoulder blades to both cats and dogs to control fleas and some ticks.
- Volume to be administered is determined by weight (see dosing chart in receiving).
- Revolution® can be applied to cats and dogs 8 weeks of age and older.
- Client should be advised that Revolution® or other flea/tick treatment should be repeated monthly.

### **Nematodes (roundworms/hookworms)**

- Adult Cats and Dogs (> 5 months old)
  - Administer oral dose of pyrantel pamoate (Strongid®) at time of vaccination.
  - Dose is 1 ml/4.5 kg.
- Kittens and Puppies 2 weeks - 5 months old
  - Administer pyrantel pamoate (Strongid®) at an oral dose of 1 ml/4.5 kg.
  - Send one additional dose home to be administered 14 days after the initial dose.
  - If highly parasitized, a third dose can be dispensed to be given four weeks after the initial in-clinic dose.

# PHARMACY

## Pharmacy layout

The RAVS pharmacy is divided into several sections:

- Dispensable medications: Located near recovery area
- Anesthetic drugs: Located in lock box at anesthesia table, handled only by RAVS staff.
- Emergency drugs: Located between induction tables facing surgery tables.
- Fluids and fluid administration supplies: Located in box under anesthesia table
- Vaccines: Stock stored in trailer refrigerator. Supply in use kept in cooler in receiving.

## Dispensing Prescription Drugs

Animal drugs approved by the FDA are classified as either veterinary prescription (Rx) or over-the-counter (OTC) drugs. Products classified as veterinary Rx, are labeled "For use by or on the order of a licensed veterinarian". Prescription drugs must be used or prescribed only within the context of a valid veterinarian-client-patient relationship and appropriate records of all prescriptions issued must be maintained. *All prescriptions dispensed other than standard anti-parasitics must be approved by a veterinarian prior to being filled.*

When dispensing medication for a patient, remember that the medication is only effective if the client is successful in administering it as prescribed. When possible, choose dosage schedules that minimize the number of treatments and duration while providing appropriate treatment (e.g. choose once or twice daily dosing instead of three times daily, etc)

## Controlled Drugs

A controlled substance is defined by law as a substance with potential for physical addiction, psychological addiction and/or abuse. These drugs are labeled with a capital C followed by a Roman numeral, which denotes the drug's theoretical potential for abuse (CI through CV). Controlled substances must be stored securely and a written record must be maintained describing when, how much and to whom the drug is dispensed.

**All controlled drugs MUST be dispensed by a staff veterinarian or technician.**

## Prescription Information:

The prescription **order** should contain the following information and should be accurately recorded in the patient record:

**Rx:** Drug Name, Strength and Quantity  
**Sig:** Dosage and Directions for use

Example: Rx: Ampicillin 500 mg #20  
Sig: 1 PO BID

The prescription **label** should include:

- Name, address and phone of the veterinarian-RAVS stamp provided at pharmacy table.
- Patient's name followed by last name of the client
- Date
- Name, strength and quantity of the drug
- Dosage and directions for use - fully written out in simple language
- Expiration date of drug

Doctor Fantabulous, DVM	June 6, 2013
Rural Area Veterinary Services	
PO Box 1589 Felton, CA 95018	Phone: 800-625-8114
"Fluffy" Smith	
Ampicillin 500 mg #20	
Give 1 capsule by mouth every 12 hours	
	expires Jan 2015



## DOSAGE CALCULATIONS

**Amount to administer = Weight x Dose x 1/ Strength of Drug**

### A. Units needed = weight x dose rate

Example: How many mg of Amoxicillin are needed for a 10 kg dog if the dose is 20 mg/kg?

$$\text{mg needed} = 10 \text{ kg} \times 20 \text{ mg/kg} = 200 \text{ mg}$$

### B. Amount needed = dose / concentration

Example: How many mL of Amoxicillin are needed for the patient above?

The Amoxicillin available is in a 100-mg/mL concentration

$$\text{mL needed} = 200 \text{ mg} / 100 \text{ mg/mL} = 2 \text{ mL}$$

## IV DRIP RATE CALCULATIONS:

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

To calculate drip rates:

- Volume of fluid to be administered must be known value
- Time period for the volume of fluids must be known
- Fluid drip set "drops/ml" must be known

$$\frac{\text{volume (ml)} \times \text{drop factor (gtt/ml)}}{\text{time (min)}} = X \text{ gtt / min} \rightarrow \frac{60 \text{ sec / min}}{X \text{ gtt / min}} = 1 \text{ gtt/ every } \underline{\quad} \text{ sec}$$

OR

$$\begin{aligned} \text{mls/hr} \div 60 \text{ (minutes in 1 hr)} &= \text{mL/min} \rightarrow \text{ml/min} \times \text{drops/ml} = \text{drops per minute} \\ 60 \text{ (seconds in 1 min)} \div \text{drops/min} &= 1 \text{ drop every } \underline{\quad} \text{ seconds} \end{aligned}$$

### Example:

Animal needs 1200 mL of fluids over the next 24 hrs, and you have a 15gtt/ml drip set

$$\frac{1200 \text{ ml} \times 15 \text{ gtt/ml}}{1440 \text{ min}} = 12.5 \text{ gtt / min} \rightarrow \frac{60 \text{ sec / min}}{12.5 \text{ gtt / min}} = 1 \text{ gtt/ every } \underline{4.8} \text{ sec}$$

OR

$$\begin{aligned} 50 \text{ ml/hr} \div 60 \text{ (minutes in 1 hr)} &= 0.83 \text{ mL/min} \rightarrow 0.83 \text{ ml/min} \times \text{drops/ml} = 12.45 \text{ drops per minute} \\ 60 \text{ (seconds in 1 min)} \div 12.45 \text{ drops/min} &= 1 \text{ drop every } \underline{4.8} \text{ seconds} \end{aligned}$$

OR

$$\begin{aligned} 1200 \div 24 &= \text{mL of fluids needed per hour (50mls/hr)} \\ 50\text{mls/hr} \div \text{minutes in 1 hour (60)} &= \text{mL/min (0.83ml/min)} \\ 0.83\text{ml/min} \times \text{drops/ml} &= \text{drops per minute (12.45 drops/min)} \\ 60 \text{ (number of seconds in 1 min)} \div 12.45 \text{ (drops/min)} &= 1 \text{ drop every } \underline{(4.8)} \text{ seconds} \end{aligned}$$

# PATIENT DISCHARGE PROTOCOL

## 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.**
- 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 surgery went well and that their animal is doing well. Explain that you would like to go over very important instructions.
- Show client the Animal Care Record. Briefly go over what each of the treatments/vaccinations are for and when they are due again.
  - Point out the list of things to look for post-surgery and the contact numbers to call should they have any concerns. Ask them to keep this form for their records.
- Check patient records for any abnormalities that the client should be aware of. 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?
  - Be sure that the client understands the route of administration. Do not assume they will know 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 tomorrow
  - Behavior: May be slightly groggy tonight 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.
  - **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. Be sure that the name of the DVM/RVT approving the discharge is recorded on the record.
- 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.

## **CLEANING AND INFECTION CONTROL**

At every HSVMA-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 limits the spread of disease and infection. Do not take shortcuts during cleaning. The well being of our patients depends on this crucial task.

### **Standard Cleaning/Disinfectant**

For most of our standard cleaning, we use Trifectant<sup>®</sup> (Potassium peroxymonosulfate), a broad-spectrum disinfectant diluted with water to a 1% solution. Follow dilution instructions carefully-Using more does not disinfect better it only wastes the product and increases the risk of chemical irritation to both personnel and animals. Using any disinfectant at an inappropriate dilution can cause problems for the user including skin or eye irritation. Once mixed, Trifectant<sup>®</sup> solution can be stored for up to 7 days.

### **Bleach**

Diluted bleach should be used to clean any area contaminated with a potentially resistant disease agent (eg: parvovirus, distemper, ringworm) or if 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.

### **Clinic Cleanliness**

Clinics are set up in various 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. All equipment must be thoroughly disinfected before being packed.

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

### **Consider the Fomites**

Our stethoscopes, caddies, kennels, leashes, muzzles, pens and clipboard, etc. can all harbor infectious agents and should be disinfected frequently throughout the day. Hands should be washed and/or sanitized between patients and exam gloves are required when handling all patients less than 6 months of age.

### **Isolation Protocols**

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 in 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: canine parvovirus, canine distemper, feline panleukopenia, feline upper respiratory infection, kennel cough etc.

Animal in isolation should be handled as little as possible and by a limited number of identified caretakers. Clean exam gloves and isolation gown, clean surgery 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.

## MEDICAL RECORDS

Complete and accurate medical records are both a legal requirement and essential to good medical practice. It is crucial that all patient records be absolutely complete and stay with the patient at all times. The record forms used in HSVMA-RAVS' clinics have been designed to most efficiently meet all documentation needs in a standardized format that can be used and interpreted by any volunteer.

Throughout the course of their treatment, each patient is likely to be handled by a number of team members. It is crucial that each person handling or treating the patient have all treatment information available. Every relevant exam finding, procedure, medication and anesthetic administered must be appropriately recorded. Also, you must indicate who performed each procedure (PE, vaccines, surgery, anesthesia, etc.) so that we know who to ask if there is a question or complication to address.

### **General information - included on EVERY page of medical record:**

- **Animal Number** - Assigned at intake and corresponds with the patient's number on the surgery board. It is the responsibility of the Health Assessment Team to accurately record the number on both the medical record and surgery board.
- **Clinic Location** - The name of the community the clinic is being held in.
- **Patient Name** - Animal's name and client's last name.

### **COMPONENTS OF THE PATIENT RECORD**

- **Consent for Treatment/Anesthesia/Surgery**
  - A consent/release must be signed for every animal before we can initiate treatment.
- **Patient History**
  - Patient history - Intake support or Health Assessment Team will complete this portion with the information obtained from the client interview.
- **Physical Exam Record**
  - Physical exam findings and pre-anesthetic assessments are recorded by the Health Assessment Team and any consulting veterinarian(s).
- **Treatment Record**
  - ALL procedures, vaccines, anti-parasitics and any other treatments administered or medications dispensed are recorded and signed by the appropriate person.
  - Medications dispensed to go home with the patient are also recorded here.
- **Anesthesia Record / Report**
  - Alerts- history or exam findings that may influence anesthesia or surgery.
  - Includes all information on drugs administered, patient monitoring, fluids administered etc.
  - Any anesthetic complications or unusual details are recorded in the notes section.
- **Recovery Record**
  - Time moved to recovery, initial TPR, and time of extubation are completed by the Anesthetist. Monitoring parameters are recorded by the recovery team until the patient is fully recovered and returned to a kennel.
  - Any post-procedure drugs are recorded in the appropriate section.
- **Surgery Report**
  - The primary surgeon provides a brief report including any complications and explanation of any aspects of the procedure that required assistance or extended surgery time.
  - When a veterinary student is involved with a surgery case they will complete the initial surgery report and have it reviewed by the supervising surgery veterinarian on the case.
- **Animal Care Record**
  - Information provided to the client when the patient is discharged.
  - Indicates procedures performed, vaccines and treatments administered and recommendations for further care. All treatments recorded by person administering.
- **Rabies Certificate**
  - Every animal who receives a rabies vaccination should have a fully completed rabies certificate which includes the rabies tag number and signature of lead veterinarian.



# \_\_\_\_\_

**BEHAVIOR:** Gentle / Social    Fearful / Possible Caution    Aggressive / Feral

**PHYSICAL EXAM**

Examined by: \_\_\_\_\_ time: \_\_\_\_\_

**Wt** \_\_\_\_\_ kg (est. / actual)    **Temp** \_\_\_\_\_ °F    **Pulse** \_\_\_\_\_ bpm    **Resp** \_\_\_\_\_ bpm    **MM/CRT** \_\_\_\_\_ / \_\_\_\_\_

**BCS** (1-9): \_\_\_\_\_    **Hydration:** adequate / marginal / inadequate    **Mentation:** BAR / QAR / Depressed

*\*Circle Abnormalities / Describe all abnormal/atypical findings*

<b>INTEG:</b> <input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Coat unkempt	Mass	Lesion	Petechia / ecchym	Other
<i>Notes:</i>					
<b>EENT:</b> <input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Ocular discharge	Nasal discharge	Ear discharge	Dental disease	Other
<b>CV:</b> <input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE					
	Murmur	Arrhythmia	Abnormal / Asynchronous pulse	Other	
<b>RESP:</b> <input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE					
	Harsh lung sounds	Crackles	Wheeze	Cough	Other
<b>NERV:</b> <input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE					
	Hx of Seizure	Head tilt	Ataxia	Myoclonus	Other
<b>M/S:</b> <input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE					
	Lameness	Muscle wasting	Other		
<b>ABD/GI:</b> <input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE					
	Tense	Painful/splinting	Splenomegaly	Umbilical hernia	Other
<b>GU:</b> <input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE					
	Pregnant	Cryptorchid	Discharge	Lesion/TVT	Other
<b>PLN:</b> <input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE					

**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

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Examined by veterinarian / staff technician:**    DVM/RVT: \_\_\_\_\_ time: \_\_\_\_\_

DVM/RVT Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**TREATMENT RECORD** *(mark only after treatments administered)*

Vaccinations given by: \_\_\_\_\_ time: \_\_\_\_\_    Previous Rabies: Date Rcvd \_\_\_\_\_ Date Due \_\_\_\_\_

- Rabies 1 yr / 3 yr (Tag # \_\_\_\_\_)                       DHPP                       FVRCP
- Pyrantel: \_\_\_\_\_ ml PO                       Flea/Tick Tx: Revolution: \_\_\_\_\_ ml
- Canine 4Dx Snap: Heartworm (+) / (-)    Ehrlichia (+) / (-)    Lyme (+) / (-)    Anaplasma (+) / (-)
- Heartworm Test: (+) / (-)                       Parvo Test: (+) / (-)                       Feline Combo: Felv/FIV (+) / (-)    HW (+) / (-)
- PCV/TP (result: \_\_\_\_\_ / \_\_\_\_\_)     iStat (attach results)                       Skin scraping (result: \_\_\_\_\_)
- Other Labs: \_\_\_\_\_
- Other Tx \_\_\_\_\_

**MEDICATIONS DISPENSED**

Drug Dispensed	Strength	Qty	Dosing Instructions	Dx / Reason	DVM









## POST-SURGERY CARE INSTRUCTIONS

Your animal has just had general anesthesia and surgery. For the safety and well-being of you and your animal, the following instructions must be carefully followed:

1. **DIET:** When any anesthesia is used, stomach upset can occur. To avoid this, restrict the amount of food and water your animal has access to upon returning home. Animals can be fed **1/2 of their normal meal this evening**. All animals can return to their normal diet beginning tomorrow morning.
2. **EXERCISE:** **Keep your animal INDOORS tonight**. Restrict his/her activity for the next 7 days. No running, jumping, swimming or bathing for the next week. If your pet is a FEMALE, keep her away from male dogs for the next 2 weeks. Rest is important for healing.
3. **INCISION:** You should **check the surgery site every day** until it is healed. A small amount of blood is normal immediately after surgery. Should you notice any continued bleeding, draining or swelling contact us at the number provided immediately. If the area gets dirty, gently clean the area with a cotton ball and hydrogen peroxide. Do not let your animal lick or chew at the incision.
4. **SUTURES:** If your pet's surgery required the use of sutures, the **stitches are dissolvable** and will not need to be removed.
5. **TATTOO:** A small tattoo shows that your animal has been spayed or neutered. Any smudges of ink on the skin will wash off in several days leaving a small green line.
6. **DO NOT give aspirin, Tylenol or other human medications for pain relief.** These medications can be harmful or fatal to animals.
7. **IMPORTANT:** Should your animal show ANY of the following signs, please call the RAVS veterinarian or a local veterinary clinic immediately:
  - Not eating or drinking for more than 24 hours
  - Vomiting or diarrhea
  - Straining to pass urine or stool
  - Whining or not wanting to being handled
  - Blood or any material coming from the incision
  - Not wanting to move or stand
  - Swelling of surgery site
  - Abnormal breathing
  - Swollen face, itching or hives

**IF YOU HAVE ANY CONCERNS ABOUT YOUR ANIMAL'S CONDITION AFTER SURGERY  
PLEASE CONTACT HSVMA-RAVS STAFF:**

**1-800-625-8114**



**SEE THE BACK OF THIS FORM FOR A RECORD OF THE SERVICES  
YOUR ANIMAL HAS RECEIVED TODAY.**

# THE RABIES CERTIFICATE

RABIES VACCINATION CERTIFICATE ADAPTED NASPHV FORM 51 Print - use ball point pen or type				Tag fee \$: _____ Tag #: <u>1</u>
Owner's Name & Address				Cert. Serial #: _____
PRINT LAST <u>2</u>	FIRST _____	M.I. _____	TELEPHONE <u>4</u>	
NO. <u>3</u>	STREET _____	CITY _____	STATE _____	ZIP _____
SPECIES: <u>5</u> Dog <input checked="" type="checkbox"/> Cat <input type="checkbox"/> Other <input type="checkbox"/> (Specify) _____	SEX: <u>6</u> Male <input type="checkbox"/> Female <input type="checkbox"/> Neutered <input type="checkbox"/>	AGE: <u>7</u> 3 Mo. to 12 Mo. <input type="checkbox"/> 12 Mo. or older <input type="checkbox"/>	SIZE: <u>8</u> Under 20 lbs. <input type="checkbox"/> 20 - 50 lbs. <input type="checkbox"/> Over 50 lbs. <input type="checkbox"/>	PREDOMINANT BREED: <u>9</u> _____
DATE VACCINATED: <u>12</u> Month Day Year				COLORS: <u>10</u> _____
PRODUCER: <u>14</u> _____ (First 3 Letters)				Veterinarian's # <u>17</u> License No. _____
VACCINATION EXPIRES: <u>13</u> Month Day Year				Veterinarian's Signature <u>18</u> _____
1 yr. Lic./Vacc. <input type="checkbox"/> <u>15</u> 3 yr. Lic./Vacc. <input type="checkbox"/> <u>16</u> Vacc. Serial (Lot) No. _____				Address _____
FDP - 514				
Owner's Name & Address				Tag fee \$: _____ Tag #: _____
PRINT LAST _____ FIRST _____ M.I. _____				Cert. Serial #: _____
NO. _____	STREET _____	CITY _____	STATE _____	ZIP _____
SPECIES: _____ Dog <input type="checkbox"/> Cat <input type="checkbox"/> Other <input type="checkbox"/> (Specify) _____	SEX: _____ Male <input type="checkbox"/> Female <input type="checkbox"/> Neutered <input type="checkbox"/>	AGE: _____ 3 Mo. to 12 Mo. <input type="checkbox"/> 12 Mo. or older <input type="checkbox"/>	SIZE: _____ Under 20 lbs. <input type="checkbox"/> 20 - 50 lbs. <input type="checkbox"/> Over 50 lbs. <input type="checkbox"/>	PREDOMINANT BREED: _____
DATE VACCINATED: _____ Month Day Year				COLORS: _____
PRODUCER: _____ (First 3 Letters)				Veterinarian's # _____ License No. _____
VACCINATION EXPIRES: _____ Month Day Year				Veterinarian's Signature _____
1 yr. Lic./Vacc. <input type="checkbox"/> _____ 3 yr. Lic./Vacc. <input type="checkbox"/> _____ Vacc. Serial (Lot) No. _____				Address _____
FDP - 514				
Owner's Name & Address				Tag fee \$: _____ Tag #: <u>214031</u>
PRINT LAST <u>Public</u> FIRST <u>John</u> M.I. <u>Q</u>				Cert. Serial #: _____
NO. _____	STREET <u>777</u>	CITY <u>Easy Street, Paradise, CA</u>	STATE _____	ZIP <u>93000</u>
SPECIES: <input checked="" type="checkbox"/> Dog <input checked="" type="checkbox"/> Cat <input type="checkbox"/> Other <input type="checkbox"/> (Specify) _____	SEX: _____ Male <input type="checkbox"/> Female <input checked="" type="checkbox"/> Neutered <input checked="" type="checkbox"/> <u>(2-29-04)</u>	AGE: _____ 3 Mo. to 12 Mo. <input type="checkbox"/> 12 Mo. or older <input checked="" type="checkbox"/>	SIZE: _____ Under 20 lbs. <input type="checkbox"/> 20 - 50 lbs. <input checked="" type="checkbox"/> Over 50 lbs. <input type="checkbox"/>	PREDOMINANT BREED: <u>Beagle X</u>
DATE VACCINATED: <u>02 29 04</u> Month Day Year				COLORS: <u>TRI</u>
PRODUCER: <u>FOR</u> (First 3 Letters)				Veterinarian's # <u>20622</u> License No. _____
VACCINATION EXPIRES: <u>02 29 07</u> Month Day Year				Veterinarian's Signature <u>Truly Caring</u> _____
1 yr. Lic./Vacc. <input type="checkbox"/> _____ 3 yr. Lic./Vacc. <input checked="" type="checkbox"/> <u>2135223A</u> Vacc. Serial (Lot) No. _____				Address <u>Somewhere, CA</u> <u>92200</u>
FDP - 514				
RABIES VACCINATION CERTIFICATE ADAPTED NASPHV FORM 51 Print - use ball point pen or type				Tag fee \$: _____ Tag #: _____
Owner's Name & Address				Cert. Serial #: _____
PRINT LAST _____ FIRST _____ M.I. _____				TELEPHONE _____
NO. _____	STREET _____	CITY _____	STATE _____	ZIP _____
SPECIES: _____ Dog <input type="checkbox"/> Cat <input type="checkbox"/> Other <input type="checkbox"/> (Specify) _____	SEX: _____ Male <input type="checkbox"/> Female <input type="checkbox"/> Neutered <input type="checkbox"/>	AGE: _____ 3 Mo. to 12 Mo. <input type="checkbox"/> 12 Mo. or older <input type="checkbox"/>	SIZE: _____ Under 20 lbs. <input type="checkbox"/> 20 - 50 lbs. <input type="checkbox"/> Over 50 lbs. <input type="checkbox"/>	PREDOMINANT BREED: _____
DATE VACCINATED: _____ Month Day Year				COLORS: _____
PRODUCER: _____ (First 3 Letters)				Veterinarian's # _____ License No. _____
VACCINATION EXPIRES: _____ Month Day Year				Veterinarian's Signature _____
1 yr. Lic./Vacc. <input type="checkbox"/> _____ 3 yr. Lic./Vacc. <input type="checkbox"/> _____ Vacc. Serial (Lot) No. _____				Address _____
FDP - 514				
RABIES VACCINATION CERTIFICATE ADAPTED NASPHV FORM 51 Print - use ball point pen or type				Tag fee \$: _____ Tag #: _____
Owner's Name & Address				Cert. Serial #: _____
PRINT LAST _____ FIRST _____ M.I. _____				TELEPHONE _____
NO. _____	STREET _____	CITY _____	STATE _____	ZIP _____
SPECIES: _____ Dog <input type="checkbox"/> Cat <input type="checkbox"/> Other <input type="checkbox"/> (Specify) _____	SEX: _____ Male <input type="checkbox"/> Female <input type="checkbox"/> Neutered <input type="checkbox"/>	AGE: _____ 3 Mo. to 12 Mo. <input type="checkbox"/> 12 Mo. or older <input type="checkbox"/>	SIZE: _____ Under 20 lbs. <input type="checkbox"/> 20 - 50 lbs. <input type="checkbox"/> Over 50 lbs. <input type="checkbox"/>	PREDOMINANT BREED: _____
DATE VACCINATED: _____ Month Day Year				COLORS: _____
PRODUCER: _____ (First 3 Letters)				Veterinarian's # _____ License No. _____
VACCINATION EXPIRES: _____ Month Day Year				Veterinarian's Signature _____
1 yr. Lic./Vacc. <input type="checkbox"/> _____ 3 yr. Lic./Vacc. <input type="checkbox"/> _____ Vacc. Serial (Lot) No. _____				Address _____
FDP - 514				

- VACCINATION RECORD  
Name 19
- RABIES
  - LYME DISEASE
  - CANINE DISTEMPER
  - CANINE PARAINFLUENZA
  - CANINE ADENOVIRUS 2
  - CANINE PARVOVIRUS
  - CANINE CORONAVIRUS
  - CANINE BORDETELLA
  - LEPTOSPIROSIS
  - CAN./FEL. GIARDIA
  - FELINE LEUKEMIA
  - FELINE PANLEUKOPENIA
  - FELINE RHINOTRACHEITIS
  - FELINE CALCIVIRUS
  - FELINE CHLAMYDIA
  - FELINE RINGWORM

- FELINE CHLAMYDIA
- FELINE RINGWORM

- VACCINATION RECORD  
Name Snoopy
- RABIES
  - LYME DISEASE
  - CANINE DISTEMPER
  - CANINE PARAINFLUENZA
  - CANINE ADENOVIRUS 2
  - CANINE PARVOVIRUS
  - CANINE CORONAVIRUS
  - CANINE BORDETELLA
  - LEPTOSPIROSIS
  - CAN./FEL. GIARDIA
  - FELINE LEUKEMIA
  - FELINE PANLEUKOPENIA
  - FELINE RHINOTRACHEITIS
  - FELINE CALCIVIRUS
  - FELINE CHLAMYDIA
  - FELINE RINGWORM
- Spayed 7/29/04

The rabies certificate is a legal document and may be necessary to save an animal's life if it has bitten a person or another animal. Possession of a rabies vaccination certificate is the owner'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.

**The following must be filled in on the rabies certificate:**

1. **Tag number:** Each animal receives a year-specific rabies tag with a distinct tag number.
2. **Owner** of animal. Be sure spelling is correct.
3. **Address** and zip code of owner. A street or physical address is preferred not always available.
4. **Telephone number:** The owner's telephone number with area code.
5. **Species:** Mark appropriate box for 'dog' or 'cat'. Fill in if 'other' (horse, cow, etc.)
6. **Sex:** Mark appropriate box. If 'neutered', check this box. If animal is altered the same day as vaccinated, write in the date altered next to the checked 'neutered' box.
7. **Age:** Mark appropriate box. Look in the animal's mouth and estimate age if uncertain.
8. **Size:** Mark appropriate box. Accurate weights are preferred. Weigh animal if possible.
9. **Breed:** Fill in: "Mix" is not appropriate. Make your best guess, i.e.- lab x, shep x, terrier x, etc. to accurately describe the animal. This information along with color, sex, and age may save an animal's life if they have bitten a person or other animal.
10. **Colors:** Fill in space. 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.
11. **Name:** Fill in animal's name. Check spelling with client.
12. **Date:** Fill in date vaccine is given.
13. **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.
14. **Producer:** Fill in the first 3 letter of the manufacturer of the vaccine you are using. (e.g. FOR = Fort Dodge; MER = Merial, etc.)
15. **Vaccine type:** Mark appropriate box. This depends on the type of vaccine used, not the animal's age or previous vaccination history: i.e. Imrab-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.**
16. **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!
17. **License number:** This is the state license number for the veterinarian signing the certificate.
18. **Signature:** RAVS veterinarian must sign. The town and state of licensure should be written or stamped in.
19. **Vaccination record:** Not all rabies certificates have this space. It is not used, just detach and discard.

Each rabies certificate will produce three copies: The WHITE copy is given to the client. The PINK copy (provided to the local animal control/public health officials) and YELLOW copy (retained for our records) stay in the certificate book until the end of the clinic.

# ANIMAL HANDLING AND RESTRAINT

## Animal Handling Skills-Professionalism and Safety

- The public watches us to learn how to properly handle animals.
- Being professional means being SAFE and HUMANE.
- Good animal handling skills prevent team members from being injured.
- Good animal handling skills reduce stress for the animal.

## Examples of Safe Animal Handling:

- Be aware of the special stressors for animals in the clinic setting.
  - The clinic is extremely chaotic for any animal. There are an incredible number of smells and other stimuli and animals are likely to be confused and distressed.
  - Many of our patients have lived entirely outdoors and have not been handled or examined before. They may not have any experience on a leash and may panic in response.
  - Even the most social animal may exhibit aggression toward other animals, particularly in a strange environment and may redirect to nearby people when over-stimulated.
- Never put your face directly into the face of a dog or cat.
- Do not move in behind or crowd around a dog.
- Concentrate on the animal you are handling without being distracted by other activities.
- NEVER sit on the floor while handling/examining a dog. If the animal becomes aggressive or aroused you will be unable to move away or protect yourself and risk serious facial bites.
- Always be prepared to protect yourself or move away quickly in the event an animal becomes aggressive unexpectedly.

Safe and effective animal handling requires a thorough understanding of the normal behavior and responses of each species. Below is some general information on animal behavior and handling techniques. There is no substitute, however, for careful observation and experience.

**If there is any doubt about the temperament of an animal, ask for assistance. There are no extra points for being a 'hero'. The safety of our team and patients is most important!**

## Communication

Any animal exhibiting potentially aggressive behavior should have a kennel sign (CAUTION) posted to alert others who may be handling the animal. Specific alerts or recommendations should be written on the sign and in the medical record to provide staff and other volunteers with as much information as possible when handling the animal.

## Restraint or Control

The first rule to keep in mind when handling any kind of animal is that the least restraint is often the best restraint. This does not mean that you give up your control, just that you use as little restraint as necessary while maintaining control of the situation. Every animal and every situation is different so there are no hard and fast rules as to what method works best in which situation.

Before attempting to restrain an animal you should take a moment to allow the animal to become comfortable with you:

- Crouch down so that you are on their level. Do not sit on the ground as you will be unable to move away or protect yourself if necessary.
- Avoid direct eye contact but maintain safe visual contact with the animal
- Talk in soothing tones. Avoid high-pitched, excited talk.
- Try patting your leg or the ground, motioning the animal towards you.

## TYPES OF RESTRAINT

### **VERBAL RESTRAINT:**

Many dogs know some commands or can at least recognize authority, even if the command is unfamiliar. Commands such as SIT, STAY, COME, DOWN, NO or even HEEL may be useful tools to encourage a dog to cooperate. Also, soft quiet words can calm a frightened animal. Yelling or screaming should never be used as it can cause the animal to become more fearful or aggressive.

### **PHYSICAL RESTRAINT: TOOLS AND EQUIPMENT**

**Leash:** The most common tool used to handle animals in the clinic is the leash. Placed around a dog's neck it normally controls even the largest dog. In the event a dog refuses to cooperate with a leash – carry him. Some dogs have never seen a leash and will freeze up to the sensation around a sensitive area like the neck. Leashes can be abused; never drag or strangle an animal with a leash. If the animal starts to struggle, pulling and jerking away from you, she is probably not leash trained. Pause and let the dog calm down and try again after reassuring her. Sometimes a quick tug on the leash will encourage a fearful dog to walk. If the dog refuses to walk, apply a muzzle (if necessary) and carry her.

When handling cats, a leash should be used as a backup in the event the cat should become frightened and resist restraint. Make a figure-eight harness by looping the free end of a slip lead back through the metal ring. The looser loop is placed around the chest behind the cat's front legs and the other loop placed around the neck with the metal ring/handle on top between the shoulders. This will prevent the cat from escaping or injuring someone should she get loose from your restraint. The harness should be put on at intake and can be left on the cat throughout their stay.

**EVERY animal being transported or handled in the clinic must ALWAYS wear a slip-lead.** This includes puppies, cats and sedated animals. It is too easy for a frightened animal to get loose and escape. Animals presented on leash/collar 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.

**Your hand:** A very effective form of restraint, your hands are sensitive to the amount of pressure that is being exerted on the animal and can be quickly modified to the situation. Hands can be used to gently stroke a dog or to firmly grasp a struggling cat. Although hands can be the most versatile, they are also the most vulnerable to injury. Recognizing when they would not be effective is very important.

**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.

**Nets:** The net is the primary tool used to handle fractious cats or wildlife. It allows for the safe handling and transfer of even the most aggressive small mammal. Effective use of the net requires some training and practice. If you need to handle a feral or fractious cat ask for assistance from a staff member.

**Muzzles:** Muzzles are used when a snappy or potentially aggressive dog must be handled. There are nylon muzzles and plastic basket available. A leash or strip of rolled gauze can be used as a temporary muzzle. Because dogs often try to remove a muzzle, it is important that the muzzle be placed securely. A weak or poorly made 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. Muzzles designed for cats extend up to cover the eyes, reducing visual stimulation. For some cats these can be very useful for calming the animal and helping to protect the handler from injury,

**Drugs:** For animals who are too aggressive or stressed to handle safely for procedures, sedation and/or general anesthesia may be necessary to allow treatment. If you are unable to handle an animal, notify a staff member to determine whether sedation is appropriate.

When receiving an animal for surgery who exhibits difficult or aggressive behavior consult the Anesthesia Lead prior to 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.

Appropriate restraint techniques will be demonstrated on-site during the clinic orientation. The place where correct use of restraint is the most critical is when two people are handling the animal. This could be to perform a physical exam, administer anesthetic or to give medications. The "holder" is the person whose job it is to restrain the animal in such a way that the procedure can be accomplished with the least amount of stress to both handlers and animal. The specific amount of restraint used to control the animal is the key to safety for the handlers and comfort for the animal. Too much restraint can cause the animal discomfort or to resist, too little restraint can result in the handler or others being injured or in the animal escaping.

# 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.

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 as 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 at intake before an animal is vaccinated or admitted for surgery, every interaction you have with an animal should be used as an opportunity to assess her physical condition as parameters may change. With experience, this can be done quickly and easily

### **Say Hello**

Remember to socialize yourself with the patient before abruptly starting the examination. Taking a few moments to develop a relationship 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 have a life-threatening head injury. Perform a complete exam regardless of the presenting complaint.

### **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 sign the exam record so that the next person working with the animal can ask follow-up questions if necessary.

### **Use restraint**

It can be extremely difficult to safely restrain and adequately examine an animal at the same time. Be sure to have an assistant restrain her for a thorough exam. Remember, however, that sometimes the best restraint is light or moderate restraint, which decreases the amount of stress on the animal.

### **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.



## Physical Exam Alerts

When examining potential surgery patients, keep in mind that you are not only determining their general condition, but evaluating them 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 RAVS staff veterinarian or technician BEFORE the animal is admitted for surgery. HSVMA-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 team to the findings.

## THE PHYSICAL EXAM

### Signalment/History

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.
- Description and history of chief/presenting complaint
- Reported concerns should be followed up with additional questions to clarify nature of the complaint

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. In order 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 (GA)

- **General appearance** – observe animal from a distance and up close before any handling
  - Symmetry - note any asymmetry; note any difference in size or shape of extremities
- **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
- **Mentation** / Level of consciousness – attentiveness / reaction to environment
  - Alert and responsive – Depressed – Uncontrolled hyper-excitability – Stupor – Coma
  - e.g: Normal healthy animal's mentation is often bright, alert and responsive or "BAR". A healthy puppy may be described as "active and playful," while a sick puppy may be "moderately depressed and inactive"
- **Posture and gait** - watch the animal walk to exam area or kennel.
  - Look for limping, incoordination or unsteadiness and abnormal limb placement.

- **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, Basset Hounds). Obese animals may not have skin tenting even when dehydrated.

## **Vital Signs**

- **Body Weight**
  - 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 staff veterinarian for surgery clearance
- **Temperature:** Via rectal thermometer
  - Normal: 100.5-102.5°F
  - Examine rectal area for signs of diarrhea, parasites or other abnormality.
  - Any temperature < 99 °F or > 105 °F warrants immediate evaluation by a supervisor.
  - A patient whose temperature is 103-104.5 °F, who is excited/overactive and has no other signs of infection/illness, should sit in a quiet area for 10 minutes. The temperature should be reread and if < 103.5 °F, they can be cleared for surgery.
  - Most animals will resist having their temperature taken. Complete the rest of the exam before obtaining a temperature to avoid agitating the animal and making examination more difficult.
  - Do not struggle with an aggressive animal to obtain a temperature. If having difficulty taking an animal's temperature consult a supervising veterinarian or staff member.
- **Heart/Pulse rate**
  - Normal: Canine: 80-160 bpm; Feline: 110-200 bpm
  - Evaluate pulse at femoral artery
    - Evaluate pulse rate, strength and quality (e.g., strong, weak, thready, 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.
    - Any abnormal mucous membrane color should be brought to the attention of a supervisor
  - 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. This must be further evaluated by a staff veterinarian 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)
- Examine **oral cavity** - lips, mucous membranes, teeth, hard and soft palate, tongue, pharynx, tonsils
- Evaluate carriage and position of **ears**, thickness/malleability of pinnae and cleanliness of ear canals
- Palpate the **submandibular lymph nodes**
- Palpate **salivary glands** (normally palpable), **larynx and thyroid gland** (not normally palpable)
- Palpate the **trachea** – note coughing, swelling,

### **Trunk and Limbs (INTEG, M/S, PLN)**

- 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 luxations, 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**
- 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): submandibular, prescapular, 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: submandibular, prescapular, popliteal, inguinal (prescapular and inguinal can be difficult to locate in small or overweight animals). Not normally palpable: 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.
- Locations to auscultate specific heart valves:
  - Left 4<sup>th</sup>-6<sup>th</sup> (PMI) = intercostal space just above the sternal border = mitral valve
  - Left 2<sup>nd</sup>-4<sup>th</sup> intercostal space above sternal border = pulmonic valve
  - Left 3<sup>rd</sup>-5<sup>th</sup> intercostal space at mid thorax = aortic valve
  - Right 3<sup>rd</sup>-5<sup>th</sup> intercostal space at mid thorax = tricuspid valve
- *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 staff veterinarian.*

#### ▪ **Respiratory auscultation (RESP)**

- Listen for noisy breathing at mouth and nares without stethoscope, then auscult 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 auscult 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) - occur 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
    - ‘Rhonchi’ (musical sounds-low or high pitched) or
    - ‘Wheezes’(continuous high pitched hissing heard more often on expiration)
    - ‘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 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
- *Any abnormal lung sounds or perceived abnormalities in respiratory rate or effort should be further evaluated by a supervising veterinarian.*

#### **Abdomen (ABD)**

- **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
    - 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 (non-palpable in most patients)
  - Small intestines: masses, foreign bodies, pain on palpation
  - Kidneys: Right more cranial than left (usually not palpable in K9)
  - 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 for impacted or abscessed anal sacs

#### **Male**

Inspect **prepuce and penis**-noting any discharge, inflammation, tumors

Expose penis and look for masses and evidence of trauma, note any color abnormalities

If intact – inspect both **testicles** for symmetry, size, location (both descended) and conformation

#### **Female**

Palpate and visually assess **mammary glands** for tumors, cysts, swelling, heat or discharge

Inspect **vulva** for size, inflammation, discharge (blood, pus), polyps, tumors or structural defects

**Note – External Parasites:** Evidence of parasitism should be recorded during the physical exam in association with the relevant body system. In addition, in order to obtain community animal health data the physical examination form includes a separate area to record parasites identified.

### ***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 staff veterinarian. Additional pre-anesthetic work up 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.

### **REVIEW / RECORD FINDINGS**

At the end of your exam, take a moment to review your notes and be sure that you have covered everything. If at any time you identify a problem that you feel is an emergency, immediately notify a veterinarian. Any significant abnormalities should be evaluated by a RAVS staff member prior to the animal being admitted for surgery or released. The evaluating veterinarian or technician should record their findings in the appropriate section of the exam record.

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

## HSVMA-RAVS Physical Exam Record

# \_\_\_\_\_

**BEHAVIOR:** Gentle / Social    Fearful / Possible Caution    Aggressive / Feral

**PHYSICAL EXAM**                      Examined by: \_\_\_\_\_    time: \_\_\_\_\_

**Wt** \_\_\_\_\_ kg (est. / actual)    **Temp** \_\_\_\_\_ °F    **Pulse** \_\_\_\_\_ bpm    **Resp** \_\_\_\_\_ bpm    **MM/CRT** \_\_\_\_\_ / \_\_\_\_\_

**BCS** (1-9): \_\_\_\_\_    **Hydration:** adequate / marginal / inadequate    **Mentation:** BAR / QAR / Depressed

*\*Circle Abnormalities / Describe all abnormal/atypical findings*

<b>INTEG:</b>	<input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Coat unkempt	Mass	Lesion	Petechia / ecchym	Other
<i>Notes:</i>						
<b>EENT:</b>	<input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Ocular discharge	Nasal discharge	Ear discharge	Dental disease	Other
<b>CV:</b>	<input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Murmur	Arrhythmia	Abnormal / Asynchronous pulse		Other
<b>RESP:</b>	<input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Harsh lung sounds	Crackles	Wheeze	Cough	Other
<b>NERV:</b>	<input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Hx of Seizure	Head tilt	Ataxia	Myoclonus	Other
<b>M/S:</b>	<input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Lameness	Muscle wasting			Other
<b>ABD/GI:</b>	<input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Tense	Painful/splinting	Splenomegaly	Umbilical hernia	Other
<b>GU:</b>	<input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE	Pregnant	Cryptorchid	Discharge	Lesion/TVT	Other
<b>PLN:</b>	<input type="checkbox"/> N <input type="checkbox"/> AB <input type="checkbox"/> NE					

**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

Notes: \_\_\_\_\_  
 \_\_\_\_\_

**Abbreviations:** Some commonly used medical abbreviations to describe physical exam findings include:

TPR: Temperature, pulse and respiratory rate

BAR: Bright, alert and responsive (responsive animal who is aware of their surroundings –not acting sick)

QAR: Quiet, alert and responsive (still aware, but not as happy/active)

GA: general appearance

NERV: nervous

INTEG: integument

ABD: abdomen (gastrointestinal / genitourinary)

EENT: eyes, ears, nose, throat (and mouth)

PLN: peripheral lymph nodes

CV: cardiovascular

BCS: Body Condition Score (1-9)

RESP: respiratory

M/S: musculoskeletal

OS: Left eye

OD: Right eye

OU: Both eyes

AS: Left ear

AD: Right ear

AU: Both ears

d/c: discharge

v/d: vomiting/diarrhea

c/s: coughing/sneezing

Helpful hint: The abbreviations “S” for left and “D” for right date back to the days when left handed people were considered **S**inister while right handed people were admired for their **D**exterity. The “U” can be thought of as standing for **U**niversal ☺.

### Assessing Dehydration:

0-5%	Adequate	No abnormalities seen – skin immediately returns to normal position after tenting, CRT normal, eyes normal, mucous membranes pink and moist
5-8%	Marginal	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
8-10%	Inadequate	Obvious delay (5-10 seconds) in skin returning to normal position, increased CRT (2-2.5 sec), eyes sunken in sockets, mucous membranes dry, slightly tacky
10-12%		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)
12-15%		State of shock, death is probable

### Assessing Mucous Membrane Color

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

### Evaluating Heart Murmurs

Description of Heart Murmurs
<p><b>Location:</b> 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)</p> <p><b>Timing:</b> The part of the cardiac cycle during which the murmur is heard = Systole / Diastole / Continuous</p> <p><b>Duration:</b> Refers to the duration within cardiac cycle murmur is heard = Early systole/ Holosystolic/ Diastole</p> <p><b>Character:</b> The quality of the murmur</p> <ul style="list-style-type: none"> <li>-Plateau or regurgitant type (same sound for the duration of murmur)</li> <li>-Decrescendo, crescendo, crescendo-decrescendo or ejection type (intensity changes throughout duration of murmur)</li> <li>-Machinery (heard throughout systole and diastole)</li> <li>-Decrescendo or blowing</li> </ul> <p><b>Grade:</b> Loudness. Subjective assessment, does not necessarily indicate degree of cardiac dysfunction</p> <p>1/6 – Can only be heard in quiet room after several minutes of listening</p> <p>2/6 – Can be heard immediately, but is very soft</p> <p>3/6 – Low to moderately intense</p> <p>4/6 – Loud, but without a palpable thrill</p> <p>5/6 – Loud, with a palpable thrill</p> <p>6/6 – Can be heard with the stethoscope slightly off the thoracic wall</p>

## BODY CONDITION SCORE

(See 'Purina Body Condition System' charts below)

Body condition scores (BCS) provide a semi-quantitative method of evaluating body fat and lean body tissue percentages. The scale we will be using is the nine-point Purina Body Condition Score. Using this scale, lower numbers reflect thinner conditions and higher numbers indicate fatter animals. Animals are assessed visually and by palpation of the ribs, spine and pelvic bones.

### Thin or emaciated dogs or cats (BCS < 2/9)

Ribs, lumbar vertebrae and pelvic bones protrude. No palpable fat. With lower scores, ribs are visible and muscle loss is observed. In cats, complete lack of the "fat pad," (under the skin between the back legs) is abnormal. A cat in normal body condition will have a small amount of body fat in this area.

### 'Ideal' physical condition (BCS 4-5/9)

Well proportioned, ribs palpable but not visible with minimal fat covering.  
Visible abdominal tuck/waist is present; minimal abdominal fat pad.

### Obese dogs or cats (BCS > 7/9)

Ribs are difficult or impossible to palpate under fat.  
Abdomen is pendulous or protrudes on the sides when the animal is viewed from above.  
Palpable fat pads and enlarged fatty areas present on either side of the tail-head and over the hips.



# BODY CONDITION SYSTEM

TOO THIN

**1** Ribs, lumbar vertebrae, pelvic bones and all bony prominences evident from a distance. No discernible body fat. Obvious loss of muscle mass.

**2** Ribs, lumbar vertebrae and pelvic bones easily visible. No palpable fat. Some evidence of other bony prominence. Minimal loss of muscle mass.

**3** Ribs easily palpated and may be visible with no palpable fat. Tops of lumbar vertebrae visible. Pelvic bones becoming prominent. Obvious waist and abdominal tuck.

IDEAL

**4** Ribs easily palpable, with minimal fat covering. Waist easily noted, viewed from above. Abdominal tuck evident.

**5** Ribs palpable without excess fat covering. Waist observed behind ribs when viewed from above. Abdomen tucked up when viewed from side.

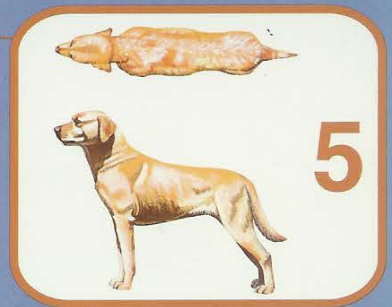
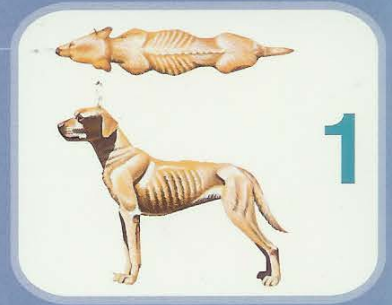
TOO HEAVY

**6** Ribs palpable with slight excess fat covering. Waist is discernible viewed from above but is not prominent. Abdominal tuck apparent.

**7** Ribs palpable with difficulty; heavy fat cover. Noticeable fat deposits over lumbar area and base of tail. Waist absent or barely visible. Abdominal tuck may be present.

**8** Ribs not palpable under very heavy fat cover, or palpable only with significant pressure. Heavy fat deposits over lumbar area and base of tail. Waist absent. No abdominal tuck. Obvious abdominal distention may be present.

**9** Massive fat deposits over thorax, spine and base of tail. Waist and abdominal tuck absent. Fat deposits on neck and limbs. Obvious abdominal distention.



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

Mawby D, Bartges JW, Moyers T, et. al. *Comparison of body fat estimates by dual-energy x-ray absorptiometry and deuterium oxide dilution in client owned dogs.* *Compendium* 2001; 23 (9A): 70

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

Kealy, 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



# BODY CONDITION SYSTEM

TOO THIN

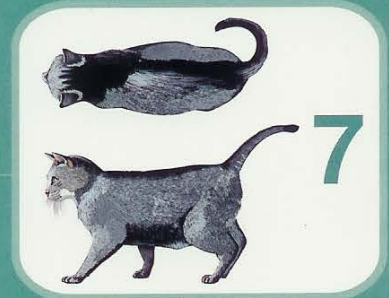
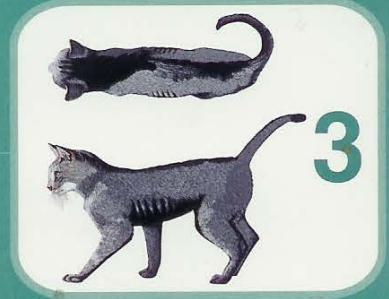
- 1** Ribs visible on shorthaired cats; no palpable fat; severe abdominal tuck; lumbar vertebrae and wings of ilia easily palpated.
- 2** Ribs easily visible on shorthaired cats; lumbar vertebrae obvious with minimal muscle mass; pronounced abdominal tuck; no palpable fat.
- 3** Ribs easily palpable 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.

IDEAL

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

TOO HEAVY

- 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.

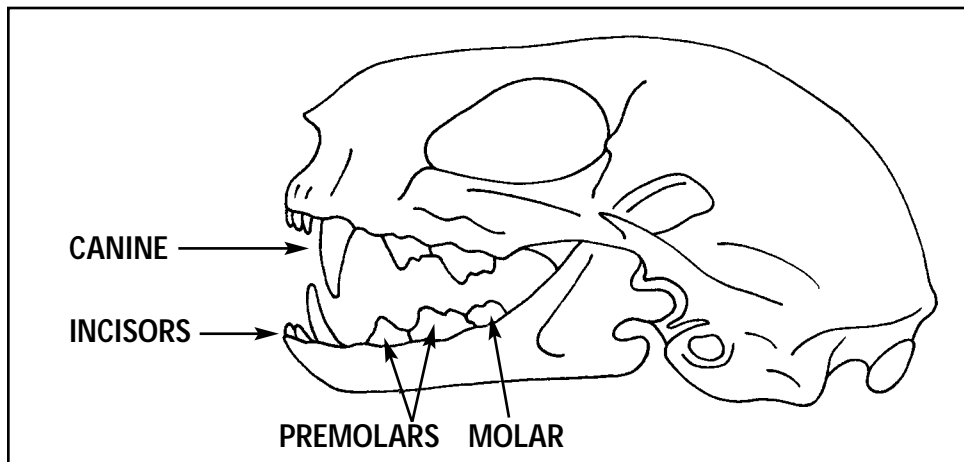


# How to Determine a Cat's or Dog's Age

**E**xamining 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.

*Shelters are depositories for animals of all types and ages, from the cute, unweaned kitten whose eyes are barely open to the graying, noble 17-year-old shepherd mix who can hardly stand on his own. How can you figure out the age of an animal who falls somewhere in between these two extremes? Start by looking at the teeth.*



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

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

Illustration by Susie Duckworth

CUT OUT AND PHOTOCOPY THIS PAGE FOR YOUR OWN REFERENCE. OR TO SUPPLEMENT STAFF AND VOLUNTEER TRAINING

# How to Determine a Cat's Sex

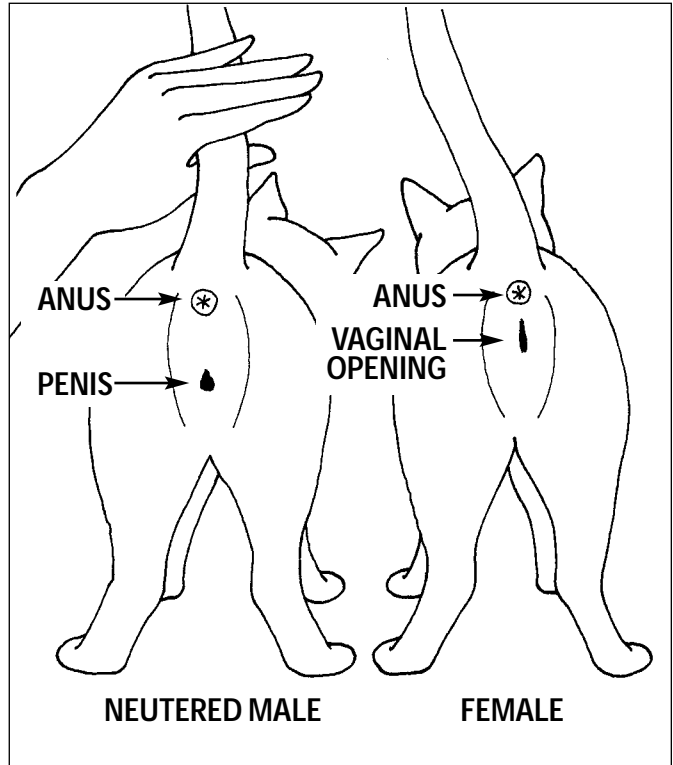
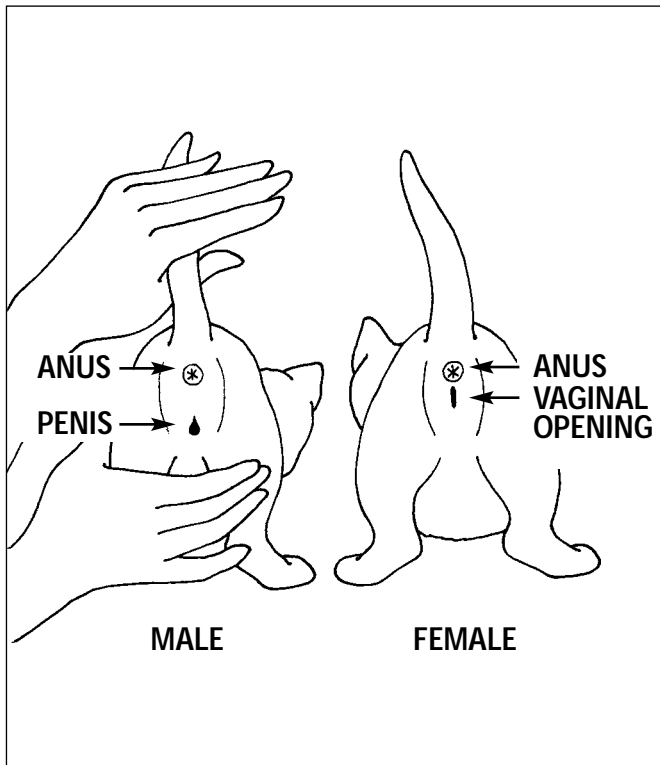
It's not always easy to figure out if a kitten or cat is a boy or girl. In kittens, unlike in puppies, no testicles are plainly visible until the animals reach 6-10 weeks of age. In adult cats, neutered males can be easily confused with females. The diagrams below can help.

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).



Illustrations by Susie Duckworth

## COMMON INFECTIOUS DISEASES

The purpose of this section is to review the basics of some of the more common infectious diseases encountered in the RAVS clinic setting. You should have a good 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. It is also critical that you are aware of these diseases in order to minimize transmission of the illness to other patients at the clinic. Gloves should always be worn when an infectious disease is suspected. (See the RAVS Infection Control Protocol for additional information on preventing the spread of disease in the clinic setting).

The vast majority of animals coming in to the clinic have had little or no previous veterinary care or vaccination history. Many animals live outdoors and roam freely, coming in contact with other domestic and wild animals on a regular basis. The incidence of parasite infestation and infectious diseases are high. An important part of your role as a veterinary professional includes sharing information about the prevention of these conditions through good husbandry, vaccination and veterinary treatment.

### RABIES

While not something we encounter frequently, given the fact that many of our patients have not been previously vaccinated and the risk rabies poses to public health, familiarity with the disease is important.

<b>Rabies</b>	
Agent:	<i>Rhabdoviridae</i>
Incubation:	Usually 2-8 weeks.
Effects:	Attacks nervous system causing encephalitis. In the first stage of disease symptoms includes behavioral changes, fever, and chewing at the bite site. In the paralytic or "dumb" form, an inability to swallow progresses to paralysis and death. The furious form is characterized by irrationality, aggression, and loss of fear. Convulsions and paralysis lead to death. Animals rarely live beyond 10 days after onset of signs
Prevention:	Killed virus vaccine given every 1 to 3 years. First vaccination is given at 3 months of age. Both dogs and cats should be vaccinated. State requirements often specify the age of initial vaccination, type of vaccine needed, and route of administration.
Transmission:	Transmitted in saliva from the bite of an infected animal. The virus will begin shedding in saliva a short time before clinical signs develop, usually less than 10 days. Rarely, transmission is through contamination of a pre-existing wound with the virus. Transmission through solid organ transplantation has also been documented
Notes:	Every animal bite is a rabies possibility. Mortality is 100% in domestic animals and humans. See 'Zoonotic Infections' page for information on rabies and humans.

<b>Rickettsial Disease</b>	
Agent:	Various-include <i>Ehrlichia canis</i> ; <i>Rickettsia rickettsii</i> (Rocky Mountain Spotted Fever).
Incubation:	2 to 3 days.
Effects:	Fever, depression, and anorexia are common. Bleeding disorders and chronic wasting occur in the worst cases. Mortality rare in acute cases, more common in chronic cases.
Treatment:	Tetracycline. Blood transfusions and supportive therapy may be necessary.
Prevention:	Effective tick control will help prevent disease.
Transmission:	These are tick-borne diseases. Ticks carry the rickettsia for months after feeding on an infected dog. Blood transfusions from infected animals are also implicated.
Notes:	Several rickettsial diseases are also serious public-health concerns in humans. Rocky Mountain Spotted Fever is zoonotic and may show no obvious symptoms in dogs.

# CANINE

## CANINE GASTROENTERIC VIRUSES

Viral diarrhea needs to be differentiated from diarrhea due to worms, diet or numerous other possibilities. Usually the watery consistency, large volume, bloodiness and bad odor of the feces coupled with a profoundly ill animal point to a viral infection. The enteroviruses are very hardy and contagious and require meticulous sanitation to prevent transmitting the infection to other animals. Any animal exhibiting signs or recent history of illness should be isolated from other patients and handled with appropriate infection-control precautions. Canine distemper virus, covered in the respiratory section below, can also manifest with gastrointestinal signs.

<b>Canine Parvoviral Enteritis (CPV, parvo)</b>	
Agent:	Canine parvovirus (non-enveloped DNA virus)
Incubation:	3 to 8 days (occasionally up to 14 days)
Effects:	Virus attaches to lining of the small intestine causing bleeding, fluid loss, and electrolyte loss. Symptoms include vomiting, diarrhea (usually bloody), anorexia, lethargy, fever and rapid dehydration. Neutropenia can be profound. All ages can be affected with high mortality in puppies less than 12 weeks.
Diagnosis:	ELISA antibody test (fecal snap test).
Treatment:	Supportive: Intravenous fluids, antibiotics, antiemetics and anti-diarrheals are all used.
Prevention:	Killed and modified live vaccines are available. Typical vaccination schedule is one injection at 6-8 weeks of age followed by boosters every 3 to 4 weeks until pups are 16 to 18 weeks old. Adults are generally boosted at one year then triennially.
Transmission:	Ingestion of infected feces is the most common means of transmission. The virus can remain infective for years in the environment and fomites can play a significant role in transmission. Shed in the feces up to 2-6 weeks post-recovery.
Notes:	Extremely hardy and capable of surviving in some conditions for up to a year. Sodium hypochlorite (household bleach) at a dilution of 1:32, potassium peroxymonosulfate (Trifectant/Virkon-S) and accelerated hydrogen peroxide (Accel) are reliably effective disinfectants.

<b>Canine Coronaviral Gastroenteritis</b>	
Agent:	Canine coronavirus
Incubation:	24 to 36 hours.
Effects:	Similar to parvo, but milder. Loss of appetite, vomiting, diarrhea, and depression occur. Feces may contain blood or mucus and often are yellowish. Usually fever is absent. Dehydration is the major problem. Mortality is not high, but can be fatal in puppies.
Treatment:	Fluids and antibiotics as in parvo
Prevention:	Killed virus vaccines are available.
Transmission:	Highly contagious, spread through infected feces and is shed for 2 weeks by infected animals. Coronaviruses do not persist in the environment like parvovirus.

## CANINE RESPIRATORY VIRUSES

Many of these infectious agents cause mild disease on their own, attacking the upper respiratory lining and make conditions suitable for *Bordatella bronchiseptica* and other bacteria to grow. Unfortunately, one of the respiratory viruses is canine distemper, and every case of canine upper respiratory disease must be considered a distemper suspect.

<b>Canine Distemper</b>	
Agent:	<i>Morbillivirus</i> (family Paramyxoviridae; enveloped RNA)
Incubation:	Clinical signs 1-6 weeks post infection. CNS signs may appear up to 3 months later (with or without preceding signs).
Effects:	<p>First symptom is a fever lasting 1 to 3 days with concurrent suppression of white blood cells. Thick, cloudy ocular-nasal discharge, depression, loss of appetite, and diarrhea are common. Some dogs develop thickened skin on the pads and nose ("hard pad").</p> <p>If the animal survives the initial disease course, nervous system symptoms may develop. These symptoms run from localized twitching in a muscle group to weakness/paralysis to convulsions/seizures. May last from 10 days up to several weeks or months. Neurological symptoms may disappear and then return.</p> <p>Mortality is often high in unvaccinated animals. Recovered animals may die from future complications. Old dog encephalitis is a separate nervous system problem that may occur years after the disease with no interim symptoms.</p>
Treatment:	Antibiotics for secondary bacterial infections, fluids for dehydration, and anticonvulsants and sedatives for nervous manifestations. Many animals will not respond or recover.
Prevention:	Modified live vaccines are available. Typical vaccination schedule is one injection at 6-8 weeks of age followed by boosters every 3 to 4 weeks until pups are 16 to 20 weeks old. Adults are generally boosted at one year then triennially.
Transmission:	Spread primarily through aerosol droplets from infected animals. Infected dogs may shed the virus for months. The virus does not survive well in the environment.

<b>Canine Parainfluenza</b>	
Agent:	Canine parainfluenza virus (CPIV)
Incubation:	5 to 10 days
Effects:	Virus attacks the upper respiratory passages and produces mild disease on its own. More serious disease results from colonization by <i>Bordatella bronchiseptica</i> or other bacteria. Watery discharge from the nose and a cough are primary signs. Bacterial invasion turns discharges thick and cloudy.
Treatment:	See Infectious Tracheobronchitis.
Prevention:	Modified live virus vaccines are available. For adults, two initial vaccinations 2-4 weeks apart are necessary. Vaccine is boosted at one year, then triennially
Transmission:	Spread through aerosol droplets. Does not survive long in the environment.

<b>Canine adenovirus type 2</b>	
Incubation:	5 to 10 days.
Effects:	Virus attacks the lining of the upper respiratory system. Bacterial complication is common.
Treatment:	See Infectious Tracheobronchitis.
Prevention:	Modified live virus vaccines are given on the distemper schedule.
Transmission:	Aerosol transmission is most common. Short-lived in the environment.

<b>Infectious Tracheobronchitis (Kennel Cough, Canine URI)</b>	
Agent:	<i>Bordetella bronchiseptica</i> , canine parainfluenza virus, canine adenovirus-2, others
Incubation:	3 to 10 days
Effects:	Typically see harsh dry coughing followed by retching and gagging. Gentle palpation of the trachea will elicit coughing. Dogs may become depressed and stop eating, or may appear active and normal. Temperature is usually normal. Bronchopneumonia with fever, heavy nasal discharge, and severe depression may occur in young, stressed or geriatric animal. Mortality is low unless there are complications.
Treatment:	Cough suppressants control coughing spasms and break the cough cycle if cough severe. Antibiotics used for secondary infection.
Prevention:	Modified live intra-nasal and killed bacterin injectable vaccines are available. Vaccination does not completely prevent infection but reduces severity of signs. Intra-nasal produces faster immunity and gives better local immunity in the respiratory passages. Vaccine is best given twice yearly to dogs likely to be exposed.
Transmission:	Spread through aerosolized particles (coughing and sneezing). Fomite transmission is some concern. <i>Bordetella</i> may be shed up to 3 months post recovery.
Notes:	Although less common for cats to suffer clinical disease, they can be infected with <i>Bordetella</i> and may be carriers. <i>Bordetella</i> infection may contribute to URI in kittens.

## FELINE

### Feline Upper Respiratory Disease Complex

The viruses under this heading along with the bacterial *Chlamydia psittaci* cause the vast majority of upper respiratory disease in cats. Although symptoms are slightly different, in any individual animal it is not possible to say which disease is present on the basis of clinical symptoms alone. Of importance is the fact that all of the major respiratory pathogens can develop carrier states and chronic infections. Healthy looking animals may be constantly shedding virus and/or relapsing when subjected to stress.

<b>Feline Viral Rhinotracheitis (FVR, Feline herpes virus-FHV, Feline URI)</b>	
Agent:	Feline herpesvirus-1 (enveloped DNA virus)
Incubation:	Usually 2-6 days; recrudescence usually observed within ~7 days after a stressful event.
Effects:	URI: Sneezing, ocular and nasal discharge, conjunctivitis, fever, anorexia, rarely oral ulceration. Corneal ulceration is particularly suggestive of herpes. Can cause chronic rhinitis/sinusitis. Mortality is low with more deaths in kittens and elderly cats.
Treatment:	Supportive/symptomatic therapy. Antibiotics are used in cases of secondary infection. Assisted feeding and fluids may be necessary. Topical anti-viral ophthalmics may inhibit development of corneal ulcers if given when signs first appear.
Prevention:	Modified live and killed injectable vaccines available. Vaccine does not necessarily prevent infection but reduces severity of disease. Vaccinate kittens at 6-8 weeks old and every 3 to 4 weeks until 16-18 weeks old. After the kitten series and a 1 year booster, triennial vaccination is recommended. Modified live intranasal vaccines give faster response, but may generate sneezing 4 to 7 days post-vaccination.
Transmission:	Causes 40 to 45 percent of feline URI. Direct contact, aerosol droplets from sneezing and indirect contamination through objects and caretakers are the major routes of infections. Virus does not last long in the environment. A large percentage of cats will remain chronic carriers and intermittently shed the virus, particularly when stressed.



<b>Feline Calicivirus (FCV, Feline URI)</b>	
Agent:	Feline calicivirus (non-enveloped RNA virus)
Incubation:	2 to 6 days. Average is shorter than for FVR.
Effects:	Fever, sneezing, conjunctivitis, lack of appetite, and depression are common. Some strains cause salivation and ulcers on the tongue, nostrils and hard palate while others produce pneumonia, especially in kittens. Some strains cause limping/ polyarthritis Superficial lesions heal rapidly and the cat will eat again 2 to 3 days after the beginning of symptoms. Mortality is higher than in FVR and may reach 30%.
Treatment:	Symptomatic as for FVR.
Prevention:	Modified live and killed virus vaccines available. Usually included with injectable FVR vaccine. Intranasal vaccine is also available.
Transmission:	Accounts for 40 to 45 percent of all feline URI. Virus is shed continuously by infected cats and spread via aerosol droplets and contaminated objects. Virus can be shed for long periods after apparent recovery. Resistant to standard disinfectants and can persist in the environment for weeks. Bleach (1:32), potassium peroxymonosulfate (Trifectant <sup>®</sup> ) and accelerated hydrogen peroxide (Accel <sup>®</sup> ) are effective disinfectants.

<b>Feline Pneumonitis</b>	
Agent:	<i>Chlamydophila psittaci</i> (intracellular bacteria)
Incubation:	5 to 10 days
Effects:	Conjunctivitis is the most common symptom (initially unilateral). Fever may develop. Recovering animals may relapse, and disease may become chronic. Mortality is low.
Treatment:	Tetracyclines are considered the most effective broad-spectrum antibiotic for this disease.
Transmission:	Accounts for 5 to 10 percent of infectious feline URI. Spread through aerosol droplets and contaminated objects.
Notes:	Zoonotic, but is rarely transmitted from cats to human.

## OTHER FELINE INFECTIOUS DISEASES

<b>Feline Panleukopenia (FPV, Feline distemper, Feline infectious enteritis)</b>	
Agent:	Parvovirus. Closely related to canine parvovirus (non-enveloped DNA virus)
Incubation:	3 to 14 days
Effects:	Virus primarily attacks the lining of the gastrointestinal tract causing sloughing of the intestinal epithelium. Symptoms include depression, anorexia, vomiting and profuse, usually bloody diarrhea, causing severe dehydration and malnutrition. Signs can manifest acutely and death can occur within twelve hours. 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.
Diagnosis:	Marked leukopenia, anemia, and thrombocytopenia are generally seen. The CITE <sup>®</sup> fecal antibody test for canine parvovirus can be used to cross-detect FPV.
Treatment:	Supportive: fluids, nutrients, antibiotics and possible blood transfusion.
Prevention:	Modified live and killed virus vaccines available. Modified live is recommended for higher titers and better ability to overcome maternal antibodies. Vaccinate kittens as early as 6 weeks of age and then every 3 to 4 weeks until 16-18 weeks old. A booster vaccine is recommended 1 year later and then revaccination every 3 years.
Transmission:	Highly contagious. All secretions of infected animals are loaded with virus. Shedding can precede clinical signs by several days and continue up to six weeks post recovery. Virus is extremely resistant-bleach (1:32) is required to disinfect contaminated surfaces.

<b>Feline Leukemia Virus (FeLV)</b>	
Agent:	Feline leukemia virus (enveloped RNA retrovirus)
Incubation:	Up to four weeks from exposure before detectable by antigen test. Development of clinical signs may not occur for months after infection.
Effects:	High percentage of infected cats will develop some type of immunity and be unaffected. Some will be chronic shedders of virus, however. Of those who develop disease, the most common effect is severe immune suppression resulting in death from secondary disease. A small percentage will develop leukemia or other cancers.
Diagnosis:	ELISA serum antigen test
Treatment:	Symptomatic treatment for chronic disease problems with specific treatment being given for each secondary disease. Mortality in cats showing disease is 100%.
Prevention:	A killed virus vaccine and a recombinant DNA transdermal vaccine are available. Doses are given as early as 8 weeks of age and boosted 3 to 4 weeks later. Annual revaccination is necessary for cats at risk of exposure.
Transmission:	Spread primarily through direct contact with saliva or blood. Repeated exposure often is necessary to transmit the disease. Virus does not survive long in environment. Cats may be viremic and appear healthy for extended periods, but are infectious.

<b>Feline Immunodeficiency Virus (FIV) (sometimes called Feline AIDS)</b>	
Agent:	Feline Immunodeficiency virus (enveloped RNA retrovirus)
Incubation:	Antibodies first detected 2-4 weeks post infection; clinical signs usually develop within 3-6 years. Infected cats may appear healthy for extended periods, but are infectious.
Effects:	Early in disease, may see generalized but often temporary enlargement of the lymph nodes, often with fever. Health may deteriorate progressively or be characterized by recurrent illness interspersed with periods of relative health. Sometimes not appearing for years after infection, signs of immunodeficiency can appear anywhere throughout the body. Immune suppression leads to chronic health problems and opportunistic infections. Many FIV-positive cats have chronic gingivitis/stomatitis.
Diagnosis:	ELISA serum antibody test
Treatment:	There is no cure for FIV. Specific treatment is aimed at secondary diseases/symptoms.
Prevention:	Vaccine exists. May be useful for cats at high risk. Not widely used (see note).
Transmission:	Not highly contagious. Transmitted primarily through biting and mating.
Notes:	- Not a zoonotic disease. - No current tests can distinguish between FIV antibody from vaccination and antibody from disease.

<b>Ringworm (Dermatophytosis-external fungal infection) Cats/Dogs</b>	
Agent:	<i>Microsporum canis</i> (50%), <i>M. gypseum</i> , <i>Trichophyton mentagrophytes</i>
Incubation:	1-3 weeks
Effects:	Spots of hair loss with scaling and crusting, particularly around the face and ears.
Diagnosis:	About half of all <i>M. canis</i> strains (which causes 50% of infections) will fluoresce under a Wood's lamp. Fungal culture and microscopic identification is definitive.
Treatment:	Usually self-limiting, but may take up to 3 months to clear. Topical therapy is aimed at preventing spread and speeding recovery. Lime-sulfur dip is economical, safe and most effective treatment. Other topicals are not generally effective. Oral anti-fungals are used for severe cases (itraconazole is drug of choice).
Transmission:	Contact with infected animals, contaminated objects, or soil-borne organisms. Contact only sometimes results in infection. Immune-compromised individuals are most susceptible. Cats can remain infectious for several weeks following clinical recovery  Fungal spores are highly resistant and can persist in the environment. Repeated applications of bleach at high concentration (1:10) is necessary for inactivation.
Notes:	Zoonotic. Particularly a concern in young children and immunocompromised.

## COMMON SMALL ANIMAL PARASITES

Although safe and effective treatment and control methods exist for most internal and external parasites, many animals continue to suffer from preventable parasitic infections. Geographical location, lifestyle, housing conditions and species play a role in which parasites are likely to be a problem.

Internal and external parasites can cause great discomfort, transmit disease to animals and humans and significantly interfere with the relationship between people and animals. It is important that we encourage comprehensive parasite control as a priority in preventive health care. 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. 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

The following is a brief overview of some of the most common parasites seen in our clinics.

### INTERNAL PARASITES

<b>Giardiasis</b>	
Agent:	<i>Giardia lamblia</i> (flagellated protozoa)
Incubation:	8-10 days
Effects:	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.
Diagnosis:	ELISA fecal antigen test most reliable. Identification of motile trophozoites on direct fecal smear or non-motile cysts on zinc sulfate fecal flotation with centrifugation.
Treatment:	Fenbendazole, metronidazole.
Prevention:	Good husbandry, prevent exposure to feces contaminated environments. A vaccine is available that may reduce severity of clinical signs and shedding of cysts.
Transmission:	Fecal-oral either directly or indirectly via e.g. fecal contaminated water or food. Cysts can exist for months in a moist/cool environment. Shedding may still occur even after disease is treated.
Notes:	Zoonotic

<b>Roundworms (Ascariasis)</b>	
Agent:	<i>Toxacara canis</i> (dogs), <i>Toxacara cati</i> (cats), <i>Toxascaris leonina</i> (dogs and cats).
Lifecycle	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.
Effects:	Often asymptomatic. Young animals may show slow growth, poor hair coat, and be "pot-bellied." Diarrhea may be present and worms can pass in feces or vomit. Migration can damage the lungs and lead to pneumonia. Death can occur in severe cases.
Diagnosis:	Fecal float to identify eggs. The vast majority of puppies and kittens are infected, and should be routinely treated, regardless of fecal results.
Treatment:	Pyrantel pamoate is the drug of choice in young puppies. All puppies & kittens should be treated every 2-3 weeks starting at 2-3 weeks of age until 12-16 weeks old.
Prevention:	Pregnant and nursing mothers should be treated to minimize transmission to offspring.
Transmission:	Fecal-oral, transplacental, transmammary most common. Eggs are extremely resistant. Frequent removal of feces before eggs become infective is recommended.
Notes:	Zoonotic-can cause visceral and ocular larval migrans in humans

<b>Hookworms</b>	
Agent:	<i>Ancylostoma spp.</i> <i>Ancylostoma caninum</i> is the most likely to cause disease.
Lifecycle:	Usually transmitted to the young through mother's milk or through eating larva. Larva can also invade directly through the skin. Prenatal infection is not common. Skin 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. In older animals, larvae migrate to muscle and become dormant.
Effects:	Animals are most commonly asymptomatic. Can cause black, tarry diarrhea and severe blood loss which can be fatal in puppies.
Diagnosis:	Fecal flotation to identify eggs.
Treatment:	Pyrantel pamoate is the drug of choice. Fenbendazole and milbemycin also effective. All puppies should be treated every 2 weeks starting at 2 weeks of age until 12 wks old.
Prevention:	Pregnant and nursing bitches should be treated to minimize transmission to offspring.
Transmission:	Fecal-oral, transmammary (dogs), percutaneous, ingestion of animals who have ingested hookworm eggs. Eggs become infective 2-8 days after they are shed and are less resistant than those of roundworms.
Notes:	Zoonotic- can cause cutaneous larval migrans in humans

<b>Whipworms</b>	
Agent:	<i>Trichuris vulpis</i>
Incubation:	Pre-patent period (time from infection to shedding) = 3 months
Lifecycle:	Larvae develop in the small intestine and the adults live in the cecum.
Effects:	Frequently asymptomatic. Weight loss and diarrhea (with fresh blood) are major signs. Anemia may develop. Rarely seen in cats.
Diagnosis:	Fecal flotation for identification of eggs.
Treatment:	Fenbendazole, milbemycin. Ivermectin is unapproved but effective. Due to long period of maturation, deworming should be repeated three times at monthly intervals.
Prevention:	Eggs are very resistant, especially in soil. Reduce exposure by prompt removal of feces. Eggs become infective one month after they are shed
Transmission:	Fecal-oral is only route of transmission.

<b>Tapeworms</b>	
Agent:	( <i>Dipylidium caninum</i> (90%); <i>Taenia taeniae</i> )
Effects:	Serious disease is rare. Mild diarrhea and unthrifty appearance are typical signs.
Treatment:	Praziquantel is drug of choice.
Prevention:	Effective flea control and preventing ingestion of rodents is the best preventative.
Transmission:	Eggs are passed separately or in segments and eaten by a flea, mouse, or other animal. Ingestion of intermediate host is the only way a dog or cat becomes infected. Flea-borne <i>Dipylidium</i> accounts for most infestations in dogs and cats.

<b>Coccidia</b>	
Agent:	<i>Isospora</i> species are most common and are species-specific (single cell protozoa)
Lifecycle	Oocysts produced through sexual reproduction are passed in feces of infected animals.
Effects:	Often subclinical. May cause diarrhea, weight loss, and dehydration. Young animals commonly affected. Stress and other diseases can precipitate. Death occurs rarely.
Diagnosis:	Identification of oocysts on fecal flotation
Treatment:	Sulfadimethoxine, trimethoprim-sulfa, ponazuril or toltrazuril. Fluids and electrolytes for symptomatic therapy.
Prevention:	General husbandry, including removal of feces before oocysts become infective.
Transmission:	Excreted in feces. Transmission occurs directly via ingestion of infective oocysts or by ingestion of intermediate host (rodents). Resistant to many disinfectants. Oocysts require 8-36 hours to become infective so frequent litter box changes prevent spread.

<b>Heartworm (dogs)</b>	
Agent:	<i>Dirofilaria immitis</i>
Incubation:	Pre-patent period (time from infection until positive test possible): 6-7 months.
Lifecycle:	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.
Effects:	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.
Diagnosis:	Serum antigen test, identification of microfilaria.
Treatment:	Injectable arsenic compounds kill adult worms slowly (melarsamine). Concurrent steroids and antibiotics help prevent complications. Strict cage rest is critical to prevent pulmonary thromboembolism from dying worms.
Prevention:	Ivermectin or milbemycin given monthly are the most commonly used preventatives. Animals > 6 months of age should be heartworm tested before preventative is given.
Transmission:	Must be transmitted by mosquito. No direct transmission.
Notes:	Though more common in dogs, cats can also be infected with heartworm.

## EXTERNAL PARASITES

<b>Fleas</b>	
Agent:	<i>Ctenocephalides felis</i> , <i>C. canis</i>
Lifecycle:	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. Can go 2 months without feeding, and can reproduce explosively.
Effects:	Itching. Heavy infestations may result in anemia. Most serious result is when animals develop allergic reactions to flea saliva and self-mutilate due to the intense itching.
Treatment:	Applying a suitable insecticide to both the animal and the environment is the most common control method. Imidacloprid (Advantage®) and fipronil (Frontline®) are very safe and effective, but may not be available to all clients. Pyrethrins are safest effective OTC products available. Flea collars are not generally effective. Clients should be cautioned not to use canine labeled products to treat cats.
Notes:	Fleas also transmit <i>Dipylidium caninum</i> , the tapeworm.

<b>Ticks</b>	
Agent:	( <i>Dermacentor spp.</i> ; <i>Rhipicephalus</i> )
Lifecycle:	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 this 1 to 3 times depending on the tick species before finally breeding. Life cycle is completed in a couple of months.
Effects:	Anemia from the feeding of many ticks is possible. Tick paralysis can result from an animal's reaction to a feeding tick. Transmit a number of rickettsial and bacterial agents which can cause serious disease in both animals and humans.
Treatment:	The ear canal and shoulders are typical sites of feeding. Ticks should be removed with a forceps to prevent breaking off the mouth parts in the skin and causing infection.
Prevention:	Both the environment and animal must be treated to achieve effective control. There are a number of tick control/preventive products that are effective.
Notes:	Ticks can transmit several serious zoonotic disease (RMSF, Lyme disease, etc)

<b>Sarcoptic Mange</b>	
Agent:	<i>Sarcoptes scabiei</i> (burrowing mite)
Incubation:	Dogs may show signs within a few days of infection
Lifecycle:	Spread through direct contact. Eggs are laid in skin tunnels as the female burrows. The entire life cycle of 17 to 21 days is spent on the host.
Effects:	Intense itching with self-mutilation and secondary bacterial infection is common. Dry, thick, wrinkled areas with possible crusts on the head, under the chest, and around the tail head. If untreated, animals may become debilitated and can die.
Diagnosis:	Via skin scraping and microscopic identification, but false negatives are common. Diagnosis may be made on clinical signs.
Treatment:	Lime sulfur dips, rotenone, and amitraz have all been used. In the clinic setting, the typical treatment is ivermectin (not collie-breeds) or selamectin. Live mites may remain after resolution of pruritus – continue treatment at least 4-6 weeks
Prevention:	Prevent contact with infected animals.
Transmission:	Direct contact, fomite transmission. Mites live off host up to 6 days at room temperature, longer (up to 21 days) in moist cool environment. All dogs in prolonged direct contact (house or kennel mates) with affected dog should be treated.
Notes:	May transiently infect cats and humans

<b>Demodectic Mange</b>	
Agent:	<i>Demodex canis D. cat</i>
Lifecycle:	Life cycle of egg to mite requires 20 to 35 days.
Effects:	Localized form is most common with small, discrete areas of hair loss on face and front legs. About 90 percent of these cases resolve spontaneously.  In generalized demodectic mange the skin becomes reddened, oozes serum, and is complicated by bacterial infection. These may be very difficult to cure.
Treatment:	Oral ivermectin (administered daily for 30-90 days+) is effective.
Prevention:	General nutrition and immune support (sterilization, parasite control, etc)
Transmission:	Lives in hair follicles and is found on many healthy animals. Direct contact transfers wandering mites to a susceptible host, usually received when nursing from the dam. Hereditary predisposition and other immunosuppressing factors play a role.
Notes:	Disease is not contagious to other animals and is not zoonotic.

<b>Earmites</b>	
Agent:	<i>Otodectes cynotis</i>
Incubation:	Adults live in the ear canal and pierce the skin to suck lymph fluid. Eggs are laid there and the life cycle repeats every 2 weeks.
Effects:	Irritation and crusts appear in the ears. Head-shaking and scratching can result in self-inflicted wounds. Secondary bacterial infections and abscesses are common.
Treatment:	Ivermectin administered orally or topically is effective (may need to repeat in 2 weeks), as is selamectin and imidacloprid/moxidectin.
Transmission:	Direct contact with infested animals. Cat to dog and vice versa spread is common.



# GENERAL ANESTHESIA BASICS

## INTRODUCTION

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. The anesthetist is NEVER to 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 supervising veterinarian or technician 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, the patient is fasted as appropriate and pre-anesthetic drugs are administered.

### Physical Examination

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. You will be expected to be thoroughly familiar with the intake exam findings and medical history and for assessing the animal again prior to anesthesia.

As part of the physical exam process, every surgical patient will be assessed for anesthetic risk factors. Any animal with potential increased risk must be evaluated by a supervisor before being accepted for surgery. A staff veterinarian will evaluate these cases and inform the client of potential risks involved.

### Fasting

Food is withheld from the healthy adult patient for 8-12 hours to minimize the risk of vomiting and regurgitation during anesthesia. Fluids need only be withheld for 2 hours.

To avoid complications associated with hypoglycemia, pediatric animals (<4 months of age) are not fasted prior to surgery. Pediatric animals are fed a small meal at intake and the feeding time is recorded in the medical record and on the surgery board.

### Pre-anesthetic Medication *(see 'Anesthetic Agents' for information on specific medications used)*

The most important reasons for the administration of pre-anesthetic agents are:

- To calm or sedate an excited or vicious 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.

If you are 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 for the patient
- 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.
- **Administer** the medication as directed.
- **Record** the drug, dosage, route of administration and time (DDRAT) on the patient's record
- The time of pre-medication is also recorded on the **surgery board** next to the patient's name.

## **ASSESSMENT AND INDUCTION** (see 'Anesthetic Agents' for information on specific medications used)

### **Assessment Process**

- **Assess** animal (TPR, evaluate Hx) and verify suitability for anesthesia/surgery
- **Setup** appropriate anesthetic monitoring equipment, breathing circuit and supplemental heat.
- **IV catheters** are placed in most patients.
- **Calculate surgical fluid plan** including type, amount and drip rate
- **Report** physical exam and identifying information to Anesthesia Coordinator. The anesthetist will be expected to be familiar with the patient's signalment, pertinent physical exam/history findings, current TPR, any medications administered and calculated fluid plan.
- **Ax Cleared** - Anesthesia Coordinator will approve the patient for surgery or request additional assessment or diagnostics before proceeding. Once the patient has been cleared they can be taken to induction.

**General Induction Process** – Throughout the induction process the anesthetist assigned to the case is responsible **ONLY** for ensuring the safety of their patient and for accurate record-keeping. Additional team members will restrain the animal, administer medications, prep the surgery site, etc.

- **Report** any alerts to Induction Lead who will decide on the anesthetic plan for the patient
- **Administer induction agent** to effect
- **Intubate** - All cases except uncomplicated cat neuters are intubated/maintained on isoflurane.
- **Turn on oxygen**, then connect patient to breathing circuit
- **Turn on isoflurane**
- **STOP - Evaluate patient**
- **Inflate cuff** of endotracheal tube as needed
- **Lubricate eyes**
- **Clip hair** and vacuum
- **Administer ancillary medications** (penicillin, ketoprofen)
- **Administer local** block as appropriate (castrations are blocked at the spermatic cord or testis)
- **Express bladder** as needed
- **Evaluate patient** - If stable, move to surgery table.

Induction agents are generally administered by IV injection and given to effect. The amount of anesthetic administered is titrated to suit the patient's requirements rather than relying solely on a calculated dose.

All anesthetic drugs will be drawn up and dispensed by the Induction 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.

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 heart beat or have any question as to the patient's status, say so. Do not be afraid to speak up!

### **MAINTENANCE**

During the maintenance period the anesthetist has two responsibilities. First is to monitor the patient closely to ensure that the animal's vital signs remain within acceptable limits. Second, is to 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.

*For information on parameters and techniques in anesthetic monitoring see 'Patient Monitoring'.  
For parameters used to assess depth/stage of anesthesia see 'Assessing Anesthetic Depth'*

**Anesthetic Equipment** (see '*Anesthesia Machine*' for more information)

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 an experienced anesthetist for a review.

**Patient Monitoring** (see '*Patient Monitoring*' for more information)

Vital signs are recorded to the surgery **record every 5 minutes** throughout the anesthetic procedure, but patient monitoring should be 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.

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 to ask for assistance. The time to act is as soon as you notice a potential problem or trend.

**Assisting ventilation** (For additional information see '*Responding to Complications*')

All patients under anesthesia will hypoventilate and need some ventilatory support. If the patient's respiratory rate and character are within acceptable ranges, 'bagging' the animal a few times every 5 minutes is sufficient to prevent atelectasis.

If the respiratory rate is below the acceptable range (< 8-10 bpm) or breaths are shallow, you may need to ventilate the patient more frequently. First, assess all other parameters to be sure the animal is not too deeply anesthetized. If the animal appears to be at an acceptable plane of anesthesia and all other parameters are normal, provide manual breaths as needed.

If the animal has a respiratory rate less than 8 bpm or appears to have stopped breathing-TURN THE VAPORIZER OFF and GET HELP. Under the direction of an Anesthesia Supervisor, an animal who is not breathing should be given one breath every 4-5 seconds. Periodically stop for a few seconds to assess and give the animal a chance to build up CO<sub>2</sub> and initiate a breath on their own. If the animal does not resume breathing, continue as above.

**RECOVERY** (see '*RAVS Protocols-Recovery*' for more information)

The anesthetic period does not end when the surgery ends. Perioperative support and monitoring continues through the recovery period. The anesthetist MUST stay with their patient until the endotracheal tube has been safely removed, at least one TPR has been recorded, the patient is stable and has been cleared by the Recovery Lead. The anesthetist is responsible for informing the recovery team of any anesthetic or surgical complications that occurred and any special needs before leaving the patient.

Vital signs should be monitored in the recovering animal every 15-20 minutes or as appropriate until the patient is sternal. Then as needed until the animal is ambulatory and able to return to a kennel or released to the client.

**If at ANY time you are concerned about the status of a patient's recovery or any parameter-consult a supervising veterinarian or technician.**

# 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.
- 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 is determined primarily by the diameter of the endotracheal tube. The larger the 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 in to 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 in the cat. Use caution not to continually stimulate the arytenoids, closing off the airway and preventing the animal from breathing. If you are having difficulty, ask for assistance.
- The tube should not 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 can not visualize the tube entering the trachea, do not assume it is in place. Double check or re-intubate.
- Other ways to verify proper 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 a piece of gauze tied around the tube and behind the animal's head or on top of the muzzle.

## 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.
- If the tube is of an appropriate size, you do not hear a leak and are able to adequately ventilate the patient, you may need to add little or no air to the inflation balloon.
- 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.
- 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 the cuff.

## SPECIAL NOTES ON PEDIATRIC ANESTHESIA AND RECOVERY

Any animal less than 16 weeks of age will be considered 'pediatric'. While anesthesia and surgery in younger animals is very similar to that in adult animal, there are some specific considerations to keep in mind when anesthetizing 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.
- **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 tbs of canned food) should be fed at intake or prior to pre-medication
    - Feeding time should be recorded on the medical record and on the surgery board.
- **Hypothermia** can be a serious problem for smaller patients.
  - Only a small area of hair at the surgical site should be clipped
  - Over-wetting during surgical scrub should be avoided
  - Supplemental heat source should be used during 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 closely during recovery. If slow to recover, check the body temperature and 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).
- **Heart Rate:**
  - **Normal pediatric heart rate = K9: 120-180 bpm; Fe: 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 a rate of oxygen consumption 2-3 times that of the adult animal - increased respiratory rates are required to meet oxygen demands.
- **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 – trends are more important than single measurements.
- **Anesthetic Protocols:** There are many different drug protocols in the literature for pediatric anesthesia. Specific protocols used will be discussed during anesthesia orientation sessions. Considerations in pediatric patients include:
  - Phenothiazine tranquilizers (such as acepromazine) are avoided or dose reduced in animals less than 3 months old because of their potential to cause hypotension
  - The use of NSAIDS is generally avoided
  - May be more sensitive to fluid overload – standard surgical fluid rate of 5ml/kg/hr is used

If you are inexperienced with anesthesia in young patients, or have any additional questions, consult a staff veterinarian or technician.

# ANESTHETIC AGENTS

The following provides a very brief overview of the anesthetic agents most commonly used in HSVMA-RAVS' small animal protocols. This is NOT a detailed monograph on the listed drugs. Consult additional anesthesia texts or Plumb's [Veterinary Drug Handbook](#) for more detailed information.

## PRE-ANESTHETICS AND ANALGESICS

### OPIOIDS

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 agonist-antagonists (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.

#### **Buprenorphine** (Buprenex®)

##### Mode of Action

- Partial mu agonist
- Strong affinity for receptors and a dose dependent longer duration than morphine

##### Effects

- Moderate analgesia
- Minimal, if any, sedative effect

##### Method of Use

- Can be administered IV or IM
- In cats, is also well absorbed via oral mucosa
- Delayed onset – time to peak effect: 20-30 mins IV, 45-60 mins IM
- Duration of effect influenced by dose (4-8 hrs)
- Schedule III controlled drug

##### Precautions

- May be difficult to reverse if undesirable effects occur (uncommon)

#### **Butorphanol** (Torbugesic®)

##### Mode of Action

- Mixed agonist/antagonist (kappa agonist, mu antagonist)

##### Effects

- Mild analgesia, moderate-strong sedative

##### Method of Use

- Can be administered IV, IM or SQ
- Duration of effect is 30-60 mins in dogs and 1-3 hrs in cats
- Reversible with naloxone
- Schedule IV controlled drug

##### Precautions

- Short duration of action may require additional re-dosing or additional analgesics post-procedure

## **Morphine Sulfate**

### Mode of Action

- Pure mu agonist

### Effects

- Potent analgesia and sedation
- Minimal cardiovascular effects though higher doses can cause bradycardia
- Respiratory depression (usually not clinically-relevant)

### Method of Use

- Can be administered IV, IM or SQ
- Duration of effect is 2-6 hours
- Can also be used for epidural analgesia
- Reversible with naloxone
- Schedule II controlled drug

### Precautions

- Sedative synergism with morphine and acepromazine in the dog – reduce acepromazine dose
- Use with caution in cats if no sedative/tranquilizer is used due to potential excitatory response
- May cause panting (due to resetting of thermoregulatory mechanism)
- Often causes vomiting and defecation when given IM or SQ

## **PHENOTHIAZINES**

### **Acepromazine**

#### Mode of Action

- Thought to depress portions of the reticular activating system causing sedation.
- Anticholinergic, antihistamine, antispasmodic and alpha-adrenergic blocking effects.

#### Effects

- Strong sedative
- Antiemetic effect

#### Method of Use

- Used in healthy adult animals in combination with opioid analgesic as a pre-anesthetic sedative and to help decrease dose of general anesthetic required.
- May be administered PO, SQ, IM or IV (with caution).
- Duration of effect is 6-8 hrs

#### Precautions

- Increased potency in geriatric animals, neonates and animals with liver dysfunction.
- No analgesic effect-painful patients should be treated with NSAID or opioid instead.
- Can cause significant hypotension.
- Maximum total dose is 3 mg, regardless of body weight

## **NSAIDS (Non-Steroidal Anti-Inflammatory Drugs)**

### **Meloxicam (Metacam®)**

#### Mode of Action

- Inhibits inflammatory cascade by blocking cyclooxygenase (COX) enzymes.

#### Effects

- Antipyretic, analgesic and anti-inflammatory effects via inhibition of cyclooxygenase-2 (COX-2)
- COX-1 inhibition effects platelet function and integrity of gastrointestinal mucosa

#### Method of Use

- May be administered PO, IM or IV.
- Duration of effect is 24 hours

#### Precautions

- Avoid in animals with GI, hepatic or renal disease and in dehydrated or hypotensive patients.
- Do not combine with other drugs known to alter hemostasis or cause gastrointestinal erosion (aspirin, corticosteroids, etc)

Notes: Other drugs in this class occasionally used include carprofen and ketoprofen.

## ALPHA-2 AGONISTS

### Dexmedetomidine (DexDomitor®)

#### Mode of Action

- Alpha-2 adrenoreceptor agonists - Stimulation of these receptors causes a decrease in the level of norepinephrine released in the brain resulting in sedation and analgesia.

#### Effects

- Profound sedation and anxiolytic action. Moderate to profound analgesia
- 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.
- Lowered respiratory rates and a reduction in body temperature

#### Method of Use

- May be administered IM or IV.
- Onset of action following IM injection is 5 minutes and 1 minute following IV dose
- Duration of sedation is 30-90 minutes.
- Effects are reversible with atipamezole
- Typically used at doses MUCH lower than the label recommends.

#### Precautions

- 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. Reversal agents are available and can be used if adverse effects are seen.

## ALPHA-2 ANTAGONISTS

### Atipamezole (Antisedan®)

#### Mode of Action

- Alpha-2 antagonist used as reversal agent for medetomidine, dexmedetomidine or xylazine

#### Method of Use

- Completely, permanently reverses dexmedetomidine effects
- May be administered IM or IV
- For complete reversal, administer same volume atipamezole as dexmedetomidine
- Can be used at partial dose for partial effect

#### Precautions

- May reverse all of the effects of dexmedetomidine, including analgesia, thus administration of another analgesic agent may be appropriate at the time of reversal.

#### Notes

- Yohimbine is an alpha-2 antagonist that is less selective for alpha-2 receptors (i.e. it also is effective at alpha-1 receptors). It may occasionally be used in HSVMA-RAVS' clinics.



## INDUCTION

### DISSOCIATIVES (Cyclohexamines)

#### **Ketamine**

##### Mode of Action

- Disrupts pathways within the cerebrum and *stimulates* the reticular activating center.

##### Effects

- Exaggerated reflex responses and increased muscle tone
- Significant superficial analgesia, but poor visceral analgesia.
- Increased heart rate
- May exhibit apneustic respiration (inspiration followed by prolonged pause and short expiration).

##### Method of Use

- Primarily used as an induction agent or to perform a short procedure with little pain involved.
- 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.
- May be given IM or IV or orally (fractious cats).
- Schedule III controlled drug.

##### Precautions

- Positive inotropic effect on the myocardium and increases heart rate, cardiac output, blood pressure, pulmonary artery pressure and central venous pressure.
- May cause increased salivation.
- Increased intracranial and intraocular pressures
- Hyperthermia may occur in dogs during recovery
- Animals recovering from cyclohexamines often show exaggerated response to touch, light or sound and may show seizure-like activity. Avoid unnecessary stimulation during recovery.
- As diazepam is unpredictably absorbed when given IM, ketamine/diazepam mixtures are generally administered only intravenously.

#### **Tiletamine** (Telazol®)

Tiletamine is a cyclohexamine similar to ketamine and sold only in combination with zolazepam which is a benzodiazepine similar to diazepam.

Telazol produces results similar to that of ketamine and diazepam combinations with the following advantages:

- Less pronounced apneustic breathing
- May be administered IM, IV, or SQ
- Smaller volumes are used.
- Because of IM route, particularly useful for chemical restraint of aggressive dogs and cats (can be mixed with butorphanol for added analgesia).
- Can be given orally to dogs

Onset of anesthesia is 2-5 minutes after IM injection, duration of anesthesia is 20-30 minutes. As with ketamine, IM injection may be painful. Recovery may be prolonged with IM injection (up to 5 hours).

## **BENZODIAZEPINES**

### **Diazepam (Valium®)**

#### Mode of Action

- Hypnotic sedative-probably effects release of endogenous GABA, an inhibitory neurotransmitter.

#### Effects

- Anti-anxiety and calming effects, and good skeletal muscle relaxation.
- Anticonvulsant activity.
- Minimal adverse cardiovascular and respiratory effects. High margin of safety.

#### Method of Use

- Can be administered PO or IV
- 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
- Schedule IV controlled drug.

#### Precautions

- 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.

### **Midazolam (Versed®)**

Midazolam is a benzodiazepine similar in action to diazepam but can be administered IM or IV.

### **Zolazepam (Telazol®)**

Zolazepam is a benzodiazepine similar in action to diazepam. It is manufactured in combination with tiletamine as the product Telazol®. (*see tiletamine above*)

## **OTHER INDUCTION / MAINTENANCE AGENTS**

### **Propofol**

#### Mode of Action

- Unique hypnotic agent consisting of a phenol in a hyperlipid emulsion – method of action is unknown but it may affect the GABA system.

#### Effects

- Very fast acting injectable agent without cumulative effect - rapid induction and recovery.
- No analgesic effects.

#### Method of Use

- Must be administered IV.
- Can be given as intermittent bolus or CRI for maintenance of anesthesia.
- As a bolus carefully titrate to effect, generally administering 25% of calculated dose at a time.
- Administration with IV diazepam can decrease propofol need by 50%.

#### Precautions

- 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.

## MAINTENANCE

### INHALANT ANESTHETICS (isoflurane, halothane, sevoflurane)

Basic inhalation anesthesia:

- 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 in to 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. The mechanism of action is uncharacterized.

#### Isoflurane

Mode of Action

- Fluorinated hydrocarbon.
- Metabolism=99% respiration (good for neonatal and geriatric patients)

Effects

- 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)

Method of Use

- 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.

Precautions

- 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.

# ANESTHETIC EQUIPMENT

## PURPOSES OF THE ANESTHETIC MACHINE

- Provide oxygen (machine system)
- Deliver precise amounts of anesthetic agent (machine system)
- Remove CO<sub>2</sub> (breathing system)
- Provide assisted or controlled ventilation (breathing system) to the patient

## 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.
- Cylinder sizes are designated according to letters, with size 'A' being the smallest; size 'E' (E-tank) is commonly used on anesthesia machine. H-tanks are also used at HSVMA-RAVS clinics, usually with a manifold that allows multiple machines to operate off the same tank.
- Cylinders are color coded according to the gas contained, green indicates oxygen.
- 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 at all times 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. E-tanks take a special key or wrench to operate the valve. H-tanks have a handle permanently attached to the valve stem.

### ➤ 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 (45-50 psi).
- Regulator also provides for constant flow as the pressure in the tank decreases.
- Regulators used at HSVMA-RAVS clinics mount on top of the oxygen tanks. 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.

## 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 semi-closed (circle) 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 1000 ml/minute will 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. 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”.
  - 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** (See 'Patient Breathing Circuits' below)
- 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 10 lbs body weight.
    - Non-rebreathing system- used for patients under 10 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<sup>®</sup>) 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.
  - 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<sup>®</sup> canister must be changed after 8 hrs of normal use or a weight gain of 50 grams.

### **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 carbon dioxide canister. They are then directed into the reservoir bag and back toward the patient through the inhalation flutter 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 these 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.
- **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.
  - 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, 2) the bag is too large, or 3) a leak is present in the system.
- **Inhalation flutter valve, breathing tubes, Y-piece and exhalation flutter valve**
  - Fresh gas entering the circuit passes through a one-way valve (flutter or unidirectional valve), which allows flow in only one direction (toward the patient).
  - When the patient inhales, the inhalation flutter 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 flutter valve which prevents expired gases from returning to the patient without first passing through the CO<sub>2</sub> absorber.
- **Pressure relief valve (pop-off valve)**
  - Waste gases exit the anesthetic circuit and enter the scavenging system at the pop-off valve.
  - 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. It is generally kept mostly open during anesthesia, allowing gas to escape.
  - When we need to bag the patient, the valve is closed, increasing the pressure in the circuit. The valve is then re-opened, again allowing the gases to vent.
  - In HSVMA-RAVS clinics, the pop-off valve is left open at all times. A spring loaded pop-off safety allows the anesthetist to close the circuit to ventilate the patient without closing the actual pop-off valve.
  - If valve were to remain closed, the excess pressure in the circuit would eventually reach the animal's lungs, causing alveoli to distend and possibly rupture!
- **Carbon dioxide absorbing canister:**
  - Any gases that do not exit the system through the pop-off valve are directed to the CO<sub>2</sub> 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<sub>2</sub>. 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.

➤ **Pressure manometer**

- Measures the pressure of the gases within the anesthetic system (expressed in centimeters of water), which in turn reflects the pressure of gas in the animal's airway and lungs.
- Pressures over 15 cm of water indicate a build-up of air within the machine, either because the pop-off valve is closed or the oxygen flow rate is too high
- When bagging an animal pressure should not exceed 15 to 20 cm H<sub>2</sub>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 this case, the reservoir bag should be compressed just enough to cause a slight rise in the patient's chest.

**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 flutter valve. Exhaled gases pass through another hose and may enter a reservoir bag, but do not enter a CO<sub>2</sub> absorber. The gas is then released into a scavenger.

- Used for patients weighing less than 7 kg (15 lbs).
- 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 CO<sub>2</sub> to be re-breathed and may create respiratory acidosis.
- Minimum oxygen flows of at least 200-300 ml /kg/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.
  - Does not influence the mechanics of the circuit - allows artificial ventilation to be performed.

➤ **Pressure relief 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.
- When the anesthetist wishes to bag the patient, the valve is closed, increasing the pressure in the circuit. The valve is then re-opened, allowing the gases to vent.
- 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 possibly rupture!
- If using a system without a relief valve, ventilation can be provided to the patient by occluding the end of the reservoir bag where it attaches to the exhalation tubing by pinching it.



## 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 his/her patient at all times. An anesthetized animal should NEVER be left unattended for any reason. Monitoring of the anesthetized patient is a continual process throughout the anesthetic event from pre-medication to full recovery. 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 that, while absolute numbers are obviously important, subtle change and trends are often an early indicator that the patient is beginning to decompensate. Do not wait until a patient's monitoring parameters are in the critical range to act or to ask for assistance.

These training materials are intended as a basic review of these important topics. For more information please refer to one of the numerous 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, 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):

#### Respiratory

- Airway
- Respiratory rate, depth and character
- Oxygen saturation (SpO<sub>2</sub>)

#### Cardiovascular

- Heart rate and rhythm
- Pulse rate and strength
- Mucous membrane color and capillary refill time
- Arterial blood pressure

#### Body Temperature

#### Anesthetic depth/patient status

- Reflexes and muscle tone
- Eye position and pupillary reflex activity
- Heart and respiratory rates
- Status of surgical procedure

#### Equipment function

- Anesthetic level,
- Vaporizer and oxygen flowmeter settings
- Pressure relief (pop-off) valve

## 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.
- In recovery, animals should be placed with the neck extended so the ET tube is not bent or kinked. Recovering animals should be placed facing forward in their cages with the tongue protruding to allow easy visualization of the animal's mucous membrane color.

#### ➤ 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 a supervising veterinarian or 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 8-12 bpm.
- The anesthetist may occasionally note an increase in respiratory rate (tachypnea) and depth (hyperventilation). 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 CO<sub>2</sub> is not being adequately removed from the breathing circuit by the CO<sub>2</sub> absorber. Hyperventilation is also seen as a response to mild surgical stimulus (e.g. when surgeon pulls on suspensory ligament during OVH).
- 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.

#### ➤ Oxygen saturation (SpO<sub>2</sub>) - (see 'Monitoring Equipment' for more information)

- **Normal SpO<sub>2</sub> : 95-100%**
- The patient's SpO<sub>2</sub> is the percentage of oxygen-saturated hemoglobin, and indicates how well the lungs are delivering oxygen to the blood.
- The pulse oximeter measures both SpO<sub>2</sub> 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.
- 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.
- However, do not assume that a low reading is a malfunction. Again, **EVALUATE YOUR PATIENT** before making any decisions.

## Cardiovascular

### ➤ Heart rate (HR) and rhythm

- **Normal HR: Canine: 80-120 bpm; Feline: 100-180 bpm**
- Assess via auscultation.
- Bradycardia may indicate excessive anesthetic depth, a response to vagal stimulation or other causes. Heart rates less than 80 bpm in dogs and 100 bpm in cats should be reported to a supervising veterinarian or technician for evaluation.
- Tachycardia may be a response to surgical stimulation and, in combination with other factors may indicate an inadequate anesthetic level. However, some response to surgical stimulation is normal.
- The presence of a beating heart does not necessarily mean that circulation is adequate. Heartbeat should always be assessed in conjunction with 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. 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.
- However, 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** (see 'Monitoring Equipment' for more information)
  - **Normal BP: 120/80 mm Hg (80-120 mmHg systolic, 60-100 mmHg diastolic). Normal Mean Arterial Pressure between 70-90 mmHg**
  - 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., Dinamap), 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).
  - The minimum acceptable BP is 80/40. If the mean arterial blood pressure (MAP) is below 60 mmHg, organ and tissue perfusion is inadequate.
  - 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.
- 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, 'Snuggle Safe' warming disks should be placed under a towel between the patient and surgery table to help the animal conserve body heat. Animals in recovery can be placed on a covered heating pad and covered with a blanket until the body temperature is normalized.
- Care should always be taken with any supplemental heat source to avoid burns or hyperthermia. Heating pads should ALWAYS be set at the LOW setting. Warming devices and hot water bottles should be wrapped in a towel or other barrier. Body temperature should be monitored frequently and supplemental heat should be discontinued when the patient's temperature is 99-100°F.

### **Anesthetic Depth/Patient Status** - (For more information see 'Assessing Anesthetic Depth')

During the course of 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. 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.

### **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
- Stage IV - Overdose
- Stage V - Death

➤ **Reflexes**

- Normal, conscious animals demonstrate predictable protective reflex responses to certain stimuli. These protective reflexes are progressively depressed at increasing depths of anesthesia. Progressive return of reflexes indicates imminent arousal from anesthesia.
- **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 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 swallow 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.
- **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** - (See 'Assessing Anesthetic Depth')

- 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 may be 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 and any problems or abnormalities that may occur.
- 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**

- Observation of the vaporizer setting does not in itself indicate the patient's anesthetic depth as there is a tremendous variation in patient response. The concentration of anesthetic gas received by the animal will vary with the oxygen flow rate and quality of ventilation received by the patient. The vaporizer setting should be continually adjusted according to the depth of anesthesia and status of procedure.
- In general, a relatively high anesthetic dose (2.5-3%) 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.
- 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, increasing the oxygen flow rate and manually ventilating will increase the uptake of isoflurane.
- Periodically monitor the level of isoflurane in the machine. This should be done as part of your pre-anesthetic machine check, several times throughout the procedure and again at the completion of the procedure. If the isoflurane setting is below the half-way mark, be sure to fill the reservoir prior to beginning the procedure.

➤ **Oxygen flow meter setting**

- In general, an oxygen flow rate of 0.5-2 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 oxygen 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.
- The pop-off valve prevents the build-up of excessive pressure or volume of gases in the circuit. If allowed to occur (as when the valve is left in the closed position), this pressure can reach the animals lungs, causing the alveoli to distend and eventually rupture.

## ASSESSING ANESTHETIC DEPTH

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

# PATIENT MONITORING EQUIPMENT

## An Important Note on Monitoring Devices:

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 not rely solely on equipment and should physically check the patient at frequent intervals to confirm that the 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 the anesthetist's own senses.

## 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 ear pieces. Placement after the animal has been intubated avoids the possibility of the stethoscope accidentally entering the trachea.
- Allows auscultation of heart and lung sounds even if the patient is covered by surgical drapes.

## Pulse oximeter (SpO<sub>2</sub>)

- 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 proportion 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. In general a saturation of >95% is good. If it falls to 92-94% you should take note but corrective action may not be necessary, especially if the cause is known and self-limiting. When the saturation falls below 92% action must be taken to improve oxygenation.
- If pulse oximeter readings are abnormally low during anesthesia, consider the following:
  - 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 oxygenation. Impaired peripheral perfusion (low cardiac output, vasoconstriction, hypothermia) may interfere with readings (and indicate issues that need to be addressed).
  - Is the instrument working correctly? Readings may be affected by factors such as probe placement, external light sources and motion.
- Addressing problems with the pulse oximeter:
  - 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 to be normal.
  - Readjust the probe. Especially in cats and other smaller patients, the probe may occlude the blood supply to the area where the clip is placed. Moving the probe to a different location on the tongue may help. Alternatively, the ear pinna or toe web can be tried.
  - Wet the tongue. The probe needs moisture to work properly. If the patient's tongue is dry, remove the probe and wet the area with a few drops of water.
  - Check the battery. If the low battery light and/or alarm is signaled, request a new battery.
  - 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 then replacing and trying again.
  - If you continue to have a problem with the machine. Resume your monitoring of other parameters 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 throughout 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. The lowest pressure that is exerted 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 oscillometric device or a Doppler ultrasound flow detector. Both instruments have advantages and disadvantages. As indirect measurements can be significantly different from direct measurements, results should always be interpreted with caution. Again, trends may be more important than actual readings.
- All patients anesthetized at HSVMA-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.
- To use the oscillometric monitor: 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 approximately 40% the circumference of the limb around which it is placed. Too large a cuff can give artificially low readings; too small will show falsely elevated readings.
- It may be necessary to loosely tape the cuff to prevent the velcro from opening when inflated.
- 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.
- Normal systolic pressure in the dog and cat is approx 120 mmHg (range 80-140); normal diastolic pressure is 80 mmHg (60-100)-together indicated as 120/80. Normal MAP: 70-90 mmHg
- Systolic pressure in the anesthetized patient should be maintained above 80 mmHg, with MAP maintained above 60 mmHg. Below these levels, organ function may be compromised.

## 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. The depolarization and repolarization 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 surface of the body. The electrical signal is picked up by electrodes, amplified and displayed on a screen.
- 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. If the electrodes are placed on each arm a lead I waveform is obtained. Lead II is measured from the right arm to the left leg, and lead III is measured from the left arm to the left leg.
- For anesthetic monitoring, a lead II trace, with positive P, R and T wave is usually chosen.
- The typical ECG lead arrangement for anesthetic monitoring has leads placed on the left (black connector) and right (white connector) arms and left leg (red connector). It is often easier to place the arm electrodes on either side of the chest rather than on the arms. The leg electrode can go on the inside of the thigh where the hair is thin.
- 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. As such, electrocardiograms are not generally the first choice for anesthetic cardiovascular monitoring.

# SURGERY/ANESTHESIA RECOVERY PROTOCOL

'Recovery' includes everything from the time the anesthesia/surgery is ended until the animal is alert, ambulatory and all vitals have returned to normal ranges.

## Recovery Crew

- **Anesthetist** - Responsible for administering anesthesia
  - The anesthetist **MUST** stay with their patient until the endotracheal tube has been removed, at least one TPR has been recorded, the patient is stable and the recovery team has been rounded on the case.
- **Recovery Monitors** - Responsible for care and monitoring of animals until fully recovered and ready for discharge.

## Recovery Responsibilities

### Anesthetist

- Deflate endotracheal tube and assess patient prior to transferring animal to recovery area.
- Transfer to clean recovery bed, untie endotracheal tube and verify that the cuff has been deflated.
- The anesthetist **MUST** stay with their patient until the endotracheal tube has been removed, and at least one TPR has been recorded. The anesthetist should remain in recovery until the patient is cleared by the Recovery Lead.
- Remove endotracheal tube once animal has regained swallow reflex (\*see below).
- 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 has been cleared for transfer by the Recovery Lead, the patient can be turned over to the recovery monitors- Be sure to notify recovery crew of any abnormalities or difficulties encountered during anesthesia, surgery or recovery.

### Recovery Monitors

- 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 period.
- 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.
- Kittens and puppies under 4 months of age 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 karo syrup or honey on the gums.
- Aggressive animals are recovered in a kennel. A CAUTION sign should be posted on the cage. 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. Do not place animals in a cardboard carrier until they are completely recovered as it impossible to monitor an animal you can not see.
- Once the animal is alert/ambulatory and all parameters are within normal range she can be released by the Recovery Lead and returned to a kennel in the receiving area. Before kenneling the animal, examine incision for swelling or oozing and verify that medical record is complete.

### \*Endotracheal Tube Removal:

- 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.
- 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 RVT or veterinarian immediately.
- The animal may cough for a few seconds after extubation, but should quickly resume normal respirations.

### IV Catheter Removal:

- Unless the animal 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. If the animal is feral / aggressive the catheter should be removed as soon as the animal begins to arouse. The time the IV catheter was removed should be noted on the Anesthesia Record.

### Other Recovery Duties:

- Recovery Treatments
  - Check the 'Treat in Recovery' section of the Anesthesia Record for any requested treatments. This section is used by the intake 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. All treatments performed in Recovery must be recorded on the Treatment Record page.
- 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.
- 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.
- Record keeping
  - Review medical record and verify that all pages are completed.
  - Any drugs administered during recovery must be recorded in the recovery record. The drug, amount, route and time are to be noted.
  - All treatments performed in recovery must be recorded on the Treatment Record page.
- Minimize the use of laundry. Doing large amount of laundry is time consuming, expensive and often not even an option. Use newspapers if available or towels/blankets covered with garbage bags. These can be cleaned with disinfectant when soiled and replaced when torn.

## RESPONDING TO ADVERSE EVENTS IN RECOVERY

If at any time you are concerned about the status of a patient's recovery or any monitoring parameter-consult a supervising veterinarian or technician.

### Slow Recovery: Animal not extubated within 15 minutes post op

- Notify Recovery Lead or anesthesia staff.

### Hypothermia: Rectal Temp < 98° F

- Place a heating pad on the LOW setting underneath 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 the animal 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.

### Hyperthermia: Rectal Temp > 103° F

- Direct a fan on low toward the animal. Exam gloves filled with cold water or ice can be placed around the animal and isopropyl alcohol can be sprayed onto the foot pads. Check the animal's temperature every 5 minutes and remove external cooling sources when the temperature is between 100-102° F. Continue to monitor the animal to be sure the temperature remains in the normal range. If the animal is dysphoric or hyper-aroused, do not struggle to obtain repeated temperature readings. Consult Recovery Lead for recommendations.

### Bradycardia: K9 HR < 80 bpm ; FL HR < 100 bpm

- Stimulate activity by gently rubbing the torso and extending limbs.
- If HR < 80 bpm (K9) or < 100 bpm (FL) consult supervising veterinarian or RVT.

### Vomiting:

- Immediately lift the rear legs to allow vomit to flow down and out to prevent animal from inhaling it. Place towels under the animal's rear end after vomiting stops to prevent aspiration if the animal vomits again. Make note of consistency of vomit (watery or undigested food). Alert supervising RVT or veterinarian. Place paper towels under animal's head after cleaning up.

### Hyperactivity/Vocalization:

- Quietly attempt to calm and comfort the animal. Remove all stimuli possible such as lights or noise. Excessive touching/petting may aggravate the situation.
- If the animal does not calm down within 1-2 minutes or there is danger that the animal may injure herself, consult veterinarian or RVT about sedative or analgesic administration.
- Animals who are particularly sensitive to the noise and activity in the recovery area should be moved to a quieter location if possible.

## 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 that the anesthetist remembers that every anesthetic procedure has the potential to cause the death of the animal. In spite of 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
  - Misassembly 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:
    - Assessment of the patient and any potential risk factors
    - Familiarity with side effects and contraindications of different agents
    - Appropriate protocol choice, often including multi-drug use to achieve balanced anesthesia
- Patient related factors
  - Geriatric patients
  - Pediatric patients
  - Brachycephalic dogs/cats
  - Trauma patients
  - Systemic disease (Cardiovascular, respiratory, hepatic, or renal disease)
  - General poor condition

Both human error and equipment problems are generally preventable complications. Proper training and attention will prevent these situations from arising. If at any time you are uncertain about an animal's status, proper equipment use or protocol, do not hesitate to ask for assistance.

Patient related complications can often be prevented by identifying potential risk factors and modifying the anesthetic plan to address the patient's special needs. Any risk factors noted during the physical exam should be noted in the medical record and brought to the attention of the veterinarian or technician in charge of anesthesia prior to the animal being medicated.

## RESPONDING TO PROBLEMS DURING ANESTHESIA

### ➤ 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 O<sub>2</sub>/isoflurane until adequate anesthetic depth 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 setup. Follow the flow of O<sub>2</sub>/isoflurane through the machine and to the patient, checking each tube and connection.
- If you are unable to readily determine the cause-alert a supervisor!

### ➤ 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.
- If you are concerned that your patient is too deeply anesthetized, turn the vaporizer setting down or completely off and alert a supervisor.

### ➤ Pale mucous membranes

- May result from preexisting anemia, blood loss, anesthetic agents which result in vasodilation and hypotension, hypothermia or pain.
- Assess anesthetic depth and other vital signs and alert a supervising veterinarian or RVT.

### ➤ 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. Pulse and blood pressure should be evaluated. A systolic BP < 80 mmHg or MAP <60 mmHg indicates hypotension and poor perfusion.
- If pulse or blood pressure is abnormal, the anesthetist should alert a supervisor and closely observe the animal for other signs of shock.

### ➤ Dyspnea and/or cyanosis

- Dyspnea indicates an inability to obtain sufficient oxygen using normal respiratory effort. Cyanosis indicates inadequate tissue oxygenation.
- Any patient showing signs of dyspnea or cyanosis should be brought to the attention of a supervisor **immediately**.
- 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) or respiratory disease (pleural effusion, pulmonary edema, diaphragmatic hernia, etc)
  - Excessive anesthetic depth such that vital functions are compromised.
- Check SpO<sub>2</sub> reading.
- Quickly evaluate other vital signs and anesthetic depth and equipment setup.
- Once oxygen delivery to the patient and patent airway has been confirmed, turn the vaporizer off and ventilate with 100% oxygen until mucous membrane color and SpO<sub>2</sub> readings return to normal.
- Monitor closely during resuscitative efforts to ensure cardiac arrest does not occur.

- **Tachypnea**
  - Must be differentiated from dyspnea in which respiratory distress is present.
  - Evaluate other vitals and anesthetic depth.
  - 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 CO<sub>2</sub> levels or in response to hypotension.
  - Check CO<sub>2</sub> 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.
  - If tachypnea continues or other parameters are abnormal, alert a supervisor.
  
- **Bradycardia (HR < 80 bpm (K9) or 100 bpm (FL) )**
  - Common causes include increased vagal tone and inhalant anesthetic overdose
  - Evaluate other vital signs and anesthetic depth.
  - If excessive anesthetic depth is indicated, reduce vaporizer setting and continue to monitor all parameters closely.
  - If heart rate remains below 80 bpm in a dog or 100 bpm in a cat, alert a supervisor.
  
- **Tachycardia (HR > 160 bpm (K9) or 200 bpm (FL) )**
  - Causes include light anesthesia, drug induced tachycardia (as a result atropine or glycopyrrolate administration), 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.
  - Evaluate other vital signs and anesthetic depth.
  - 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 cardiovascular depression, which tends to decrease blood pressure. In most cases this depression is in a dose dependent manner.
  - 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.
  - Evaluate other vital signs and anesthetic depth and reduce vaporizer setting.
  - If hypotension persists, alert a supervisor immediately.

➤ **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 CO<sub>2</sub> levels)
- If the patient is not breathing spontaneously, **TURN OFF THE VAPORIZER**, alert a supervisor, and then quickly evaluate other vital signs and anesthetic depth.
- If heart rate/rhythm, mucous membrane color and SpO<sub>2</sub> are normal, the patient does not generally require immediate treatment. 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 CO<sub>2</sub> levels, which act as the stimulus for the patient to resume breathing. Closely monitor the heart rate, mucous membrane color and SpO<sub>2</sub> for 1 to 2 minutes before assuming that a serious problem exists.
- 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 SpO<sub>2</sub> values rapidly fall below 90%.
- If respiratory arrest occurs, a supervisor will take over. However, you should be aware of the treatment procedure and prepared to assist as necessary.

➤ **Cardiac arrest**

- If you cannot hear a heartbeat or see respirations--**TURN OFF THE VAPORIZER** and call for help! It is better to have a false alarm than a dead patient.
- If the animal is breathing, she must have a heartbeat. (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. If you are not able to hear a heartbeat, call for help!
- In an arrest, a supervisor will take over. Your job is to monitor carefully and keep notes on what is being done/drugs being administered, etc. The staff member running the code will tell you what to do, if anything. Otherwise, stay out of the way, and ask questions later.
- You should have a basic understanding of the CPR techniques outlined and be able to follow instructions to assist in resuscitative efforts as needed

## **HANDLING CARDIAC ARREST**

In the event of an arrest, a supervisor will take over. Your job is to monitor carefully and keep notes as to what is being done/drugs being administered, etc. You should have a basic understanding of the CPR techniques outlined here and be able to follow instructions to assist in resuscitative efforts as needed

### **Warning signs of impending cardiac arrest**

- Hypotension, weak pulses, increasingly irregular pulses
- Hypothermia
- Cyanosis
- Decreasing respiratory rate and depth
- Sudden unexplained deepening under anesthesia

### **Diagnosis of cardiac arrest :**

- Absence of a pulse or audible heart beat.
- Apnea or agonal gasping
- Loss of palpebral and corneal reflexes.
- Eyes are fixed, wide open.
- Pupils are dilated and unresponsive to light.
- ECG can be normal when heart is not contracting.  
Fibrillation or asystole = no heart beat



## **Cardiopulmonary Resuscitation-Response Protocol**

The goal of CPR is to deliver oxygen to the lungs by artificial ventilation, and 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:

1. Airway management/breathing
2. Cardiac compression
3. Venous access
4. Drug administration
5. Monitoring vitals and recording events

## **THE ABC'S OF BASIC CARDIAC LIFE SUPPORT**

The essential steps in responding to a cardiac arrest can be summarized with the mnemonic ABCDE (Airway, Breathing, Circulation, Drugs, Evaluation)

### **Airway (A)**

- Check for patent airway by bagging the patient and observing the chest rising.
- Intubate / reintubate if necessary.

### **Breathing (B)**

- Check to see if patient is breathing.
- Administer 2 long breaths, check for spontaneous breathing/pulse
- If not breathing, ventilate with 100% oxygen at a rate of 12-20 breaths per minute (one breath every 3-5 seconds)
- Ventilate to pressure reading of 20 cm H<sub>2</sub>O for dogs; 10 -15 cm H<sub>2</sub>O for cats, or enough to visualize chest rising.

### **Circulation (C)**

- Check for heartbeat or pulse.
- If no heartbeat, then begin external chest compressions at rate of 80-120 bpm (1-2 compressions per second).
  - Right lateral recumbency for small/medium dogs and cats
  - Dorsal recumbency for large dogs.
  - Hand-over-hand position standing above the patient, exert compression on the chest at the 4<sup>th</sup> - 5<sup>th</sup> intercostal space (where elbow meets chest)
  - Thumb and fingers of the same hand can be used for cats/small dogs
  - Displace chest 30% of its circumference
- Coordinating breathing/cardiac compressions
  - One person - two breaths to fifteen compressions
  - Two trained people - one breath to two compressions
- Cardiac compressions are the most important intervention in an arrest. Even if an airway cannot be obtained immediately, compressions should be initiated at once.
- It is also believed that compressions may assist circulation by increasing pressure in the chest, indirectly inducing blood flow (thoracic pump theory). A prolonged compression time (50 -60% of the cycle) favors flow produced by changes in intrathoracic pressure.
- For large dogs, interposed abdominal compression may aid circulation to cranial half of body.
- Each compression should result in a palpable femoral pulse. If a pulse is not detected, the method of compression should be adjusted.
- If external compressions are ineffective-consider open-chest cardiac massage.

## Drug (D) administration:

- Intravenous fluids - given at 10 to 20 ml/kg to offset peripheral vasodilation. More rapid rates of fluid administration are not indicated unless severe hypovolemia exists.
- Commonly used emergency drugs:
  - Atropine - Used as treatment for bradycardia.
  - Dopamine - Increases force of myocardial contractions, increases heart rate.
  - Epinephrine - Increases rate and force of cardiac contractions. Increases systemic vascular resistance and diastolic blood pressure resulting in improved coronary and cerebral blood flow.
  - Lidocaine - Most commonly used to treat ventricular arrhythmias (PVCs or ventricular tachycardia). Used to raise threshold for fibrillation.
  - Naloxone - Narcotic antagonist.
  - Sodium bicarbonate - Treatment for metabolic acidosis.
- Routes of drug administration
  - First choice is a central venous catheter (jugular) which will provide a more rapid onset of effect compared with administration through peripheral catheters.
  - If peripheral catheter is used, external cardiac massage must effectively establish circulation if the drug is to reach the heart.
  - Administration of certain drugs (epinephrine, atropine, lidocaine) into the endotracheal tube lumen allows prompt absorption across the tracheal mucosa and serves as a useful alternate route for drug administration. This is usually done using 2-5 ml of saline as diluent for the drug (at 2 times the IV dosage) administered into the lumen of endotracheal tube, followed by 2-3 large breaths with artificial ventilation.
  - Intracardiac administration of epinephrine is rarely indicated and in fact discouraged. It may be used when the chest is already open. Other routes which permit rapid uptake of drugs include the intralingual and intraosseous routes.
- If ECG is available we can recognize and treat cardiac arrhythmias. Electrocardiographically, there are *three forms* of cardiac arrest :
  - *Asystole* is the absence of any electrical activity (flat line). Initial drug of choice is epinephrine which increases arterial wall tone and peripheral resistance allowing better intrathoracic arterial flow by reducing the tendency of vessels to collapse from the pressure induced by chest compressions. Epinephrine also increases diastolic pressure and renders the fibrillating heart more susceptible to defibrillation. It also diverts blood flow away from nonvital, towards vital tissues.
  - *Ventricular fibrillation* appears as completely chaotic, irregular, bizarre deflections. There are no recognizable P or QRS waves. The treatment is to defibrillate with DC current. Lidocaine and sodium bicarb may then be tried if fibrillations are still present.
  - *Electromechanical dissociation* is present when there is a normal wave form but no effective cardiac output. This form of cardiac arrest carries a fairly poor prognosis.

## Evaluation (E)

- Every several minutes pause to assess the patient
  - Evaluate heartbeat and peripheral pulses, mucous membrane color and CRT
  - Auscult for bilateral lung sounds
  - Run ECG strip
  - Check pupils
  - Arterial blood pressure
- If spontaneous contractions are observed, cardiac compressions should be discontinued, although ventilation must be maintained until spontaneous breathing is established.
- If spontaneous contractions are not observed, external or internal compressions can be resumed, although after 15 minutes they are unlikely to be successful in establishing a heartbeat.
- Resuscitation efforts will be discontinued at the direction of the lead veterinarian.

## SURGERY BASICS

The information presented here is not designed to be an all-inclusive course on surgery. There are numerous text books and web sites on surgery of small animals. Several are listed in the "References" section of these pages, with specific page citations. It is expected that all volunteers participating in surgery at HSVMA-RAVS clinics are familiar with basic surgical techniques and surgical anatomy.

The objective of this outline is to guide you in some aspects of spay/neuter procedures and general surgery that we feel are particularly important. The specific techniques listed are those that are used in HSVMA-RAVS clinics. All volunteers participating in surgical procedures at HSVMA-RAVS clinics must be familiar with these techniques. It is not that we think these are the only safe and effective approaches. You may have experience or training in other techniques that work quite well. However, in order to standardize teaching it is important that all volunteers know and utilize these specific techniques. Variations may be discussed with the veterinarian in charge at the time of the clinic.

If you plan to participate in surgeries at HSVMA-RAVS clinics you will be responsible for knowing all of the following information (including specifically referenced texts) and having practiced all the listed techniques until you are **proficient**. (This means that you can describe when, where and why it would be appropriate to use a given technique and perform the technique without prompting to a minimal degree of proficiency while wearing surgical gloves and maintaining surgical asepsis.) Surgeons are not born or hatched; they are trained just as one would train to acquire any manual skill; we expect that you will dedicate sufficient time prior to the trip to have the basics down so that you can build your skills from there. You will be tested on this information before you are assigned to clinic duties. If you have difficulty in accessing or learning this information please contact RAVS staff ([ravs@hsvma.org](mailto:ravs@hsvma.org)) well in advance of your scheduled trip.

### RESPONSIBILITIES OF THE SURGICAL TEAM

- Before the procedure supplies are gathered (pack, suture material, blade, etc), the surgery table is set up and the patient is prepared
- Veterinary students assigned to surgery 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.
- 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.
- After the procedure, the surgery table must be cleaned and the area prepared for the next procedure, instruments must be washed and the surgical pack wrapped and autoclaved.
- Before the patient leaves the recovery area, the surgeon is responsible for completing the surgery report to note areas of difficulty or complications encountered during the procedure

## PRESURGICAL PREPARATION OF THE PATIENT

**Hair Removal** - Done at induction, before the animal is moved to a surgery table.

- Hair is clipped with a No. 40 clipper blade at least 10 cm in all directions from the planned incision.
- Loose hair is removed with a vacuum before transferring from induction to a surgery table.

### Positioning

- Before beginning the skin preparation be sure:
  - The patient is stable in dorsal recumbency with the head toward the anesthetic machine in appropriate position for lighting and instrument access
  - Anesthetic tubing is properly connected and secure
  - Warming pads are on and additional supplemental heat sources are placed as needed  
Warming devices should be placed under a towel or other covering and should never be placed in direct contact with the patient as serious burns can result.
- 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.

### 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 from the prep tray.
- Rinse with water containing dilute chlorhexidine solution (pale blue 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 'bull's 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 which increases chances of hypothermia.
- After skin prep is complete, finish securing legs and make final adjustments in lighting.
- Open first layer of surgical pack and use sterile technique to drop blade and suture on sterile field after the patient is positioned and scrubbed.

### Preparation of Surgical Team

- The primary surgeon and assistant must be sterilely gowned and gloved for all surgeries except uncomplicated cat castration in which only sterile gloves are needed.
- 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.
- We use an initial traditional chlorhexidine surgical scrub to ensure students are proficient in the technique. Successive aseptic scrubs are done with Avaguard non-rinse hand scrub.
- If you are unfamiliar with techniques for surgical scrubbing or sterile gowning and gloving (closed and open gloving), consult a surgery text and practice a few times in before the clinic. Techniques will be reviewed during clinic orientation.

### Draping

- Drapes are in the surgery packs and are not fenestrated
- The drape is fenestrated after it is placed on the patient.
- There should be a continuous sterile field from the cranial end of the drape to the instrument tray (which is placed behind the patient).
- 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.

## BASIC SURGICAL TECHNIQUE

### Incision

- Use the “finger tip grip” rather than the “pencil grip” for abdominal 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.

### Hemorrhage control

- 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 this disturbs 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 the surgeon places a mosquito forcep (“clamp”) on the offending vessel.
- Do not place clamps on large chunks of tissue or on the epidermis. This causes undue trauma and is ineffective at controlling hemorrhage.
- “Clamps” can be removed after several minutes or when hemostasis is achieved.
- Hemorrhage can always be controlled with pressure AND you cannot fix a problem that you can’t see. If you encounter abdominal hemorrhage:
  - **Do** put pressure on the area with gauze
  - **Do** alert the Surgery Lead immediately
  - **Don’t** just hope things will get better on their own
  - **Don’t** panic

## OVARIOHYSTERECTOMY TIPS

### Locating the linea alba

- Make sure the patient is laying straight on the surgery table in dorsal recumbency. A little extra time making sure that the animal is positioned and stable will make things easier in the long run.
- Palpate the ventral midline. In most animals the aponeurosis of the external abdominal oblique can be palpated. Try to make your skin incision immediately over the linea
- The linea is wider and easiest to locate closer to the umbilicus (at the cranial end of the incision).
- Once the skin has been incised pick up the loose fascia and fat that covers the external rectus sheath with Brown Adson forceps and snip off this tissue with Metzenbaum or Mayo scissors. This will expose the bright white fibers of the external rectus sheath. The linea is at the confluence of these fibers as they travel cranially and medially on the rectus abdominus muscle.
- Removal of subcutaneous fat does not cause any more hemorrhage or ‘dead space’ than blunt dissection, and gives a clearer view of the rectus sheath and linea more efficiently.
- The linea should be located within 2-3 minutes after making a skin incision. If you have been unable to clearly identify this structure, ask for help right away. Failure to incise the linea will make the rest of the procedure more difficult and will result in more potential pain for your patient.

## Entering the abdomen

- Grasp the linea alba with rat toothed forceps and tent the body wall as much as possible. This is important as the spleen can otherwise be lacerated while entering the abdomen.
- With the cutting surface of the number 10 or 15 scalpel blade facing up, use the point of the scalpel to stab through the linea alba. This should be done on patient inhalation and be located about 0.5 cm away from the rat-toothed forceps which are holding the linea in a tented position.
- Have a blunt tipped instrument ready to verify that the abdomen has been entered.
- Once a small hole has been made through the linea alba into the abdomen, the incision can be extended using either scissors or a guarded scalpel.

**Note on incision placement:** Spay incisions are generally made between the umbilicus and pubis. In dogs the incision is made somewhat more cranial than in cats. 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 insure that this important landmark can always be identified. Proper incision placement, based on species, age, body type, and sexual status is the key to successful use of a small incision.

**Note on incision size:** While exposure of the ovaries, uterus, and cervix are important to a successful surgery, larger incisions do have a “down side”. The longer the incision the greater the tissue damage (pain), the greater the likelihood of complications (dehiscence and wound infection), and the greater the surgery time (longer anesthesia and more opportunity for organisms to gain access to the abdomen). More experienced surgeons are able to make an incision further caudally. This allows a smaller incision. If the incision does not allow adequate exposure, it can always be extended. A good rule of thumb for beginning surgeons is to start with an incision of about 2 finger widths in length for cats and small dogs. For medium-sized dogs use 3 finger widths and 3.5 finger widths for large dogs (60 lbs+).

**Suture sizes and applications:** All HSVMA-RAVS clinics use glyconate, (tradename Monomend), synthetic monofilament absorbable sutures with a swaged needle. The following table gives suture sizes used in various procedures.

	<b>2-10 lbs</b>	<b>11- 20 lbs</b>	<b>20 – 40 lbs</b>	<b>40 lbs +</b>
Dog Spay	2-0 (3-0 pediatric) 3-0 skin	2-0 linea alba 2-0 or 3-0 skin	2-0 linea alba 2-0 or 3-0 skin	0 linea alba 2-0 or 3-0 skin
Dog Neuter	3-0	3-0	2-0	2-0
Cat Spay	3-0 linea alba and skin			

**Suture handling** – The following techniques all have applications in soft tissue surgery and must be mastered before participating in surgical procedures at HSVMA-RAVS clinics. You should 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. You DO need to practice. Practicing in distracting situations, such as while watching TV, is a good idea. We are serious about expecting students to be proficient and you will be tested!

These are knots you should be proficient at before participating in surgery:

- Square knot – basic knot for all ligatures and suturing
- Surgeon’s knot – for knots being tied under tension
- Miller’s knot – handy knot for ligatures under tension and in difficult to reach places
- Instrument tie – use of needle holders

These knots may also be covered during clinic orientations

- Aberdeen knot
- One handed tie or Two handed tie

See *References*: Fossum-Common Suture Techniques – Page 49-59

**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. The essential techniques and coordination however can be practiced on any model. You should know and practice the following patterns on cloth, banana skin, cadaver skin or a suture practice model until you are very comfortable with the steps in completing the pattern. You will be responsible for knowing:

- Simple Interrupted
- Simple Continuous
- Cruciate
- Understanding how to bury knots at the beginning and end of patterns

These patterns may also be covered during clinic orientations:

- Colorado or Modified Colorado closure
- Ford Interlocking
- Horizontal OR vertical mattress

### **Application of patterns:**

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”. The final “throw” should be ‘cinched’ tightly to prevent untying.

- 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.
- 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 not necessary in animals with minimal subcutaneous tissue, such as pediatrics
- 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 that most novice surgeons have the most difficulty with. 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, practice this as much as possible. While we do use tissue glue, this compound is designed only to seal skin and is not a substitute for good suture technique.

See *References*: Fossum - Common Suture Techniques: Pg. 49-59

- Suture patterns for closure of the abdominal wall: Pg. 327-330

**Please refer to the following texts for the specifics on spay and neuter surgeries.**

*With minor variations RAVS clinics use the techniques outlined in Fossum's Small Animal Surgery text.*

#### **REFERENCES:**

1. Bojrab, Joseph M. Current Techniques in Small Animal Surgery, fourth edition, Williams and Wilkins, Baltimore, 1998. SF991.C87 1997. ISBN 0-683-00890-0  
Ovariohysterectomy: Pages 489-49  
Suture patterns for closure of the abdominal wall: Pages 327-330
2. Fossum, Theresa Welch. Small Animal Surgery, Second edition, Mosby, St. Louis, 2002. SF911.F67 2002. ISBN 0323012388
  - a. Common Suture Techniques - Pages 49-59
  - b. Ovariohysterectomy and Orchiectomy : Pages 616 – 622. (Note: We use closed canine castration techniques and the "figure 8" knot for feline castration.)
  - c. Celiotomy of the dog and cat: Pages 255- 258. (Note: Though you will not be expected to do an abdominal exploration as described in Table 20-2, it is worth knowing this material. You will not be tested on it.)

**Please read and learn these selections. You will be tested and we WILL expect you to know this material and have practiced the techniques.**

#### **COMMON MISTAKES IN SURGERY PRACTICE AND HOW TO AVOID THEM**

- Proper grip of needle driver and thumb forceps - see above references.
- Always clamp your needle fully in the driver.
- Always pull and check the tension of your closure pattern with every throw, especially on the linea, which should be firmly opposed but not crushed.
- When creating a knot, follow your first throw quickly with a second throw to lock your knot ensuring that your ligature does not loosen inadvertently between throws.
- Avoid excessive use of sponges to check for bleeding in the abdomen, abrasion of the peritoneal surface by surgical gauze is painful and creates adhesions.
- Procedures like finding the linea, entering the abdomen, breaking down the suspensory or removing the broad ligament require you to be concise and definitive in your manipulations. If you have done 3 maneuvers and not accomplished your objective - stop and get help. Trauma and complications result from multiple small or misplaced maneuvers.

#### **GENERAL SURGERY REMINDERS**

- Patient welfare ALWAYS comes first.
- Procedures will be assigned based on experience and skill level. You will not be asked to do anything for which you are unprepared and you will be well supervised. However, it is your responsibility to ask for assistance when needed and to honestly tell a veterinarian when you feel you are in "over your head".
- You are allowed a certain amount of surgical time. Think about what you want to work on. If it is decided student time is up, it is up, no matter where you are in the procedure.
- A good surgeon practices ahead of time and has a series of plans already in mind if things do not go as planned. You should run through the steps of a procedure repeatedly until you know exactly what to do next. Then start mentally practicing what you would do if something went wrong.
- Practice knot tying and suture patterns until they are spinal reflexes. When you have gotten to the point where you can tie knots without looking at your hands, you still need to tie about 500 more.
- You will have lots of supervision, and we will be right there to help and teach. However, you will get much more out of the trip and be allowed to do more if you have practiced ahead of time. Those who have prepared get a lot of responsibility and will learn much more. Those who have not practiced will spend a lot of time watching others. It is unethical to do surgery on a live animal without having done all the practice one can possibly do on a phantom.



# SURGERY PRACTICAL SKILLS ASSESSMENT

ALL veterinary student volunteers, who plan on participating in surgery, will be required to take a practical skills assessment at the start of each trip. The assessment will be done on simple phantoms that volunteers can use at home for practice.

## Recommended practice materials:

- 1/2 or 5/8 inch rubber or plastic tubing (can be found at most hardware stores or lab supplies)
- A blue or green surgical huck towel
- A 6-10 inch long piece of 1/8 inch cord
- Monofilament suture material (2-0 or 3-0) or nylon fishing line (~ 20 gauge)
- Basic instruments (pair of needle holders, curved mosquito or Kelly hemostat, and thumb forceps).

As RAVS clinics use monofilament suture (PDS, Monocryl, Monomend, etc) it is a good idea to practice with either outdated pieces of these suture types or nylon fishing line. The actual assessment will usually be done using 2-0 or 3-0 Monomend with a swaged FS-1 needle.

Any of the various practice boards available can be used to learn and practice these skills. Of course nothing is exactly the same as real skin or tissue, but it is absolutely unethical to do any procedure without practicing all you can, and mastering basic skills, on phantoms first. The simple materials suggested here, and used in the assessment, will provide you an excellent and inexpensive opportunity to develop the basic skills.

## Tips for successful preparation:

- Practice until the procedures become spinal reflexes. Just “figuring it out” is not sufficient.
- You will be nervous during the assessment. Prepare for this by practicing in distracting situations, while being watched, etc. Remember: You’ll be **more** nervous during surgery!
- Practice in a standing position, as that will be the position in which you will be doing surgery.
- Keep your back straight and your elbows at your sides. If you can’t do these simple procedures in that position, you need to practice more.

## ASSESSMENT DESCRIPTION

The following are the specifics of what will be on the practical assessment, along with practice hints. Refer to the Surgery Basics page and referenced required reading for details on these procedures.

1. **LIGATURE:** You will be required to tie a ligature using Monomend suture material on a piece of latex tubing. You will use an instrument tie and may use either a Surgeon’s knot or a Modified Miller’s knot, with at least 4 “throws” (half hitches). Each throw should lie parallel to the preceding one, making a series of square knots and avoiding the slip knot effect (and no “grannies”). The final knot must be tight on the tubing. The short end of the knot should be no longer than 4 inches before the ends are cut.

To Pass: The procedure must be completed in 30 seconds, the ligature must be tight on the tubing, and there must be at least one good square knot in the 4 throws completing the knot.

### Practice hints:

- a. Practice tying ligatures with the tubing at different angles to your body. You will be tested standing, with the phantom on a surgery table, the tubing parallel or perpendicular to your shoulders but you never know what angle you might be in when trying to control hemorrhage.
- b. Learn how to pass suture around a pedicle (in this case the tubing) with an instrument. This allows better visualization when working on small patients. You can use either your needle holders or a curved Kelly or mosquito. I prefer the latter on cats and pediatrics.

- c. 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 if you don’t learn how to keep it gathered in your hand. This is where many students lose most of their time.
- d. Pass the end of the suture **without** the needle around the tubing (“pedicle”). The needle-less end is used for ligating. This is much easier and avoids inadvertent laceration of tissues with the needle.
- e. Train yourself to make a good “square knot” every time you add a throw. This is done by having your hands going in the right direction (which **MUST** become a reflex - if you have to think about it you haven’t practiced enough) and pulling evenly on both ends of the suture as the throw is tightened.
- f. 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. Most people want to pull harder with their “dominant” hand.
- g. Pull your first throw (Surgeon or Miller’s) really tight and watch it to make sure that it doesn’t slip and release tension as the second throw is placed. This is **THE** most common cause of ligature failure.

2. **SIMPLE CONTINUOUS PATTERN / SQUARE KNOT:** 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 (the ones with the cutting surface behind the holding jaws) and may use either rat tooth or Brown-Adson thumb forceps to handle the “tissue”.

To Pass: You will have to complete this exercise in 3 minutes. The final product should have sound tight knots at both ends and apposed towel edges without overlapping. Sutures should be spaced 1/4 inches apart and 1/4 inch from the edge of the “incision”

Practice hints:

- a. 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.
- b. 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.
- c. Pay attention to the same issues of suture control and knot tying mentioned under ‘ligatures’.
- d. 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 and pull it into a granny. Also, 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.
- e. Olson-Hagar needle holders don’t accidentally cut sutures. Surgeons who aren’t paying attention or are clumsy cut sutures accidentally with Olsen-Hagars.
- f. 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 bites from 1/8 inch to 1/2 inch. Space your stitches evenly from 1/8” to 1/2” apart.
- g. When tying the end knot in a continuous pattern, make your last two bites closer together and be sure to grasp the loop in the center to avoid uneven tension when making your knot.
- h. You may pick up your needle following each stitch with your fingers, Brown-Adsons, or needle holders. Each technique has advantages and disadvantages, which we will discuss in rounds. Try all techniques, but pick one, practice and learn it.

3. **FIGURE-8 KNOT:** RAVS clinics use the “figure 8” knot (also called a “clove hitch”) for ligating the cord on cat castrations. Fossum has a good diagram of this and there is a good demonstration in the slide show on this web site. You will be tested on a 6 inch piece of 1/8 inch cord. 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 tie the knot in the cord with a curved mosquito or Kelly.

To Pass: You will have 15 seconds to complete the knot in the clove hitch or figure 8 configurations.

Practice hints:

- a. You should practice the hand motions in this technique until you don't have to watch your hands.
- b. 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.

This is a complete description of the assessment. It will be simple and short (~ 5 minutes). You will be closely observed and you will be nervous. So practice a lot! Student participation and responsibility levels will be defined by the initial results of the surgical assessment and continued practice and accomplishments during suture practice rounds. We want you to learn these techniques and become proficient, but you have to do the preparation and can not put it off until the week before the trip. You cannot successfully “cram” for a surgery practical!

If you have questions about any of these techniques or how to learn them please contact us well before your scheduled trip! (ravs@hsvma.org).

Video demonstrations of components of this practical exam are available on the HSVMA-RAVS website. ([http://www.ruralareavet.org/training\\_av.php](http://www.ruralareavet.org/training_av.php))

## 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 preventative medicine.

Effective communication is a skill that must be practiced and refined over time. 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.

In the veterinary-client relationship you have something very important in common—you both care about and want to help the animal. Recognizing and pointing out something special about their animal can help break the ice with clients. Thank them for bringing the animal in and acknowledge that they are doing a great thing for their companion.

When obtaining a medical history or discussing medical conditions and treatments with a client it is extremely important to use language that they are able to understand. 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 a number of different ways can help the client comprehend what you are saying.

Many clients have not been to a veterinarian before. They may have little knowledge of basic animal health concerns or current preventative health recommendations. Resources and availability of veterinary care vary considerably in each community. 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. 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 by trained personnel who can ask additional follow up questions as needed to obtain an accurate clinical history.

Think about what information you are trying to obtain and phrase questions 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.

A common tendency when taking a clinical 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.

Many of the animals that we treat in the field will be presented by caretakers who do not have extensive information on the animal's background or even daily observations. The animal may live outdoors or roam free much of the time, preventing the caretaker from making close observations. In order 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.

## **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. The most intelligent individuals can become incapable of really absorbing information when they are concerned about their animal's health or safety. Simply asking "Do you understand?" or "Do you have any questions?" though important, is not in itself 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 a number of health or welfare concerns. Attempting to address all of 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 HSVMA-RAVS or a local veterinarian if any questions or problems arise.