

# Fundamentals and Standards of Small Animal Field Clinic Surgery

## The Humane Society Veterinary Medical Association Rural Area Veterinary Services (HSVMA-RAVS)

### Introduction

Clinics designed to function in remote areas require attention to minimally acceptable standards to adequately and safely perform surgery no matter the setting. Although the specific protocols may vary depending on many factors, there exists a minimally acceptable level which all clinics should mandate. This ensures the safety and well-being of the animals, clinic staff and volunteers and maintains quality control over services delivered. The standards applied to the patient on the day of the surgery will affect the immediate outcome of the patient as well as have effects long after the patient has recovered from surgery and returned to their own environment.

Minimally acceptable standards should be established, met and followed for each specific program. If a program cannot maintain minimal requirements for each patient and individual welfare is compromised, then one must reevaluate their approach to a field clinic. It is important all staff acknowledge the seriousness of anesthesia and surgery on every, individual patient. We recognize the wide range of what is considered “minimally acceptable”. With that in mind, the primary article addresses guidelines that represent the minimal standard of practice HSVMA-RAVS applies. Addendums to this article will address specific anesthetic protocols, surgical technique, a clinic supply list and enhanced practices when the ability to implement them exists.

HSVMA-RAVS programs focus on educational enhancement of clinic participants with the goal of demonstrating how to establish and maintain minimal standards. Although HSVMA-RAVS programs involve a significant teaching component, these guidelines are intended for use in any field clinic setting, high volume practice, daily practice or teaching clinic.

### Planning

Working in remote locations requires planning well in advance of the clinic, often beginning 4-6 months prior to the clinic date. Even with great attention to detail, unforeseen circumstances can alter logistics. One must be willing and able to adapt to the circumstances. This may encompass drastically reducing the original goal and intent to possibly cancelling the clinic altogether. The safety of each animal and the safety of each participant must be kept in mind throughout the entire clinic. Planning requires an abundance of time and patience.

**Community organization** - The most important aspect of planning is the observation of cultural sensitivity. The ability to be aware of cultural differences and be flexible in your approach is the key to the success of any clinic. Every attempt should be made prior to a clinic to gain knowledge of the area and develop a community outreach program. In addition, communication with the local veterinary community may enhance the overall effectiveness of the program, establish relationships that may grow and assist the program and demonstrate respect to the local veterinarians.

Language skills are imperative for communication. If participants are unable to speak and understand the local language, translators must be arranged.

**Permit acquisition** - If equipment and medicines are to be imported for use in the clinic, permit acquisition to import is often the most difficult aspect of a clinic. Permits require a tremendous amount of time, patience and communication. Communications can be very limited with people in the destination country due to logistical difficulties.

The export and import rules and regulations vary from country to country. If permits will be required, the permit application process should be implemented at least 3 months prior to the arrival date. Occasionally more time may be necessary. One must take into consideration holidays such as Christmas, New Year's and Easter as well as national holidays such as Independence Day in Latin America and Carnival as government offices completely close down during these times. Permits almost always require a local person capable of communicating with the authorities responsible for issuing permits. Even then, with seemingly all the proper "paperwork" acquired, permission to enter the country with supplies and medicines can be delayed, taxed or even denied. Always have multiple copies of permits and communications with the host country and identification on and in the luggage.

It is best to acquire as much as possible from local sources but this is often cost prohibitive or impossible as some of the necessary supplies may not be available. A detailed manifest will help address many of the questions as to specific equipment and medicines and the quantities to be imported. It also provides a complete checklist of clinic supplies.

The import of controlled drugs warrants special attention. These often require separate permits from the country of origin and the destination country. Controlled drugs should be hand carried to minimize possible loss and the consequences thereof.

It is also advised to check with the airlines for permission to carry certain quantities of medicines and equipment. Some airlines employ weight limits during certain times of the year. Many times luggage is hand inspected. It is advised to have copies of the contents and packing instructions if there are any specific instructions or fragile equipment.

## **Clinic location**

Clinics can be held in just about any location. Variables to address in regard to clinic function:

- Cleanliness- Although clinics can be held just about anywhere, the cleanliness of the area should be established and maintained as best as possible. Field clinics are often held outdoors yet should not excuse attention to cleanliness acceptable for surgery. Address cleanliness prior to the start of any clinic.
- Water availability - Is running water available? Are sinks available? If not, obtain adequate water holding containers for cleaning instruments, surgery prep, tables etc.
- Electricity – Is it available? What current does it use? 110V or 220V? If 220V, adapters are necessary. If no electricity is available is there any kind of battery backup for equipment such as clippers, lights etc?
- Lighting – Is the natural lighting on the site sufficient? Adjunct lighting should be available for early morning, late afternoon or evening surgery and cloudy days. Headlamps are essential.
- Protection from the elements – Protection from sun, rain and wind must be addressed. Additional sources of heat may need to be supplied for surgery, recovery or ill cases.
- Adjunct supplies:

- Tables for surgery and other supplies. Surgical tables will need to be of an appropriate height or adjustable.
- Sharps containers.
- Trash collection and disposal.
- Disposal of biohazard material.
- Cages.
- Laundry.
- Cleaning supplies.

## **Caseload**

Caseload acquisition is usually determined by the local organizer. This will involve advertising the clinic, identifying animal holding capabilities and organizing animal transport, if necessary. The veterinarian of record determines which cases are surgical and how many can safely be done on any given day. Selection and numbers will vary based on staffing, anesthesia capabilities, availability of supplies, and logistical influences. Communication between the clinic organizer and lead veterinarian is imperative but final decision on all surgeries is at the discretion of the lead veterinarian.

Do not put more importance on total numbers, precluding individual animal care. This may involve learning to say “no”.

## **Volunteers**

One person should be designated to oversee the clinic but all final decisions in regard to animal care should rest with the lead veterinarian in charge.

The number of experienced veterinarians, veterinarian technicians, clinical assistants and volunteers should be sufficient to ensure adequate standard of care and safety to the patients and staff. Caseload will be determined by adequate staffing.

Language skill availability should be sufficient to ensure proper communication.

## **Pre-clinic meetings**

A meeting of all participants should be held prior to the beginning of any field clinic. This identifies who is in charge of the clinic and identifies other key clinic participants which will help foster good communication throughout the clinic. In addition, this allows discussion of the standards to be adhered to throughout the clinic.

An additional meeting should be held with all credentialed veterinary professionals to discuss analgesic, anesthetic and surgical protocols, emergency protocols and an approach to possible surgical complications. Volunteers from developed countries should be aware that many of the adjunct equipment and diagnostics readily available in their respective clinics are often, and usually, not available in a field clinic. Some volunteers may not have participated in field clinics before and much of the approach to the clinic may be foreign to the veterinary work they may be familiar with. This includes the drugs used for anesthesia as well as something as basic as calculation of fluid rates in drops/second.

## **Medical Supplies**

**Supplies**- The medical supplies needed to address animal care will be acquired locally and/or imported. The primary factors of budgetary constraints and local availability will dictate specific acquisitions. A checklist will allow the organizers to address specific needs and allow determination of local acquisition versus importation.

Anesthetics and pain medicines warrant special attention. It is important to recognize local access to anesthetics and pain medications is often limited due to cost and/or availability. The veterinarian of record should be familiar with what anesthetics and pain medications the local veterinary community employs. If additional medications are indicated to adequately address anesthesia and pain management, plans should be made to import such medications.

Specific anesthesia and pain management protocols will be addressed under anesthesia and in an addendum.

**Sterilization of surgical equipment** - Methods to sterilize instruments and supplies should be determined in advance of the clinic. Many clinic sites will not have access to an autoclave although they may have access to a pressure cooker. If there is no access to either, plans need to be made to have sterile drapes and gauze available prior to the start of the clinic. Cold disinfecting is acceptable for surgical instruments if done properly.

### **Required sterile equipment and supplies**

- Instruments
- Gloves
- Gauze
- Suture material and blade
- Drape
  - Cloth greater than 270 thread count
  - Paper impermeable to water

### **Thermal sterilization**

Steam sterilization is recognized to be the method of choice for sterilization of equipment and supplies when possible. An autoclave or pressure cooker will kill all viable organisms including spores, when done at the correct time and temperature. Any person operating either machine needs to be familiar with the specifics of the individual sterilizing machine. Attention needs to be applied in regard to time of cycle, temperature and ventilation in order to assure all microorganisms, including spores, are killed. Instruments must not be clamped for adequate sterilization. Indicator strips are available to ensure adequate sterilization has been obtained inside the pack.

Autoclaves are expensive and usually difficult to maintain or repair in remote locations. Pressure cookers lend themselves well to remote work. They are relatively cheap and easy to maintain. They can be purchased as either electric or gas.

#### Minimal acceptable autoclave and pressure cooker times and temperatures

- Autoclave
  - 121° C (250° F) at 15 psi for 30 minutes
  - 132° C (272° F) at 15 psi for 15 minutes
- Pressure cooker
  - 121° C (250° F) at 15 psi for 30 minutes
- Equipment properly wrapped in material permeable to steam
  - Cloth minimal 270 thread count
  - Paper durable under steam heat

Dry ovens have limited usefulness as they require specific steribags and/or metal or glass containers in order to obtain adequate sterilization. Cloth wrapped instruments and drapes and not enclosed in a metal or glass container will burn if sterilized at the appropriate temperature in dry ovens. Indicator strips specific to dry ovens are available to ensure adequate sterilization.

#### **Chemical Disinfecting**

Although steam sterilization is recognized as the preferred method of sterilization of equipment and supplies, chemical disinfecting, when proper instructions are followed, is an acceptable method for disinfecting instruments for surgical procedures. Disinfecting solutions kill most microorganisms except spores when done properly and according to manufacturer recommendations. It is important to understand the chemical properties of the specific disinfecting solution in order to avoid side effects such as chemical peritonitis. There is a large product list based on germicidal activity (high to low). Several commercial products such as Cidex, Benz All or Surgical Crit are available.

#### Minimally acceptable standards for chemical disinfection

- Solution prepared to manufacturer's instructions
- Instruments clean and dried
- Total immersion
- Unclamped
- Timed according to manufacturer's instructions
- Removed with sterile hemostat
  - Must know solution properties and instruments rinsed if indicated by MSDS/manufacturer's directions prior to use in abdominal cavity to avoid chemical peritonitis
- Placed on sterile surface

#### **Pre-operative guidelines**

Spays and castrations are almost always elective procedures. The risks versus the benefits of surgery must be considered in each case with the final decision resting with the veterinarian of record.

**Disease awareness** – Awareness of the incidence and frequency of diseases in the local population is important for many reasons. Rabies is always a concern, especially in areas where rabies prophylaxis is minimal. Protocols must be in place should a bite occur.

Other infectious diseases will also be more prevalent where routine vaccination is lacking. Vector borne diseases such as Erlichia will also likely affect the health of your patient. Parasite control is not only minimal to non-existent, but sheer parasite loads are often clinically significant. Participants should be aware of which vaccines are locally available, to what degree the local population is vaccinated, and the clinical effects of common diseases in the area.

**Records** – A record is required on every animal admitted to the clinic. Records provide a written log of patient and owner data and physical parameters with which to decide if the animal is a surgical candidate. Feral or extremely aggressive animals must have a record even if they cannot be examined prior to sedation and/or anesthesia and their status noted on the record. Feral or extremely aggressive animals are examined after sedation or anesthesia, prior to surgery.

Records should contain the following information:

- Owner name, address, contact information and informed surgical consent
  - Communicate with the owner to assure understanding of procedures to be performed.
  - Local literacy rate should be considered.
- Patient information
  - Name, species, breed, age, weight, physical exam findings.
  - Every effort should be made to obtain an accurate weight on each patient.
- Medical history
  - It is recognized that a medical history may not be possible on all animals such as ferals or an owner with an unknown history of their pet
- Physical exam results
- Medications administered, strength of medications, dose and times of administration
  - Vaccines
  - Analgesics
  - Anesthetics
  - Antibiotics
  - Dewormer
- Anesthesia record
- Surgical record
- Recovery notes
- Post operative instructions

**Physical exam** – All animals must receive a physical exam prior to undergoing anesthesia and surgery. Exceptions to this will be feral or extremely aggressive animals.

Often field clinics are held in impoverished areas. A record and physical exam demonstrates the care, dedication and respect each animal receives and establishes a good reputation within the

community. This in turn often increases the value and worth of the animal in the owner's eyes and the value of the clinic in the community's eyes.

Many animals in a field clinic may not be in the best of health. Often no preoperative diagnostics are available. A good physical exam may identify potential problems which can be addressed accordingly, minimizing complications.

The findings on physical exam will determine the appropriate anesthetic and surgical protocols. Pediatric, geriatric, pregnant or metabolically compromised animal will need special planning.

Minimal data to be recorded:

- Temperature
- Pulse rate and quality
- Respiration rate and lung sounds
- Capillary refill time and mucous membrane color and texture
- Exam of all other systems for clinically relevant findings
- Weight
  - An accurate weight is needed to calculate the correct dose of any medication to be administered. A baby scale or fish scale can be used in animals under 4.5 kilograms. A weight scale can be used for animals greater than 4.5 kilograms.
  - It is also important to consider body condition score (BCS) with regard to analgesic and anesthetic dosing. Certain medications, especially anesthetics, are more accurately dosed and are metabolized based on lean body weight versus overall body weight. Experienced staff should assign a BCS score to more effectively address analgesia and anesthesia.
  - BCS guide: <http://www.purina.com/dogs/health/bodycondition.aspx>
- Reproductive tract:
  - Verify sex
  - Males:
    - Two palpable testicles in the scrotal sac
    - Observe for transmissible venereal tumors (TVT's) on the penis or penile sheath. TVT's can also occur in the mouth. TVT's are common in areas with a high population of intact dogs.
  - Females:
    - Note if pregnant or in heat.
    - Observe for vaginal swelling, discharge or the presence of transmissible venereal tumors.

**Food and water** - Normal preoperative instructions are to withhold food for eight hours prior to admission to the clinic. It is not needed, nor recommended to withhold water prior to admission, especially as the environment of a field clinic can contribute to dehydration.

**Pediatrics** – Pediatric patients are defined as a patient less than 16 weeks of age. Although normal pre-operative instructions are to withhold food for 8 hours prior to surgery, pediatric patients are the exception to this advice. They are much more prone to hypoglycemia. They may not be taken to

surgery for hours after presentation. Their complete eating history may not be known. Pediatrics should be fed two to four hours prior to surgery. If surgery is done within two hours of presentation, their blood glucose level can be augmented by applying honey or Karo syrup to the gums. Glucose/dextrose solutions should never be given by any other route than intravenously or orally.

**Thermoregulation** -Ambient temperatures in a field clinic can range from extremely cold to very hot. Anesthesia and surgery disrupt the normal thermoregulatory mechanisms and typically cause the patient to become cold. Inattention to thermoregulation of the patient produces significant and often avoidable complications and delays recovery.

Thermoregulation is greatly overlooked in many field clinics. It is the most common post-operative complication. Methods to address thermoregulation include:

- Monitoring temperatures intra-operatively and in recovery:
  - The use of a digital thermometer in the nostril intra-op gives a general idea of body temperature.
- Placing material between the animal and table surface such as newspaper, bubble wrap or a dry towel.
  - Warm, ambient temperatures are not conveyed to the table surface. The material of the table surface may contribute to an already disrupted thermoregulatory mechanism. Cool or cold ambient temperatures can worsen this and may require additional attention to thermoregulation. In addition, heat loss from an animal to the table surface can be significant, even if the ambient temperature is high. This is especially important in cats, small dogs and pediatric patients.
- Keep patients warm and dry. Wet animals are much more prone to hypothermia.
- Keep heat sources available such as socks filled with rice and warmed in a microwave, warm water bottles, heating pads etc.
  - NEVER put a heat source directly against an animal's skin as they are very easy to burn.
- Minimize the use of water and cold prep solutions. Excess prep liquid should not be squeezed onto the surgical surface. Alcohol greatly and rapidly lowers body temperatures. Routine use is not recommended.
- Intravenous or subcutaneous fluids
  - Fluids at room temperature are colder than a normal dog and cat's body temperature and can contribute to hypothermia.
  - Warm subcutaneous fluids may help address hypothermia.
  - Room temperature subcutaneous fluids may help address hyperthermia.
- If working in an extremely hot environment with minimal to no ventilation, employ methods to keep body temperatures within acceptable parameters.
  - Use fans, cool floors, IV fluids, cool water bottles



## **Analgesia**

Analgesia is defined as the relief of pain without the loss of consciousness. It is often overlooked, inadequate or inhumane. All animals undergoing surgery should receive at least one analgesic. It should be understood how and when to use them. Participants should be aware of the analgesics available, modes of action, doses, side effects and contraindications. Availability should be addressed accordingly, whether acquired locally or imported.

Pre-emptive analgesia refers to addressing pain relief prior to inciting pain. This approach prevents wind-up pain, decreases the perception of pain, reduces post-operative pain and reduces the amount of pain medications needed post-operatively. If a patient is treated before they are painful and agitated, they are much easier to handle. This may be a bigger factor in a field setting as the environment is often much more stimulating with noise, light and activity.

Multimodal analgesia is the combination of several analgesics throughout the procedure. This provides a broader approach to overall pain management and synergistically increases the overall effects of pain medications while reducing the amount of each medicine used. If access to pain medication is limited, even a combined use of a non-steroidal anti-inflammatory (NSAID) and a local block greatly enhances pain management.

Medications commonly used in pain management are opiates (morphine, hydromorphone, buprenorphine and butorphanol), opiate-like (tramadol and nalbuphine), alpha-2 agonists (xylazine and dexmedetomidine), non-steroidal anti-inflammatories (NSAIDS) such as ketoprofen, carprofen (Rimadyl), deracoxib (Deramaxx), firocoxib (Previcox), meloxicam (Metacam), and local anesthetics (lidocaine, carbocaine, bupivacaine). Opioids, although an ideal pain and premedication, are rarely available or affordable by the local veterinary professionals. Opiate like substances such as tramadol are often available and affordable through local pharmacies.

Short and long acting steroids such as dexamethasone and depomedrol should never be used as analgesics for surgical procedures.

Method and time of delivery also affect overall effectiveness. Pain medicines are given pre-operatively, intra-operatively, and/or post-operatively. Common routes of administration are subcutaneous, intramuscular, intravenous, topically or by constant rate infusion.

Anxiolytic medications are used to reduce stress. Although most are not specifically analgesics, when used in conjunction with analgesia, overall pain management is increased as well. Medications commonly used as anxiolytics are ace-promazine, alpha-2 agonists, which are also considered sedatives, and benzodiazepines such as diazepam and midazolam.

## **Anesthesia**

Balanced anesthesia involves proper analgesia, loss of consciousness and muscle relaxation and immobility. No matter the setting, anesthesia needs to be adequate and humane. Surgery cannot be done without a surgical plane of anesthesia. There should be no vocalization or movement throughout the procedure.

The pace of the clinic will depend on many factors but the most important factor will be anesthesia. The time necessary to conduct procedures as safely as possible and the availability of skilled and knowledgeable volunteers will be the most important factors affecting anesthesia.

Anesthesia in a field clinic will be either by injectable protocols or by inhalation anesthetics. Many foreign countries or remote places have no access to gas anesthesia machines. Therefore injectable anesthesia is the only manner to induce anesthesia. It is not necessary, nor often not an option, to have the latest, most expensive anesthetics, sedatives or analgesics in order to achieve safe and effective anesthesia. Procedures can be done humanely with some older drugs that are relatively inexpensive and are readily available.

It is extremely important to be familiar with what drugs are available and if functioning and calibrated gas anesthesia machines are available. If gas anesthesia is not available, participants must be familiar with injectable anesthetic protocols, mode of action of the drugs involved in the anesthetic protocol, doses, including top off doses if indicated, the range of their effects pre-op, intra-op and post-op and recovery times, side effects, contraindications and how to manage complications.

Choosing an adequate and humane anesthetic protocol involves a multimodal approach to analgesia and anesthesia. Sedatives are often used as part of an anesthetic protocol but it is important to understand the difference between anesthesia and sedation. Sedation is the induction of a relaxed and easy state. Some commonly used drugs are ace-promazine and alpha-two agonists such as xylazine and dexmedetomidine. Anesthesia is the loss of the ability to feel pain, inducing a state of unconsciousness. Sedatives can and should be an important part of an anesthetic protocol but should never be the sole agent for surgery. Non-steroidal anti-inflammatories (NSAIDS) and local or splash blocks with lidocaine or bupivacaine are almost always available and compliment a multimodal approach to analgesia and anesthesia.

Primary causes of ineffective analgesia and anesthesia are the drugs used (inappropriate drug selection or quantity) and/or surgical skill. Surgical skill affects surgery time and tissue handling. Rough tissue handling induces more post-operative pain.

**Monitoring anesthesia** – Anesthesia should be monitored to anticipate if/when more drugs may be required and to assist in patient assessment and to identify pre-operatively, intra-operatively or post-operatively complications. The clinic staff must have the ability to and be prepared to address rapid changes in the depth of anesthesia. If using an injectable protocol, “top-off” doses and methods of delivery should be determined for each patient prior to inducing anesthesia. If more anesthesia is indicated during the procedure, intravenous administration is indicated. If an intravenous catheter is not in place, one should be prepared to identify and use an available vein for the appropriate administration of a toff. An ambu bag and endotracheal tubes should be available to assist respiration if need be.

**Monitoring the patient** – Field clinics often lack advanced monitoring equipment. An experienced person monitoring an animal with their eyes, ears, hands and a good quality stethoscope is the best monitoring device and often all that is required. Additional equipment such as a pulse oximeter or blood pressure machine is desired but often not available. Continual assessment of multiple parameters by an experienced person ensures greater anesthetic safety and effectiveness for the patient.

Vital parameters to monitor:

- Pulse rate, rhythm and quality
- Respiratory rate and pattern
- Capillary refill time and mucous membrane color
- Jaw tone
- Eye position and pupil size
- Temperature

**Anesthetic protocols** – Anesthetic protocols will vary depending on the use of inhalation or injectable anesthesia, the availability of specific supplies and equipment such as medical grade oxygen, endotracheal tubes and intravenous catheters, economic concerns, technical skill and the individual case. At a minimum, each patient should receive an analgesic and an anxiolytic/sedative (which may be the same drug as the analgesic) prior to induction. Upon induction, each patient should achieve a surgical plane of anesthesia and in recovery, receive a reversal agent if reversal is indicated. Basic emergency drugs such as atropine, epinephrine and diphenhydramine and reversal agents should always be on hand.

Many field clinics have a greatly restricted anesthetic pharmacy which, in turn, restricts the available protocols. Availability depends on local economic factors and/or the specific budget of a clinic. It may be that the only drugs available for surgery are xylazine, ketamine and an NSAID. These can be used in an acceptable protocol if the minimum standards are applied.

Most surgical procedures in the United States are done with inhalation anesthesia. Therefore, participants in field clinics may find themselves faced with using anesthetic protocols that are unfamiliar to them. There must be at least one veterinarian or credentialed veterinary technician familiar with the anesthetic protocols used in the field clinic. If the majority of the participants are not familiar with the protocols in place, time should be devoted to discussing the protocols before surgery begins. An addendum to this article will provide several injectable and inhalation anesthetic protocols HSVMA-RAVS has employed in various field clinics.

**Adjuncts to anesthetic protocols** –The routine use of several anesthetic adjuncts such as endotracheal tubes, intravenous catheters and fluid administration will also be affected by availability, economics and technical skill.

**Endotracheal intubation** – Every effort should be made to incorporate the routine use of endotracheal tubes in order to maintain a patent airway. It is recognized that this may not always be possible due to the factors mentioned above. Technical skill is required to safely perform endotracheal intubation. The lack of technical skill can be detrimental to the animal and the safety of the clinic. The first system addressed in any emergency is the establishment and maintenance of a patent airway. At a minimum, endotracheal tubes as well as a laryngoscope and the technical skill to insert an endotracheal tube should be available for emergency intubation.

Injectable anesthetic protocols bypass the specific need for an endotracheal tube to administer anesthesia. However, it is highly recommended to have an endotracheal tube in place when using injectable anesthesia throughout the surgical procedure to assist in ventilation and maintenance of a patent airway. Endotracheal intubation allows assisted breathing via an Ambu bag if there is a concern

for inadequate ventilation. The medical history of many patients admitted for surgery is often incomplete for a variety of reasons. Endotracheal intubation also helps prevent aspiration if there is vomiting, regurgitation, or increased oral and tracheal secretions during anesthesia.

**Intravenous catheters** - The routine use of intravenous catheters is cost prohibitive to many field clinics. Technical skills are also required to safely place an IV catheter. If injectable anesthesia is the protocol of choice, an intravenous catheter allows for the safe delivery of drugs throughout the procedure. If not routinely used, a recognized veterinary professional must be available to place an intravenous catheter. This is especially important in an emergency situation when physical parameters may increase the technical skill required to insert a catheter.

**Fluid administration** - Many animals presented for surgery in field clinics are not in the best of health, are dehydrated or metabolically challenged. Although it would be ideal for each patient to receive intravenous fluids, this is not always possible. At minimum, each case should be evaluated as to its specific fluid needs. If an animal's physical exam reveals the animal should receive fluids either prior to, during or after a surgery, appropriate therapy should be implemented.

It must be remembered that access to fluid pumps is almost never an option. Veterinarians and technicians should have the ability to calculate and administer an appropriate fluid rate based on drops per second. A pre-constructed chart by weight can greatly aid in this process and minimize human error.

**Emergency preparation** - Sterilizations in any setting, but especially in a field setting, can be complicated. Every clinic should be prepared to address emergencies or complications that may arise. Emergency drugs and procedures should be established and discussed prior to the start of the clinic. Additional items to have on hand include:

- Endotracheal tubes and laryngoscope
  - A recognized veterinary professional and the equipment and technical skill must be available to insert an endotracheal tube in an emergency situation.
- Ambu bag
  - Essential for assisted breathing if no oxygen is available.
  - Often available free from human hospitals or are available fairly cheap on eBay
- Emergency drugs
  - Minimally, atropine, epinephrine and any reversal agents.
  - Diphenhydramine and dexamethasone should be on hand in case of acute anaphylactic reactions.
- Intravenous catheters
- Intravenous fluids
- The ability to address thermoregulation
- Additional anesthetics and pain medications
- A chart of emergency drug doses by weight so as to minimize time performing calculations

**Surgical risk patients** – Cases presented in field surgeries are often more of a surgical risk. The desire to address as many animals as possible is certainly a goal but should not come at the expense of individual cases. Patients deemed to be high risk should be discussed with the owner prior to the procedure and also need final approval from the veterinarian of record prior to admission. These include pediatric, pregnant, physically or metabolically compromised, or geriatric patients. Sometimes it is in the best interest of the animal to not perform a surgery.

## **Surgery**

Minimally acceptable standards for performing surgical sterilization and skills required to perform ovariohysterectomy and castration:

### **Patient preparation**

- Hair must be atraumatically clipped/removed a minimum of 5 cm from the incision site
  - Recommended #40 blade or shaving
- Surgical preparation of the shaved skin must be disinfected with appropriate surgical scrub.
- Chlorhexadine or povidone-iodine scrub 1:1 dilution at least two scrubs with 30 second contact time and three with 30 second and 1:10 dilute chlorhexadine.

### **Table positioning**

- Clean surface with towel or clean padding/warmth placed under the patient to retain heat and prevent muscle damage or pain.
- Ventral midline approach
  - Patient must be positioned in dorsal recumbancy with legs comfortably secured away from surgery area
- Flank approach
  - Positioned in left or right lateral recumbancy with legs gently secured from surgery site

### **Surgeon Preparation**

- Attire – clean scrub top (or similar cloth)
- Cap and mask for abdominal procedures and adult canine castrations
  - Gown optional
- Surgical hand and arm scrub
- Sterile surgical gloves – single use.
  - Surgeon must know how to don and maintain sterility

### **Minimum surgeon knowledge base**

- Definition of the surgical procedure
  - Females
    - Minimally, both ovaries completely removed
      - Ovariectomy – complete removal of both ovaries

- Ovariohysterectomy – complete removal of both ovaries, both uterine horns and the uterine body
  - Males
    - Complete removal of both testicles
      - Monorchid – one descended testicle
      - Cryptorchid – no descended testicles
- Knowledge of surgical procedure to be performed
- Identify and understand the use of surgical instruments and materials.
- Ability to tie secure ligatures (square, surgeon's, Millers knots)
  - It is essential to tie square knots
- Anatomy of the surgical procedure
  - Allows identification of normal versus abnormal anatomy and how to surgically address differences.
- Peri-surgical skills
  - Recognize contamination and how to respond.
  - Know how to isolate structures to find the source of hemorrhage and apply hemostasis.
  - Recognize complications and know how to respond.
    - Hemorrhage
      - Primary due to surgical complications
      - Secondary due to disease and/or parasites
    - Surgical complications
    - Physical state – diseases/parasites

**Asperis** - Asepsis must be established and maintained throughout the surgical procedure.

- Fundamental to safe surgery and decreased post-operative complications
  - Consequences of non-sterile technique may not be immediately visible.
  - Antibiotics cannot, nor should they, make up for poor sterile technique.
- Relatively cheap and easy to establish and maintain.
  - The cost to address non-sterile technique is far more than the cost to establish and maintain.
    - Economic cost
    - Pain and suffering of the animal
    - Relationship with the community
- Sterile field
  - Anything on or above the sterile drape is considered sterile and should not be touched by anyone in the clinic other than surgeons or assistants with sterile surgical gloves.

## Postoperative care

Post operative management is vital to the overall care and safety of clinic patients. Monitoring the patient throughout recovery allows the animal to wake up as safely as possible and can also identify possible post-operative complications as soon as possible.

**Recovery** – The veterinarian in charge of the clinic must ensure continuous and direct observation throughout the recovery process is present to monitor for signs of hemorrhage, respiratory or cardiac complications and pain. Experienced volunteers are required for the safe and effective recovery of clinic patients. Experienced volunteers are able to recognize abnormal recovery parameters, identifying possible complications.

In addition, recovery is the most common place where volunteers are bitten. Lack of experience with animals recovering from anesthesia increases the possibility of a bite occurrence. Bite occurrences are important in any setting but may be even more important in a field clinic due to unknown vaccination status, a limited ability to quarantine the animal and often an inability to follow up on the case and the possible infection that may result in the person bitten.

Common situations in which bites occur

- Extubation
- Sudden return to consciousness
- Pain
- Inappropriate approach to monitoring vital parameters, especially capillary refill time and mucous membrane color.

Experienced personnel can address emergence delirium and differentiate between pain and anxiety.

Although it is advisable to recover animals in a clean, confined, quiet area, this may not be possible in a field clinic setting. Recovery areas may be just about anywhere with adequate space to allow the animals to recover but animals must be recovered in a secure, level, (ideally floor level) surface. Increased stimulation from noise, activity and light may affect recovery. Recovery assistants should take this into consideration when recovering an animal. Animals should be monitored until they are ready to go home or can be placed in a safe holding pen.

Any questions on recovery monitoring and parameters should be addressed by a veterinarian or an experienced veterinary technician. Reference ranges of normal recovery parameters should be available to assist volunteers.

Feral or extremely aggressive animals will be the exception to hands on monitoring. Although it may not be possible to directly handle a feral or aggressive animal, they should be observed to assure they are recovering in an acceptable manner. If indicated, any anesthetics that can be reversed to hasten recovery should be administered.

Recovery must monitor the following parameters:

- Temperature
  - Thermoregulation is the most common post-op complication. Hypothermia adversely affects the circulation and delays recovery. Keep patients dry and warm and use supplemental heat sources if indicated. Animals often urinate post-op. Wet bedding or

newspaper should be changed as soon as possible. Hyperthermia can be addressed by fluids, fans, ice packs, cool floors.

- Do not continue taking a temperature if it creates stress to the animal and danger to the handler.
- Pulse rate and quality
- Respiration rate and rhythm
- Airway patency
- Capillary refill time and mucous membrane color
- Signs of pain and anxiety
- Neurological status and the degree of arousal or sedation
- Movement and the ability to ambulate
- Check the incision for any discharge or swelling

Pediatric patients deserve special attention. They are much more prone to hypothermia and hypoglycemia. They should be fed a small amount of food as soon as it is safe to do so post-op. Keep them warm and address hypothermia accordingly.

**Post-operative instructions** – Post operative instructions must be provided and explained in a language the owner understands. Literacy may be a factor in the community. Written instructions must be provided but should also be explained in case the owner cannot read. Some people will not divulge that they cannot read. A contact name and number must be provided to the owner to address possible post-op questions or complications.

It must be recognized that patients from a field clinic arrive and go home in manners very different than where you may live. As many animals may not be completely recovered from anesthesia, every care must be taken to assure the animal has a safe method of transportation home. It may be unconventional, for instance in a wheelbarrow or in a basket with the owner on the back of a horse.

Oftentimes, the patient lives outdoors without any means of confinement. Post-operative instructions should include the discussion of the need for confinement in a warm, dry place for the first 24 hours and preferably for 7-10 days.

## **Humane Euthanasia**

Humane euthanasia can be a difficult subject to address in any culture. It may be an even more difficult subject in the country or place you are working due to cultural, religious or personal reasons. The subject should be addressed with all clinic participants prior to the start of the clinic. The need to conduct humane euthanasia may present itself at some time over the course of the clinic and may be a source of emotional stress or a cultural difference with some clinic participants. It would be best to address the topic prior to the start of the clinic so as to minimize possible conflict.

Many countries do not have access to euthanasia solution or the solution available is much weaker than solutions routinely used in the United States. The ability to address euthanasia humanely should be established prior to the clinic either with adequate drugs acquired locally or imported.



## Conclusion

Field clinics are conducted all over the world in a variety of clinical settings. The veterinary profession owes it to each and every animal presented for surgery anywhere to be treated with the respect they deserve and to acknowledge the seriousness of anesthesia and surgery. The facilities and supplies will vary from site to site, clinic to clinic but minimal standards should be established for each specific clinic and maintained throughout the clinic.

Lack of adherence to minimal standards can adversely affect the patient's outcome, community perception of the clinic and future clinics and undermine the trust of the community. Many people devote hours of their time and skill to address overpopulation throughout the world. It is often a difficult, time consuming and sometimes frustrating process. Proper planning can certainly help address all of the above. These guidelines are intended for the use of everyone from clinic organizers to veterinarians practicing in often less than ideal conditions. By implementing a minimal standard of care, all animals can receive the care they deserve no matter the location.

## Suggested Reading:

1. Fossum, Theresa Welch, et al: *Small Animal Surgery* 2002; 1: 1-59, 93-101.
2. Robertson, Sheliah A. *The Big Chill* North American Veterinary Conference presentation 2009.
3. Looney, AL et al. *The Association of Shelter Veterinarians Veterinary Medical Care Guidelines for Spay-Neuter Programs*, JAVMA 2008; 233: 1-13.
4. Block, Seymour D, *Disinfection, Sterilization and Preservation*. 5<sup>th</sup> Edition. Lippicott Williams and Wilkens, Baltimore, 2000

## Suggested Websites:

Rural Area Veterinary Services: [www.ruralareavet.org/volunteer/training/materials](http://www.ruralareavet.org/volunteer/training/materials)

The Humane Society Veterinary Medical Association: [www.hsvma.org/fieldservices/volunteernow](http://www.hsvma.org/fieldservices/volunteernow)

The American Society for the Prevention of Cruelty to Animals: [www.aspcapro.org/spay/neuter](http://www.aspcapro.org/spay/neuter)

The Humane Alliance: [www.humanealliance.org/resources](http://www.humanealliance.org/resources)

Veterinary Anesthesia Support Group: [www.vasg.org](http://www.vasg.org)