



# Spay/Neuter Training Reference Guide

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## 1: Introduction

Welcome to SNPLA's Veterinary Training Program! We are excited to offer our veterinary community the opportunity to come train with us in high-quality, high-volume spay/neuter (HQHVSN) surgical and clinical techniques. We recognize the need for our colleagues to have these types of professional experiences in order to build confidence and feel competent in the surgery suite.

The information provided is only a general guide and not a complete operations manual. The purpose is to augment our in-person training sessions since we know that there are numerous program designs with a variety of needs. Hopefully the information provided will be of some use.

### Program Goals

- To introduce veterinary professionals (surgeons, nurses, etc) to the principles and methods of HQHVSN.
- To give veterinarians a range of spay/neuter surgical procedures and ample "table time" to practice the repetition needed to build a strong surgical skillset.
- To provide veterinary nurses and final year nurse students the opportunity to practice hands-on HQHVSN clinical techniques one-on-one with our experienced staff.
- To encourage our veterinary community to seek out professional opportunities in HQHVSN surgery, non-profit veterinary wellness, animal shelter medicine and animal welfare.

### Training Program Overview

To build competence and confidence in the surgical suite, veterinary surgeons must have repetition... repetition...repetition. Therefore, in order to facilitate this, we want to give each motivated trainee at least 4 full days of initial training with SNPLA's Veterinary Training Program. We understand that you cannot become a HQHVSN surgeon after only a few days of training; however, this program will provide trainees with a good overview and a set of skills that will hopefully encourage all to continue to seek out further opportunities for growth.

Below is an example of our surgeon training schedule:

#### Day 1

- Orientation to SNPLA's Veterinary Training Program
- Familiarize yourself with the clinic and equipment; review morning intake procedures, patient exams and discuss "clinic flow".

- A typical training day patient break down is 10-15 surgeries with mostly male cats/dogs and female cats scheduled for the first 1-2 days. Depending on trainee skill level, dog spay procedures will be added as trainee advances.
- Surgery review: the surgeon educator will demonstrate examples of the typical surgical procedures (cat neuter, dog neuter, cat spay and dog spay) with discussion on the various techniques used to be efficient, effective and maintain high quality for each procedure.
- Trainees will perform surgery with direct supervision
- Review patient recovery procedures and perform cage rounds for all patients.
- End of day review

#### Day 2

- Assist in pre-op patient exams and discuss medical findings, special cases, surgical order and “clinic flow”
- Surgical breakdown is similar to Day 1 with more surgeries performed by trainee.
- Trainees will plan their day with respect to surgical patient order, practice communication with their team and maintaining “clinic flow”. Surgeons should focus on techniques discussed while maintaining good sterile technique and high quality of work throughout the day.
- Trainees will perform surgery with direct supervision as deemed necessary
- Perform cage rounds for all patients
- End of day review with discussion of HQHVSN protocols/clinic topics

#### Day 3 and 4

- Trainees will be expected to take more of a lead role on these days, perform pre-op exams and pre-medicate surgery patients.
- Trainees will be responsible for selecting their surgery patients for the day and determining surgery order.
- As a trainee progresses, more difficult procedures will be performed with supervision and assistance as needed.
- Focus will be on practicing techniques learned, communicating effectively with team members and addressing their needs during the day all while maintaining a high level of focus on procedure quality and patient care.
- Patient rounds and End of Day review

\*This is a sample schedule and will vary based on trainee availability, trainee skill level, individual progress made during sessions and patient availability.

## 2: Typical HQHVSN Daily Schedule

6-8 am	Intake team, receptionist and clinic manager arrive
6:30-8 am	Clients and patients arrive and begin to fill out paperwork; technicians begin pre-exams as paperwork gets completed.
8:00 am	Veterinarian begins examinations; clients of any patient believed to be at increased risk with anesthesia or during surgery are called by veterinarian or designated staff member; rechecks may arrive
8:30-9:30 am	Team break, recheck exams, surgery begins  Surgeon may arrange flow of patients as (s)he wishes by notifying the nurse on duty; typical number of surgery patients is 25-35 with ideally no more than 5 hours of operating time; animal shelter patients should be done last.
2:30-3 pm	Surgery concluded; recheck patients; ensure medical/surgery forms are completed and signed by the veterinarian.  *Surgeon may opt to take a break or work through until surgeries are completed. (Please note: surgery may have to stop for 30 minutes to cover staff lunches).
2:30-4 pm	Break; recheck exams; vaccinations; technicians clean and prep for next day's tasks.
9am-4pm	Daily vaccine clinic; Veterinarian is available until vaccine clinic has ended at 4pm.

\*The veterinarian must do a visual inspection of all patients before leaving. Veterinarians can not leave premise until all animals are fully recovered (i.e. normal body temperatures, sternal, heads up and moving, pink mucous membranes, stable incision sites, etc.).

\*The veterinarian should be available to answer any questions about their cases for 24 hours after their shift. SNPLA will notify relief veterinarians of any complications from their surgeries.

### 3: Surgery Overview

Each surgical procedure should have the same individual attention to ensure every patient is receiving a high standard of care. As team lead, the surgeon should make certain technicians thoroughly prepare the patient for surgery. This includes complete surgical site clip, bladder expressed in females, cleaning the skin to remove all debris and surgical scrub with adequate contact time prior to operating.

When a patient is brought to the operating room and when the surgeon approaches their patient to begin surgery, the patient's status should be double-checked.

Remember...

- The patient should be properly connected to the anesthesia machine
- Oxygen and isoflurane levels should be appropriate
- Check that the scavenger system is operating correctly; anesthetic machine pressure gauge “zeroes out”; all pop-off valves are open
- The monitoring equipment should be operational and health parameters appropriate
- Confirm correct depth of anesthesia
- Make sure the patient is positioned properly for the specific procedure
- Ensure that the surgery lights are correctly directed at the surgery field

The patient is then appropriately draped for the procedure creating a barrier to prevent contamination of the surgical site.

### Tips for Surgery Success

- Maintain sterile technique at all times!; Pay close attention to surroundings, equipment, suture ends, clothing/surgery gown, etc...
- Understand incision placement for each procedure and its importance
- Remove minimal subcutaneous tissue, it reduces dead space and is more efficient
- Careful tissue handling must be observed for every procedure
- Gentle use of the spay hook - “finesse” - is necessary; do not dig, scrape or use force
- Practice cutting the ovary away prior to ligation (female dog) and pedicle tie (female cat); this can reduce clutter and improve efficiency (\*need confidence in hemostats)
- Using a modified Miller's encircling ligature and “pre-crushing” tissue using the Carmalt
- At least four throws (two square knots) on all sutures must always be used
- Take adequate, large bites of the linea alba
  - Include at least 5 - 8 mm rectus tissue in the linea closure in cats and up to 10 - 12 mm in large dogs.
  - A cruciate suture pattern with a surgeon's throw is used to decrease tension and speed closure time

- Do not crush with sutures; closing linea and subcutaneous tissue should be snug and completely closed but never overly tightened
- Recommend using polydioxanone (PDS) type suture for linea and subcutaneous layer closure due to its strength retention properties during wound healing
- Recommend a three-layer closure:
  - Linea closed in a cruciate or simple continuous pattern
  - Subcutaneous and intradermal layers closed in a simple continuous pattern
  - Skin glue used to seal skin +/- skin staples if skin edges are not apposed
- Skin edges should be properly apposed; **never** allow one side to extend above the other.
- Skin glue should **not** be applied between the skin edges or in the incision; it should be used to adhere skin to skin and only as a protective barrier and does not take the place of properly placed skin sutures
- A tattoo is applied to all patients after surgery to identify as spayed/neutered

## 4: Incision Placement

The incision placement will obviously vary with both the sex and the species of the patient. Using specific incision placement depending on the age of the patient and species can improve the efficiency of the entire procedure.

- Incisions in **adult female dogs** are generally placed directly caudal to the umbilicus (Figure 1)
- Incisions in **pediatric female dogs** are generally placed approximately halfway between the umbilicus and pubis (Figure 2)
- Incisions in **adult or pediatric female cats** are also placed approximately halfway between the umbilicus and pubis (Figure 2)



**Figure 1:** Adult dog incision placement



**Figure 2:** Feline/pediatric dog incision placement

In female dogs, there are several factors which influence how far cranial you will place your incision. Generally speaking, you should plan to place your incision “closer to” or “towards” the part of the reproductive anatomy that is less mobile or harder to exteriorize from the abdomen. In younger dogs (pediatrics to about 10 months) the ovaries are more mobile and easier to exteriorize than the uterine body so we make the incision illustrated in Figure 2. In the mature adult dogs, the ovaries are less mobile than the uterine body so we make our incision illustrated in Figure 1. Also, older, overweight/obese and deeper-chested dogs usually need a more cranial incision that may extend into the umbilicus area.

Male dogs are neutered with either a pre-scrotal or scrotal incision, with pediatric male dogs routinely done through a scrotal incision.

## 5: Post-op Surgery Identifiers

### Tattoo Placement

The use of a tattoo to permanently mark a patient's skin after successfully completing a spay/neuter procedure is a very helpful physical indicator. Do not place a tattoo unless the entire procedure was completed or if a patient is verified to already be "done" (e.g. through exploratory).

Complete this procedure by following these steps:

1. Identify a clean/prepped section of skin
  - Spay procedures should have the tattoo placed near the incision/umbilicus
  - Dog neuter procedures should have the tattoo placed near the incision/pre-scrotal area
  - Male cats can have the tattoo placed cranio-lateral to the prepuce in an area easily visible when confirming gender or placed in a prepped section near the umbilicus, as in a spay
2. The skin is then superficially scored with the scalpel making ~1 cm mark
3. A very small amount of tattoo ink is collected using the corner of an indicator strip or dull end of the scalpel blade (\*use very little ink, a little goes a long way!)
4. The ink is then applied to the scored tissue
5. The skin edges of the tattoo are stretched and a drop of tissue glue is applied over the tattoo to close the skin

### Ear-Tipping

Removing the tip of a cat's ear is a permanent, universally accepted physical identifier that a patient was spayed/neutered. This practice is usually reserved for community cats where verification needs to be clear, obvious and seen from a distance.

Complete this procedure by following these steps:

1. Place a straight hemostat across the tip of the ear perpendicular to the ear's long axis. About 1/4 of the ear's tip should be above the clamp.
2. Remove the tip of the ear by drawing a scalpel blade across the top of the hemostat, leaving the ear clamped.
3. Run a silver nitrate stick across the cut edge of the ear, leaving the clamp in place until hemostasis is achieved.

## 6: Common Anesthetics/Analgesics Agents in Spay/Neuter Clinics

A variety of anesthetic protocols created for spay-neuter programs exist which are appropriately balanced for anesthesia in pediatric to adult patients. These protocols are dependent upon the patient population, competence and efficiency of professional staff with these agents and drug cost/availability. Regardless of the protocol, all combinations need to effectively provide stress reduction, analgesia, immobility/muscle relaxation and a safely reversible depression of the CNS resulting in unconsciousness.

Below is a list of commonly found anesthetic/analgesic agents in HQHVSN programs: (referenced from Plumb's online edition 2022)

**Acepromazine** – a sedative/tranquilizer, commonly used as a premedication. Provides no analgesic effects and may have anti-emetic effects. Minimal impact on respiratory function but may cause significant hypotension and hypothermia. (Does not have a reversal)

**Buprenorphine** – a partial opioid agonist, an injectable and buccal analgesic agent. May cause decreases in blood pressure, heart rate and rare decreases in respiratory rate.

**Butorphanol** – opioid agonist/antagonist used as analgesic, premed, antitussive or antiemetic. Potential adverse effects in dogs and cats include sedation, respiratory depression, ataxia, anorexia or diarrhea (rare).

**Carprofen** – a non-steroidal anti-inflammatory drug with analgesic, anti-inflammatory and antipyretic activity used in a variety of species. Common adverse effects include mild GI effects (eg. vomiting, diarrhea, constipation, inappetence) and/or lethargy.

**Dexmedetomidine** – alpha-2 adrenergic agonist (similar to medetomidine). Injectable formulation used in dogs and cats as preanesthetic agent, sedative and for analgesia. Adverse effects include bradycardia, AV block, decreased respiration, hypothermia, urination, vomiting, hyperglycemia and pain on IM injection. (Systemic and central effects may be reversed with **Atipamezole/Antisedan**)

**Diazepam** – a benzodiazepine that causes sedation and skeletal muscle relaxation as well as decreases anxiety. Adverse effects include sedation and ataxia; cats may experience a behavior change and dogs may experience excitement. (Antagonist/reversal – **Flumazenil**)

**Hydromorphone** – an injectable opioid, used as a sedative and analgesic agent. Adverse effects include nausea (common in cats), vomiting, defecation, panting, vocalization, sedation, CNS depression, respiratory depression, and bradycardia. About 5x more potent an analgesic on a per weight basis as compared to morphine. (Antagonist/reversal – **Naloxone**)

**Ketamine** – a dissociative general anesthetic agent. May cause respiratory depression, muscle tremors, spastic/jerking movements. Cat's eyes remain open after use (lubricating eyes is essential).

**Ketoprofen** – a non-steroidal anti-inflammatory drug that is labeled for use in horses and cattle; used extra-label in other species for anti-inflammatory, analgesic and antipyretic purposes. Adverse effects include gastric mucosal damage and GI ulceration, renal crest necrosis, hepatitis; may cause vomiting and anorexia.

**Midazolam** – injectable benzodiazepine used primarily as preoperative medication and, unlike diazepam, may be given IM or intranasally for seizures. Adverse effect of most concern is respiratory depression. (Antagonist/reversal – **Flumazenil**)

**Meloxicam** – a non-steroidal anti-inflammatory drug that is used for controlling pain. May cause vomiting, diarrhea and inappetence.

**Morphine** – an opioid agonist, analgesic agent. Considered a respiratory depressant and may cause hypothermia (dogs, rabbits). Gastrointestinal effects may include nausea, vomiting, defecation and decreased GI motility. (Antagonist/reversal – **Naloxone**)

**Telazol** – injectable anesthetic/tranquilizing combination comprising a mixture of two drugs tiletamine/zolazepam similar to ketamine/diazepam. Adverse effects may include respiratory depression, decrease heart rate and pain after intramuscular injection, erratic and/or prolonged recovery, bronchial/tracheal secretions and hypothermia. (Reversal of zolazepam with **Flumazenil**)

### **Reversal Agents:**

**Atipamezole/Antisedan** – reversal agent for alpha-2 adrenergic agonists (dexmedetomidine, medetomidine, xylazine). May reverse effects rapidly, including analgesia thus when appropriate a non-alpha-2 analgesic should be administered prior to Antisedan administration. Administered IM.

**Flumazenil** – benzodiazepine antagonist. Used to reverse benzodiazepine overdose or adverse effects caused by intentional doses or when rapid recovery is required. May also be used to reverse the anesthetic effects of zolazepam (Telazol – tiletamine/zolazepam). Administered IV.

**Naloxone** – opioid antagonist. Most effective at reversing pure mu-opioid receptor agonists (eg. morphine, hydromorphone, fentanyl); less effective reversal agent for partial opioid agonists (eg. buprenorphine). At reversal dosages, can negate opioid analgesic effects. May need to re-dose for desired effects. Administered IV, IM, SC.

## 7: Emergency Protocols

### Cardiopulmonary Resuscitation (CPR) Review

Treatment of patients in emergency situations in spay/neuter clinics are to be directed by the attending veterinarian. The following recommendations are meant as general guidelines for patients who have undergone cardiac arrest. Each animal must be evaluated on an individual basis by a veterinarian so that the best course of action can be determined.

Prior to initiating cardiopulmonary resuscitation (CPR), it must be determined that the animal's heart has, in fact, stopped beating.

#### Assess Patient

- Auscultate for heart sounds and feel for peripheral pulse. (Is heart rate slow, absent?)
- Check for movement of chest wall. (Is respiratory rate slow, absent?)
- Check mucous membrane color. (Is it pale, blue, grey?)
- Check for palpebral reflex. (Is it absent?)
- Check jaw tone. (Is it lax?)

Note: Be familiar with your anesthetic protocols and which agents may be reversible. (e.g. If the patient has decreased or absent heart rate or respiratory rate AND Domitor or Dexdomitor has been given, reverse by administering proper dose of Antisedan)

If cardiac arrest is confirmed:

#### **C = Cardiac and catheter**

- Confirm whether or not heart is beating.
- If there is no pulse, initiate cardiac compressions at a rate of 1-2 times per second.
- Monitor successfulness of compressions with periodic palpation for pulse.
- Place an intravenous (IV) catheter.

#### **A = Airway**

- Place widest appropriate endotracheal tube and properly inflate tube's cuff.

#### **B = Breathing**

- Give patient 1 breath every 3-5 seconds by gently squeezing rebreathing bag on anesthesia machine with 100% oxygen or by use of Ambu bag. Pop-off valve on anesthetic machine will need to be partially closed to do this.  
\*\*Be sure to open pop-off valve when done with this procedure\*\*
- Be cautious with the force used when giving breaths to the patient; it is easy to cause a pneumothorax when performing CPR.

**D = Drugs**

- If there is no heartbeat, give epinephrine or vasopressin intravenously (IV) or intratracheally (IT).
- If patient is bradycardic, give atropine or glycopyrrolate intravenously (IV) or intratracheally (IT).
- Give further drugs dictated by initiating event, anesthetics used, responses to above steps, or at veterinarian's direction.

**E = Equipment**

- All available monitoring equipment should be placed on patient.
- Doppler blood flow probe and capnograph are most useful to monitor return of cardiorespiratory function.

**F = Fluids**

- Administer intravenous (IV) fluids (Lactated Ringer's Solution, Normosol R ,or Plasmalyte) to patient.
- Reassess animal after initial fluid bolus/shock dose is given to determine continuation rate for IV fluids.

## Autotransfusion Procedure Review

Autotransfusion is the process of returning a patient's blood to their circulation when a patient has hemorrhaged into a third space such as the abdominal cavity during or after surgery. This is a valuable technique for the spay/neuter clinic setting where blood product or blood donors are not usually available nor practical. An autotransfusion can help maintain circulating blood volume and oxygen carrying capacity while the source of the hemorrhage is being managed.

Autotransfusions can be performed with any size dog or cat, although the technique varies slightly from small to large patients. In all cases, a blood filter is used to remove microaggregates from the hemorrhaged blood. Each Hemo-Nate can filter approximately 50ml of blood. If a larger amount of blood is being transfused, multiple filters may be needed.

It is important to set up all equipment prior to beginning surgery if an autotransfusion is planned.

### Recommended Autotransfusion Kit Equipment:

- 4 Hemo-Nate Filters (18 micron pore size)
- 2 Sterile extension sets
- 4 IV T-connectors
- 10 Sterile 20 ml Syringes
- 5 Sterile 60 ml Syringes
- 10 Sterile 22g Needles
- Heparin (should be stocked/available in the Injectable Drugs Cabinet)

### General steps for the autotransfusion procedure:

- Place an IV catheter in a cephalic vein for the autotransfusion; ideally a second IV catheter is placed for concurrent IV fluid administration.
- Heparinize the syringes that are used to collect the blood from the abdomen. To heparinize each syringe, draw up 1 ml of heparin in a 20-60 ml syringe (depending on patient size). Aspirate the syringe all the way back to allow heparin to coat the entire inner surface of the syringe, then expel all of the excess heparin out of the syringe. Several syringes should be prepared in this way.
- Prepare the patient for surgery.
- A sterile extension set is handed to the surgeon or placed on the sterile field; the surgeon will guide one end and the other end will be attached to a heparinized syringe worked by an assistant.
- The surgeon guides the tip of the extension into pockets of free blood in the abdomen, while an assistant aspirates and collects the free blood. Collect as much blood as possible keeping in mind that hemorrhage is continuing.
- Once the blood for autotransfusion has been collected, the surgeon needs to correct the source of bleeding.

- The assistant administers the blood back to the patient as quickly as possible. All collected blood returning to the patient should pass through a Hemo-Nate filter first. The filter can be attached at the extension set or on the T-port.

Note: An alternate method, if an extension set is not available, has the surgeon prepare multiple sterile syringes prior to opening the abdomen. The surgeon suctions directly with each syringe and, once filled, passes them off to have an assistant administer the blood back to the patient.

\*\*Monitor the patient closely, make sure to have all available monitoring equipment attached and regularly reassess physical parameters (heart rate, respiratory rate, mucous membrane color, body temperature, etc.).