DOING SURGICAL EQUINE FIELD WORK

◊ Equine work days tend to be long by nature. Inefficiency and/or unpreparedness can significantly increase the length of the day.
◊ Adding 5 minutes to the day for each patient can unnecessarily increase the length of the workday (24 patients = 2 hours, 50 patients = 4 hours)
◊ DO NOT STAND IDLE IF ALL EQUIPMENT AND SUPPLIES ARE NOT READY FOR THE NEXT PROCEDURE.
◊ You will be assigned to a team. Communications should run within and between teams so that everyone is ready and plays their own position.

Additional notes:
◊ Organization: It is critical that all necessary equipment and drugs are easily available, clearly labeled, and easy to move. Items should NOT be carried in pockets (they will fall out when you bend over) or gathered together in an “arm load” (you will drop them). They should be in carry-alls, buckets, and/or toolboxes where they are accessible and can be kept close to the patient. Blades, needles and syringes must be put in the carry-all immediately after use to avoid their getting lost.
◊ Preparation: Start prepared and stay prepared. The students on an equine field outing are responsible for adequately preparing for the outing. Prior to leaving the clinic/trailer you must check that there are sufficient:

- Forms
- Syringes
- Needles
- Blades
- Buckets
- Caddies
- Carbocaine
- Banamine
- PPG
- Snacks/lunch
- Equine pharmacy
- Filled carboys, collapsible water jugs or buckets lined with garbage bags, twisted shut above the water level

- Vaccines--tetanus antitoxin, tetanus, and rabies
- Cooler/Ice packs
- Sterile surgical gloves
- Garbage bags
- Sharps containers
- The equine surgery box-fully stocked
- The equine foot box
- Insect repellant Insect repellant
- Sun block
- Equine anesthesia pillows

REQUIRED READING
All Students who plan to participate in an equine outing must read the chapter on equine castration in Turner and McIlwraith “Techniques in Large Animal Surgery”. It may also be beneficial to read the chapters on cryptorchidectomy by noninvasive inguinal approach, and umbilical herniorrhaphy in the foal.

THE SURGERY PROCESS

◊ It is VERY important that surgery be done quickly and it should begin within minutes of induction. This requires that all members of the team have all their equipment available and know exactly what they are going to do.
◊ IF YOU ARE INVOLVED IN AN EQUINE CASTRATION AND ARE UNSURE HOW TO COMPLETE YOUR ASSIGNED ROLL, TELL THE SUPERVISOR BEFORE THE PROCEDURE BEGINS! Delay will result in anesthetic problems and a difficult recovery.
◊ Wait until the legs relax, before approaching the patient.

ASSESS YOUR PATIENT AND FORM AN ANESTHETIC PLAN BASED ON:
Your patient’s size and temperament, the experience level of your surgeon and support team, as well as your surroundings and available equipment.
TIE THE LEG ROPE

The upper leg is then tied to get it out of the surgeon’s way. This may be done in a variety of ways, depending on the facilities and the supervising veterinarian’s preference. The following is commonly used in North Dakota. Assuming that the patient is positioned on its left side:

- Position yourself behind the patient. Raise the upper leg (the patient’s right leg)
- Stand so that you are in contact with the leg so that if the patient moves you will be pushed, not kicked
- Place the noose end around the pastern.
- Figure eight around the hock twice ending at the pastern.
- Place a half hitch at the pastern.
- Step back from the patient and pass the rope behind your hind end. Lean back on the rope and let your body weight rather than strength do the work. **DO NOT TIE THE ROPE AROUND YOURSELF.**
- The rope should lie smooth and flat on the leg.
- A ¾ “rope of adequate length (15-20 feet) is the rope of choice for adult horses.
- A 5/8” rope 12-15 feet long is more suitable for minis, ponies, foals and/or burros.

ANESTHETIZE YOUR PATIENT

- Administer sedation,
- Wait for adequate sedation (head below withers)
- Administer ketamine and valium
- Open gate if working in bucking chute
- Wait for patient to drop in chute if working in squeeze chute with a side door
- If working with a manageable patient, drop patient on the left side if possible (this makes the castration easier for right handed surgeons) and do not make any attempt to knock the patient off of its feet.
- The anesthetist should check the patient’s level of anesthesia, place a towel over the eye, and place a pillow under the head.
- All team members should be prepared to perform their assigned tasks prior to the patient becoming recumbent.
- Stay prepared.
- Once the patient is recumbent and adequately anesthetized the rest of team should move quickly to complete their assigned task/tasks as efficiently as possible.
- Do not rush the patient. Wait until they are fully relaxed to proceed. The upper leg should be resting on the ground.
- Everyone involved in the process must remain on the horses back side, which is the side away from the hooves.
- The exception to this is if you are doing a procedure involving the leg or foot.

EXAMINE YOUR PATIENT

- Whenever possible do a brief physical exam on your patient prior to anesthesia.
- Fractious patients may not be examined prior to anesthesia. Pushing the issue of physical exam in a fractious patient can increase the risk to your safety, the safety of your patient, and may compromise the anesthesia and recovery process.
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SCRUB THE SCROTUM
◊ Position your bucket with necessary supplies behind the patient’s leg.
◊ Place your body against the hock so that the patient’s foot is to the left of your head.
◊ Using an ez scrub sponge and the water, scrub the scrotal area until clean. DO NOT PLACE USED SPONGES INTO THE CLEAN WATER BUCKET.
◊ Rinse the scrotum with clean nolvasan water, using a pitcher, gauze, or absorbent cotton.

NOTE: The student in the photo on the right is properly positioned. The student in the photo on the left is not in contact with the patient’s leg and is not protecting herself from a kick if the patient moves.

BLOCK THE SPERMATIC CORD OR TESTIS AND SKIN
◊ Inject the spermatic cord of each testis with 10-15 mls of mepivicaine or lidocaine to achieve local anesthesia.
◊ Alternatively, a larger volume (20-30 mls) can be injected directly into the center of each testis.
  o This technique is easier to learn, but it takes more time for the anesthetic to migrate up the chord, causing the desired effects.
  o If the surgery team is efficient, the procedure may be done before the local anesthetic has any effect.
  o Injecting local anesthetic in this way does NOT anesthetize the scrotal skin, but does decrease the stimulation caused by manipulating the testis and paralyzes the cremaster and tunic muscles, making it easier to get maximal exposure of the cord.
◊ Using a 35 cc syringe with an 18 gauge needle on it filled with 1% or 2% carbocaine.
◊ If the patient/testis is small, point the needle directly into the testis and inject until it is turgid. If the testis is not turgid, the carbocaine will not diffuse up the cord and thereby not affect your patient’s surgical or anesthetic experience. Repeat with second testis.
◊ If the patient/testis is large, isolate and grasp the spermatic cord firmly. Insert the needle where the cord rolls over your thumb and index finger, aspirate to insure you’re not in a vessel, and inject 10 ml carbocaine.
◊ Repeat in second cord. This technique is only effective when the block is placed within the cord. The carbocaine cannot diffuse across the tunic.
◊ Slide the needle below the skin and inject 5-7 mls of block where you plan to incise.
◊ Replace the needle on the carbocaine syringe and refill if needed.

NOTE: Maintain correct body position as the testis is injected. Always remain in contact with the patient’s leg.

ADMINISTER INJECTIONS: VACCINES, FLUNIXIN, PPG
◊ Administer PPG, flunixin meglumine, tetanus antitoxin (if appropriate), and vaccines
◊ If the surgical process has begun prior to PPG administration, the Penicillin can be administered after both emasculators are in place.
◊ Always verify what is in the syringe prior to administration. Do not administer any drug if you do not fully understand what its function is, and how much the patient should receive.
Position yourself behind the patient, between the legs and put your left shoulder against the inner right leg of the patient. Identify both testes prior to making any incision. **NEVER INCISE IF YOU HAVE NOT IDENTIFIED BOTH TESTES**

In larger patients, place your non-dominant hand in front of the testes and push them back toward you into the scrotum so the skin is pulled taught over them. In smaller patients you will be unable to push the testes into the scrotum. Use your non-dominant hand to stretch the skin taught over the testes, this will enable you to make your incisions

Identify median raphe

Make an incision 1 cm to either side of the median raphe. The incisions should be parallel and will be about 1” apart.

The goal is to make the incision through all layers in one attempt.

Using your blade make an incision long enough to allow exposure of the testis

If the testes are too large to allow you to grasp both at the same time, stabilize one at a time being careful to align your incisions parallel to one another.

EXPOSE THE TESTIS

START WITH THE DOWN TESTIS

Make an incision for a finger hold through the tunic at the proximal pole of the testis or apply a towel clamp.

Remember to place the towel clamp low enough so that it does not tear out of the testis. Hold the testis and the towel clamp in the palm of your hand.

STRIP THE CORD

Holding the testis with your non-dominant hand, grasp the cord firmly with your dominant hand and stroke the cord repeatedly.

You will initially feel that nothing is happening, then, almost all at once, the fascia will slip away exposing cord.

State clearly and audibly what you are administering and by what route as you do so. Each step performed during a team effort should be stated clearly in a loud enough voice for the entire team to hear.

This will prevent patients from receiving the same treatment twice and will allow the scribe to record all pertinent information.

“Prepping,” “Tetanus toxoid administered IM,” “Blocking,” “30 ml PPG administered IM,” “8 ml flunixin administered IV,” “Incising” 

**NOTE:** you should be familiar with all tasks and supplies necessary to complete the castration process. Never stand idle if all equipment and supplies are not ready for the next patient.

POSITION YOUR EQUIPMENT

Place the bucket filled with surgical instruments, emasculators and nolvasan water behind the patient’s leg and in reach of the surgical field.

MAKE TWO PARALLEL INCISIONS

Note: Correct blade hold

**Position yourself behind the patient, between the legs and put your left shoulder against the inner right leg of the patient. Identify both testes prior to making any incision. **

You should be familiar with all tasks and supplies necessary to complete the castration process. Never stand idle if all equipment and supplies are not ready for the next patient.
Record the method of emasculation performed—cord split (refer to required reading in Turner and McIlwraith) closed, routine, ligated, etc.

PLACE THE EMASCULATORS

BEGIN WITH THE DOWN TESTIS

Open the emasculator jaws and place them around the cord
Orient the emasculators wing nut pointing towards the testis (nut to nut)
Be certain that the ratchet handle is open fully
  ▪ The handles must face the back of the horse
  ▪ The emasculators must be held perpendicular to the cord and parallel to the patient’s body.
Partially close the jaws of the emasculator
  ▪ only close until the emasculators “grab the cord” and make a crunching sound
Release all tension on the testis (put the testis down)
Place both hands on the handles of the emasculators and close them completely in one smooth crush maintaining the position of the emasculators parallel to the body and perpendicular to the cord.
Lock the ratchet shut and set the emasculators down.
Repeat the entire process with the second testis

STRETCH THE INCISIONS

With the emasculators in place, place an index finger or thumb into the front and back edge of your incision and stretch the skin UNTIL YOU FEEL IT TEAR.
  ▪ DO THIS STEP AS IF YOU MEAN IT

RELEASE THE TENSION ON THE LEG ROPE

Release the tension on the leg rope and allow the upper leg to rest on the lower.
Wait a sufficient time.
One minute per year of age of your patient.
Longer is better.

REMOVE THE EMASCULATORS

Raise the leg and remove
Holding the emasculators parallel to the body of your patient and perpendicular to the cord, open them to release the cord.
Look for bleeding as the cord slips back into the patient.
Trim any tissue that will hang down below the incision once the patient stands
Clean the patients scrotum
Pull the patients down leg forward, to prevent the radial nerve from “falling asleep”
Pick up any gauze etc that has been thrown on the ground
Check that the patient’s record is completed
Prepare for the next patient

EMASCULATING OLDER HORSES

For patients with larger testi the cord will be split. The vessels will be crushed first and the cremaster and tunic will be crushed second.
Separating the vessels from the tunic and cremaster allows the surgeon to obtain a better crush and reduces the amount of bleeding that will occur.
SPLITTING THE CORD

◊ Once the cord is adequately exposed (has been stripped) scissors are inserted into the tunic and run proximally opening the tunic.
◊ A clamp is placed on the tunic to prevent it from slipping out of the surgeon's control.
◊ The thumbs are used to puncture a hole through the mesorchian, thus separating the vessels from the tunic and cremaster.

THE CRUSH IN TWO STEPS

◊ Crush the vessels first.
◊ The emasculators need only be on the vessels for a short time, as the crush is improved by removing the cremaster and tunic from this step.
◊ Crush the cremaster and tunic.
◊ Repeat the process with the second testis.

REMOVING THE MEDIAN RAPHE

◊ This is an optional step that is used infrequently on HSVMA trips.
◊ Hold the median raphe in your non-dominant hand and apply traction to stretch the skin.
◊ Identify and avoid any large vessels.
◊ Use a pair of scissors to cut out the raphe.

THE RECOVERY

◊ Many patients are better off left to recover by themselves.
◊ For those who are amenable to assistance:
  o Do not attempt to help the horse to his feet using the lead rope or head, this unbalances the patient and may cause them to fall.
  o To assist the patient to its feet, pull straight back on the tail, only until the patient has risen and regained its balance.
Data: the anesthetist or scribe is responsible for recording all data during the procedure. The name, amount, and site of drugs given must be recorded, along with the time of administration. There are also places on the equine form to record physical parameters, complications, and the NAMES of the surgeon and anesthetist. It is very important that medications are recorded at the time they are given. Relying on memory on a busy day is a recipe for error.

Catheters: IV catheters will be placed in selected cases (cryptorchids and other longer procedures). The ease of jugular venipuncture in the horse makes them unnecessary for routine cases.

Triple drip: RAVS occasionally uses a combination of xylazine (500mg), ketamine (1000 mg or 1 g), in a liter of 5% guaifenesin (50 mg/ml) given at 1 ml/lb/hr. Alternatively 5% guaifenesin can be given in boluses (not exceeding 1 ml/lb/hr) with intermittent injections of xylazine and ketamine as described above. This combination requires a jugular catheter and provides more muscle relaxation. It is used for cryptorchid surgery, exploration of draining tracts, and other extended procedures.

Crypt: whenever possible the horse’s scrotum should be examined prior to surgery to determine if both testes are descended through the inguinal canal. If the horse is a possible cryptorchid, an IV catheter should be placed prior to induction and a “crypt pack”, which includes drapes and sterile instruments, should be available. It is up to the discretion of the supervising veterinarian as to whether a cryptorchid will receive surgery. The non-descended testis is operated first and the descended testis is never removed unless the cryptorchid one can be found.

<table>
<thead>
<tr>
<th>A REVIEW OF IMPORTANT SURGICAL POINTS</th>
</tr>
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<tbody>
<tr>
<td>Identify two testi prior to incising</td>
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<tr>
<td>Verify that you have adequate exposure prior to emasculating</td>
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<tr>
<td>Split larger cords to obtain a better crush and minimize bleeding</td>
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<tr>
<td>Orient the emasculators correctly:</td>
</tr>
<tr>
<td>- Nut to nut</td>
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<tr>
<td>- Handles toward the patients tail</td>
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<tr>
<td>- Handles perpendicular to the cord and parallel to the body</td>
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<td>Close the emasculators only until they start to grab or bite the cord, then release all tension on the cord by setting the testis down.</td>
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<tr>
<td>Verify that the ratchet at the end of the handles is fully open, enabling it to lock shut when closed.</td>
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<td>Verify that there is no skin caught within the blades of the emasculators</td>
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<tr>
<td>Close the emasculators completely in one smooth crush.</td>
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<tr>
<td>Latch the ratchet.</td>
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FOLLOWING THESE STEPS WILL REDUCE THE NUMBER AND SEVERITY OF BLEEDING AND RELATED COMPLICATIONS
PROCESSING THE EMASCULATORS

ALWAYS PROCESS A SINGLE PAIR of emasculators at a time. The parts are made individually. Mixing them will result in damage to the emasculators. NEVER USE VICE GRIPS

Serra and modified Serra emasculators. Lay out your parts. Place pin in lower bottom handle. Place the second handle over the first aligning the pin.

Place first crushing blade onto right side of emasculators. Place spacer/crushing blade onto left side of emasculators, aligning pins with outer holes. Place first cutting blade onto the left hand side of the emasculators. Place second crushing blade onto the right hand side.

Place the first threaded pin into apex of the emasculators only until the threads catch. Do not tighten until all pins are in place. Place the second threaded pin into the left hand side of the emasculators only until the threads catch.

Add the wing nut. Check that all parts are well aligned and seated correctly. Begin tightening the pins and wing nut a little at a time. Be careful not to misalign the pins/nuts thus stripping the threads and rendering the instrument useless. DO NOT OVERTIGHTEN. You should be able to “flip” the instrument open with one hand.
Surgical Instruments and Packs

**Equine Hernia Pack**

<table>
<thead>
<tr>
<th>#</th>
<th>Color</th>
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<tbody>
<tr>
<td>1</td>
<td>----</td>
<td>Scalpel Handle</td>
</tr>
<tr>
<td>4</td>
<td>----</td>
<td>Towel Clamps</td>
</tr>
<tr>
<td>1</td>
<td>Red or Brown</td>
<td>Needle Drivers</td>
</tr>
<tr>
<td>2</td>
<td>Blue &amp; Black</td>
<td>Thumb Forceps-Rat Tooth</td>
</tr>
<tr>
<td>1</td>
<td>Orange &amp; Black</td>
<td>Thumb Forceps-Brown Adsen</td>
</tr>
<tr>
<td>1</td>
<td>Red &amp; White</td>
<td>Scissors-Mayo</td>
</tr>
<tr>
<td>1</td>
<td>Green &amp; Brown</td>
<td>Scissors-Metzenbaum</td>
</tr>
<tr>
<td>6</td>
<td>Yellow &amp; Black</td>
<td>Curved Mosquito Hemostats</td>
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**Additional Surgical Supplies**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>15</td>
<td>Gauze Pads</td>
</tr>
<tr>
<td>1</td>
<td>Drape</td>
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<tr>
<td>1</td>
<td>Autoclave Indicator Stripe</td>
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**Equine Crypt Pack**

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<td>Curved Mosquito Hemostats</td>
</tr>
<tr>
<td>4</td>
<td>White</td>
<td>Curved Carmalt (1 long)</td>
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Equine instruments for cold sterile use — Yellow & Green

Burdizzo Clamps, side and closed jaw view with equine equipment) may be used on RAVS equine trips for donkey castrations