EMERGENCY ROOM PROCEDURES FOR VET TECHS

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Overview

In the emergency and critical care setting, there are various advanced procedures that veterinary nurses perform as part of patient care. It's important for veterinary nurses to have a thorough understanding of the indications for, procedure, and care of these procedures to ensure quality patient care.

Feeding Tube Placement

When it comes to initiating enteral nutrition through the use of feeding tubes, the veterinary nurse plays an active role in the placement, maintenance, and use of these tubes. Feeding tubes are utilized as a standard treatment modality to assist critically ill patients in their recovery from disease processes.

Nasoesophageal & Nasogastric Tubes

NE and NG tubes are generally well-tolerated by most canine and feline patients and can be placed by the trained veterinary nurse. These tubes are small in diameter (5-12Fr), minimally invasive, require no general anesthesia (but may require light sedation), and are ideal for relatively short-term (3-14 day) feeding. NE and NG tubes are ideal for patients who are unwilling/unable to eat but have a normal, functioning GI tract. NE and NG tubes are contraindicated in patients who are actively vomiting, have no gag reflex, are comatose, have head trauma, or who have a nasal disease (i.e. tumor). NG tubes are advantageous over NE tubes in that they allow for aspiration of gastric residual volume, which is helpful in patients with GI motility disorders. Both of these tubes can be used to deliver bolus feedings or trickle feeding. There are many commercially available slicone NE/NG tubes that offer features such premeasured markings, guidewires, or weighted tips; alternatively, a red rubber catheter tube can be used.

NE Tube Placement

- Instill 2-3 drops of a topical anesthetic into both nares, keeping the head elevated for a few minutes to allow for the local anesthetic to drain into the nasal passages.
- Premeasure from the tip of the nose to the 7-8th rib (tube will terminate is the distal esophagus before reaching the cardiac sphincter) and mark the "exit" point with temporary piece of tape.
- Gently hold the patient's muzzle with your non-dominant hand and press the nasal septum upward using your thumb (this diverts the nares dorsally to ease passing of the tube).
- Lightly lubricate the tip and pass the tube, directing it ventromedially through the nasal cavity and advancing it to the premeasured piece of tape.
- Remove the temporary piece of tape and mark the exit point with a Sharpie® marker.
- Secure the tube using 2-0 or 3-0 non-absorbable suture in a finger-trap pattern.

NG Tube Placement

- Instill 2-3 drops of a topical anesthetic into both nares, keeping the head elevated for a few minutes to allow for the local anesthetic to drain into the nasal passages.
- Premeasure from the tip of the nose to the last rib (tube will terminate in the stomach) and mark the "exit" point with temporary piece of tape.
- Gently hold the patient's muzzle with your non-dominant hand and press the nasal septum upward using your thumb (this diverts the nares dorsally to ease passing of the tube).

- Lightly lubricate the tip and pass the tube, directing it ventromedially through the nasal cavity and advancing it to the premeasured piece of tape.
- Remove the temporary piece of tape and mark the exit point with a Sharpie® marker.
- Secure the tube using 2-0 or 3-0 non-absorbable suture in a finger-trap pattern.

NE/NG Tube Placement Confirmation

- Aspirate the tube. If air is aspirated, the tube is in the trachea, if negative pressure is found, the tube is in the GI (esophagus/stomach).
- Instill 5-10mL of sterile saline into the tube. If the patient coughs, you are likely in the trachea.
- Rapidly instill 5-10ml air into the tube while auscultating where the tip of the tube should be. If you hear borborygmis, you are likely in the GI tract.
- Obtain a right lateral radiograph to confirm placement; both cranial and caudal views should be taken to ensure the tube enters the esophagus and has no dependent loops.
- Tube placement should be confirmed by the attending DVM prior to use.
- Once the tube is secured with a finger-trap suture pattern, place an Elizabethan collar on the patient while in hospital.

Feeding Tube Care & Maintenance

- During each patient interaction, inspect the tube for kinks and ensure that the tube exit point mark is in place.
- The tube should be flushed with room temperature-water before and after administering medications and/or enteral nutrition in order to maintain patency.
    - If the tube becomes clogged, you can troubleshoot by either passing a stylet or instilling 3-5ml of Coca-Cola®.
- If there is ever doubt about the tube's placement (i.e. termination point), retake a lateral radiograph.

Nasal Oxygen Cannula Placement

Nasal oxygen is one method used to administer oxygen supplementation to dogs and cats suffering from hypoxemia. Nasal cannulas are often the preferred technique for patients who don't fit comfortably in an oxygen kennel or when an oxygen kennel is not available. Cannulas can be placed unilaterally (single nares) or bilaterally (both nares).

Nasal Cannula Placement

- Instill 2-3 drops of topical anesthetic into each nare.
- Measure a red rubber catheter (typically 5-10Fr depending on patient size) from the tip of the nares to the medial/lateral canthus of the eye, then mark with a Sharpie®.
    - Recent studies have suggested that a higher inspired oxygen concentration is achieved by using the lateral canthus in dogs
- Have an assistant hold the patient's head/nose in an upward position
- Apply a small amount of sterile lubricant to the tip of the catheter, then insert the catheter ventromedially to the point of the medial/lateral canthus
    - If physical resistance is met during advancement, withdraw the cannula and redirect
- Secure using 2-0 or 3-0 non-absorbable suture in a finger-trap pattern.

- Apply another single suture on the forehead area or on the side of the face for further securement.
- Attach tubing that connects the humidified oxygen source
    - Nasal oxygen is provided at a rate of 50-200ml/kg/min
- Once the tube is secured, place an Elizabethan collar on the patient while in hospital.

Urinary Catheterization

Patients with primary renal disease (i.e. urinary obstruction), severe systemic disease (i.e. heatstroke, sepsis), or patients who are recumbent will require assistance when it comes to normal voiding. Urinary management includes placing and maintaining urinary catheters and calculating and monitoring urine output.

The options for urinary catheters in the ICU setting are using either a red rubber catheter or Foley catheter. A red rubber catheter requires the use of stay sutures to secure, whereas a Foley catheter has a balloon near the distal end that allows the catheter to remain in place without the use of external sutures.

Male Canine Urinary Catheterization

- Place the patient in lateral recumbency and clip the fur on around the tip of the prepuce.
- Instill 5 to 10 ml 0.05% dilute chlorhexidine into the prepuce to lavage.
- Have an assistant extrude the prepuce, then surgically prep the tip of the penis.
- With the catheter still in the packaging, pre-measure from the tip of the penis to the mid-bladder.
- Don sterile gloves, keeping the sterile glove packaging accessible to use as your sterile field.
- Have another assistant open the catheter and squeeze the sterile lubricant onto the sterile field.
    - If using a red rubber catheter, generously lubricate the end of the catheter
    - If using a Foley catheter, have an assistant instill sterile saline down the X-mas tree adapter port to lubricate the stylet, then generously lubricate the end of the catheter.
- Insert the catheter into the urethral opening, being careful not to touch the penis.
- Advance the catheter past the level of the os penis and the point where the urethral curves around the ischial arch.
- Urine will begin to flow once the catheter has reached the bladder.
    - If using a red rubber catheter, cut the end until it will tightly fit into a urinary closed collection system. Then place two stay sutures on either side of the prepuce. Apply a butterfly-winged piece of tape to the catheter about 1-2cm from the prepuce opening. Secure the catheter by suturing each wing of the tape to the stay suture.
    - If using a Foley catheter, fill the balloon with the correct amount of sterile saline, insert a X-mas tree adapter, and connect to a closed collection system.
        - The inflated balloon is situated at the neck of the bladder to keep it in place.

Female Canine Urinary Catheterization

- Place the patient in sternal or lateral recumbency and clip the fur around the vulva.
- Instill 5 to 10 ml 0.05% dilute chlorhexidine into the vulva to lavage.
- With the catheter still in the packaging, pre-measure from the vulva to the mid-bladder.

- Don sterile gloves, keeping the sterile glove packaging accessible to use as your sterile field.
- Have another assistant open the catheter and squeeze the sterile lubricant onto the sterile field.
    - If using a red rubber catheter, generously lubricate the end of the catheter
    - If using a Foley catheter, have an assistant instill sterile saline down the X-mas tree adapter port to lubricate the stylet, then generously lubricate the end of the catheter.
- Either place a speculum into the vagina to visualize the urethral opening or insert your index finger of your dominant hand into the vagina to blindly palpate for the urethral opening.
- The urethral orifice is 3-5cm cranial to the vulva. Insert the catheter into the vagina, following the speculum or your finger. If using your finger, point it downwards to direct the catheter into the urethral opening, then advance the catheter ventrally past the clitoral fossa.
- Urine will begin to flow once the catheter has reached the bladder.
    - If using a red rubber catheter, cut the end until it will tightly fit into a urinary closed collection system. Then place two stay sutures on either side of the vulva. Apply a butterfly-winged piece of tape to the catheter about 1-2cm from the vulva opening. Secure the catheter by suturing each wing of the tape to the stay suture.
    - If using a Foley catheter, fill the balloon with the correct amount of sterile saline, insert a X-mas tree adapter, and connect to a closed collection system.
        - The inflated balloon is situated at the neck of the bladder to keep it in place.

Male Feline Urinary Catheterization

- With the patient sedated or anesthetized, place them in dorsal or lateral recumbency.
- Have an assistant extrude the prepuce, then aseptically prep the tip of the penis. With the catheter still in the packaging, pre-measure from the tip of the penis to the mid-bladder.
- Don sterile gloves, keeping the sterile glove packaging accessible to use as your sterile field.
- Have another assistant open the TomCat catheter and red rubber catheter, and squeeze the sterile lubricant onto the sterile field.
    - First use the TomCat catheter to relieve the obstruction. This is done by lubricating and advancing the TomCat in a rotary motion, then retro-pulsing sterile saline through the catheter into the urethra.
    - Once unobstructed, insert the red rubber catheter into the urethral opening, being careful not to touch the penis. While advancing the catheter, gently hold and pull the penis and prepuce out to straighten the urethra.
- Urine will begin to flow once the catheter has reached the bladder.
- Cut the end of the catheter until it will tightly fit into a urinary closed collection system.
- Place two stay sutures on either side of the prepuce. Apply a butterfly-winged piece of tape to the catheter about 0.5cm from the prepuce opening. Secure the catheter by suturing each wing of the tape to the stay suture.
- Use another piece of tape to secure the catheter to the tail while assuring enough space for normal movement.

Female Feline Urinary Catheterization

- With the patient sedated or anesthetized, place them in sternal or lateral recumbency.
- Clip the fur around the vulva, then instill 3 to 5 ml 0.05% dilute chlorhexidine into the vulva to lavage.

- With the catheter still in the packaging, pre-measure from the tip of the vulva to the mid-bladder.
- Don sterile gloves, keeping the sterile glove packaging accessible to use as your sterile field.
- Have another assistant open the catheter and squeeze the sterile lubricant onto the sterile field.
- "Blindly" insert the red rubber catheter into the vulva, then advance the catheter through the urethral opening; the catheter should pass easily and directly.
- Urine will begin to flow once the catheter has reached the bladder.
- Cut the end of the catheter until it will tightly fit into a urinary closed collection system.
- Place two stay sutures on either side of the vulva. Apply a butterfly-winged piece of tape to the catheter about 0.5cm from the vulva opening. Secure the catheter by suturing each wing of the tape to the stay suture.
- Use another piece of tape to secure the catheter to the tail while assuring enough space for normal movement.

Urinary Catheter Placement Confirmation

- Urine should be flowing from the catheter into the urinary collection set
- Ensure all connections between the catheter and sterile collection set are tight and secured.
- Obtain a right lateral radiograph to confirm placement.
- Catheter placement should be confirmed by the attending DVM prior to use.

Urinary Catheter Care & Maintenance

- Exam gloves should always be worn whenever handling the urinary catheter (u-cath), urinary collection set, or urine.
- The urinary collection set should be placed at a level below the patient to prevent the backflow of urine to the patient.
- The urinary collection set should be kept on a clean surface (not directly in contact with the floor); use a diaper pad or cardboard litter tray to prevent bacterial contamination.
- U-cath patency should be evaluated every 4-8 hours. The urinary collection set line should be observed for urine flow. If patency is questionable, you will need to flush the line, using sterile technique. Using an alcohol prep pad, wipe the urinary collection set line port. Insert the syringe of sterile saline while occluding the line towards the patient, then flush 3-5mls. Then, occlude the line towards the collection bag and flush 3-5mls.
- Urinary catheter care (UCC) should be part of the nursing care plan and should be performed every 6-8 hours. UCC consists of cleaning the vulva/prepuce, urinary catheter, and urinary catheter set connections. Fill a curved tip syringe with dilute chlorhexidine. While holding dry gauze under the prepuce/vulva, insert the curved tip into the prepuce/vulva and instill 10-12ml dilute chlorhexidine. This flushes and cleans the prepuce/vulva. Using dilute 0.05% chlorhexidine-soaked gauze, wipe the u-cath starting a few centimeters away from the prepuce/vulva and wiping away (down) the catheter towards the collection line/bag. Ensure each urinary collection set connection is tightly sealed. Then, using chlorhexidine-soaked gauze, wipe each collection connection (i.e. u-cath to urinary collection line, urinary collection line ports, urinary collection line to urinary connection bag).
    - Studies show that patients with an indwelling urinary catheter have a 50% chance of contracting a secondary urinary tract infection.

- Quantify urine output (UOP) every 2-4 hours. UOP consists of quantifying and recording the urine in the collection bag. While wearing gloves, carefully disconnect the collection bag from the collection line while maintaining sterility. Pour the urine into a collection bowl, then re-secure the collection bag to the collection line. Measure the urine volume using a 10- to 60-mL syringe.
    - Urine output should be recorded as total volume (ml), ml/hr, and ml/kg/hr.

Multi-Lumen Catheterization

Multi-lumen catheters are central venous catheters that have multiple (2-3) independent lumens in one catheter. These catheters provide central venous access by either being placed in the jugular (central because of placement into the cranial vena cava) or peripherally inserted (central because of placement into the caudal vena cava). Multi-lumens are indicated when several fluid types or drug therapies are needed, administration of hyperosmolar solutions, total parenteral nutrition, blood component therapy, central venous pressure monitoring, or for serial venous blood sampling. Placement of multi-lumen catheters is done by using commercially available kits, following the Seldinger technique. In addition to this technique being using to initially place central lines, it can also be used to replace an existing catheter.

Seldinger Technique Placement

- Position the patient in lateral or dorsal recumbency
    - Sedation is often required
    - If placing in the jugular vein, connect an ECG monitor to the patient
- Clip a wide area of fur at either the jugular vein or lateral/medial saphenous vein and aseptically prep the catheter insertion site
    - Have an assistant keep the neck or rear limb extended and have them occlude the vessel
- Don sterile gloves while an assist opens the multi-lumen catheter kit
- While holding each port, have an assistant flush each with 0.9% NaCl and clamp each port
- Sterilely drape the area cranial and caudal to the insertion site
- Using sterile technique, premeasure the guidewire from the intended insertion point to the third or fourth intercostal space (ICS), with the tip of guide wire not beyond the fourth ICS. It is not necessary to premeasure the guide wire if placed via a saphenous vessel.
- Create a small incision in the skin over the insertion site using a stab technique with a #11 scalpel blade
    - This allows for less drag and ease of advancement/placement
- Following aseptic technique, introduce an over-the-needle IV catheter into the vein
- Remove the over-the-needle catheter stylet and advance the guidewire through the catheter
    - If placing via the jugular vein, monitor the ECG during guidewire advancement to ensure you don't advance too far and cause cardiac arrhythmias
    - When advancing and handling the wire, the veterinary nurse should **never let go of the wire** to prevent iatrogenic loss of the wire within the patient
- Once the guidewire is advanced, remove the over-the-needle catheter lumen (only the wire remains in the patient)
- Thread the vessel dilator over the guidewire. Passage of the dilator may be facilitated by "tenting" the skin and gently rotating the dilator into the vessel. Insert one-half the length of the dilator into the vessel, hold for a few seconds, and then remove the dilator from the guidewire.

Expect bleeding from the insertion site, and use sterile gauze to apply pressure if needed while transitioning to the next steps.

- Remove the dilator and control the expected hemorrhage with sterile gauze
- Advance the multi-lumen catheter over the guidewire. Visualize the guidewire within one of the ports, unclamp the port, and continue threading of the catheter over the guidewire until the wire appears out of the port
    - Grab hold of the guidewire one hand and continue to advance the multi-lumen catheter into the vessel
- Once the catheter is in place, remove the wire.
- Flush each multi-lumen port with sterile 0.9% NaCl and cap each port
- Secure the multi-lumen catheter in place with sutures between the skin and the designated grooves or holes on the catheter hub and/or the plastic catheter holders. Place a sterile dressing over the insertion site, then apply a loose neck wrap containing cast padding or stretch bandaging, followed by a water-resistant bandage. Tape T-port or multi-lumen ports on top of the bandage for easy access. Ensure the bandage is not tight; several fingers should easily slide under the bandage. Recheck patency of the catheter by aspirating blood once the bandage is in place.
    - For jugular multi-lumen placement, a lateral radiograph is needed to confirm placement.
- Multi-lumen ports
    - Brown (distal) – typically used for venous blood sampling
    - Blue – typically used for fluid therapy
    - White – typically used for total parenteral nutrition

Care of Central Venous Access Catheters

- The bandage wrap should be broken down daily to inspect the multi-lumen insertion site.
- Every unused port should be flushed with 0.9% NaCl every four hours
- Always wear exam gloves when handling the ports
    - Connecting/disconnecting IV fluids
    - Blood sample collection
- For blood sample collection, follow the 3-syringe technique
    - Attach the first 3ml syringe containing 0.5ml sterile saline and aspirate back
    - Attach a second syringe to collect your blood sample volume
    - Re-attach the first syringe and return the saline/blood mixture
        - Ensure there are no clots in the syringe prior to returning the “pre” sample
    - Attach a third syringe of sterile saline to flush the port/line

Arterial Sample Collection & Catheterization

Arterial blood sampling and catheterization provide assessment of arterial blood gas analysis and measurement of direct arterial blood pressure (DABP).

Arterial blood sampling is used primarily to assess oxygenation (PaO_2), ventilation ($PaCO_2$), and acid–base balance (e.g. pH, HCO_3^-, base excess). Arterial puncture for blood sampling is most commonly done in the dorsal pedal or femoral arteries.

Arterial catheterization allows for serial arterial blood sampling and second-by-second measurement of BP. Direct measurement shows a continuous waveform that reflects each phase of the patient's blood pressure.

Arterial Puncture

- Palpate a patient's arterial pulses and determine the best location to perform the puncture.
    - Typically, dorsal pedal or femoral arteries
- Have an assistant restrain the patient in lateral recumbency with the limb of the proposed puncture site adjacent to the table
    - Sedation may be required/indicated
- Perform appropriate hand sanitization and don exam gloves
- Clip the fur around the insertion site, and aseptically prep the site
- If using a prepackaged commercial arterial blood gas syringe kit, the syringe will contain a heparinized disk. If this type of syringe is not available, you can create your own using a 3mL syringe, but heparin must be added.
    - A small amount of heparin (1000u/ml) should be aspirated into a 1ml syringe to coat the inner walls of the syringe, then squirted back out
    - To remove excess heparin from the syringe, the plunger should be drawn back and excess heparin squirted out of the syringe a minimum of three times so as to not interfere with blood gas results.
- The heparin needle is then discarded and replaced with a fresh needle.
- Hold the syringe in your dominant hand like a pencil with the needle's bevel facing up.
- Palpate the peripheral pulse using the non-dominant hand.
    - Generally, the index and middle fingers of the non-dominant hand are used to palpate the pulse, as the thumb's pulse can be misleading
- Slowly, insert the needle through the skin and into the artery at approximately a 20-45 degree angle just below the fingers that are palpating the pulse.
- Once the artery has been punctured, arterial blood should pulsate into the syringe.
    - Gentle aspiration on the plunger may be necessary.
- The syringe is allowed to fill to a minimum of 0.5–1mL.
- Once the sample is collected, withdraw the needle/syringe and immediately cover the artery with a pressure wrap for a minimum of 20 minutes.
- Insert the needle into something that will occlude exposure of the sample to room air, such as the rubber stopper from a serum separator tube. Commercial kits generally come with a specific stopper to use on the syringe following sample collection.
    - The longer the sample is exposed to room air, the more likely the results of the arterial blood sample will be skewed.
- If the sample cannot be immediately run, it can be stored on an ice bath, but it is recommended that the sample be run immediately.

Arterial Catheterization

- Palpate a patient's arterial pulses and determine the best location to perform the puncture.
    - Typically, the dorsal pedal artery
- Have an assistant restrain the patient in lateral recumbency with the limb of the proposed catheter insertion adjacent to the table
    - Sedation may be required/indicated
- Perform appropriate hand sanitization and don exam gloves

- Clip the fur around the insertion site, and aseptically prep the site
- Hold the catheter in your dominant hand like a pencil with the needle's bevel facing up.
- Palpate the peripheral pulse using the non-dominant hand.
    - Generally, the index and middle fingers of the non-dominant hand are used to palpate the pulse, as the thumb's pulse can be misleading
- Slowly, insert the catheter through the skin and into the artery bevel side up at approximately a 15-20 degree angle just below the fingers that are palpating the pulse.
- Once a flash is observed in the hub, advance the catheter into the artery
- Remove the stylet and quickly place the male adapter or T-port into the catheter hub.
- Secure the catheter with tape similar to a traditional venous catheter, then place a light bandage over the catheter with cotton gauze and an outer layer.

Care of Arterial Catheters

- Due to risk of accidental dislodgement, arterial catheters should only be maintained in non-ambulatory/recumbent critically ill patients
- It is imperative that the arterial catheter be labeled as such so as not to accidentally infuse fluids or medications.
- Ensure all arterial catheter connections are tight and secure, ideally with luer-lock connections
    - If an arterial catheter accidentally becomes disconnected, excessive blood loss can quickly occur, which may increase morbidity in an already critical patient.
- For blood sample collection, follow a modified 3-syringe technique
    - Attach the first 3ml syringe containing 0.5ml heparinized saline and aspirate back
    - Attach a second syringe to collect your blood sample volume
    - **Discard** the first syringe with the heparinized saline/blood
    - Attach a third syringe of heparinized saline to flush the catheter
- If used for arterial blood sampling, the catheter should be flushed with heparinized saline every 30 minutes to one hour.
- If used for direct arterial blood pressure monitoring, attach the fluid line and transducer to the multi-parameter monitor.

Summary

Working in emergency and critical care can provide veterinary nurses opportunities to routinely perform advanced skills. It's important to understand the indications and contraindications for these procedures, the supplies needed, the procedural steps, and the maintenance and care of patients.

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