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Tubes and Catheters in Emergency and Critical Care Medicine

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Catheter and tube based procedures are frequently used in emergency and critically care patients. These devices may be life saving in emergent situations; they are also used to provide vital support to patients with critical illness. They have become very important in delivering advanced care in a variety of emergent and critical conditions.

Although their value in providing essential patient support is unquestioned, they may be a source of complications and increased patient risk. Catheters and drainage tubes are always listed high on the list of patient complications in human critical medicine because they are a primary source of bacterial contamination and infection in critically ill patients. Because they intrinsically bypasses normal host defense mechanisms, it is essential that you understand how to properly maintain them in an *aseptic* manner. This generally requires continuous monitoring of the implantation site, daily wound care and sterile technique when handling the tube, catheter or occlusive bandage. . **Where appropriate, aseptic principles of site preparation including clipping of all hair from the area and surgical preparation of skin is required.** With appropriate management, we can significantly reduce the risk associated with their use.

The goal of this presentation is to familiarize you with common devices and techniques used in emergent and critically ill patients

Respiratory

Nasal oxygen catheter

Purpose: To provide supplemental oxygen to patients with hypoxemia.

Equipment needed: 8 or 10 F red rubber catheters, suture material, 18 G needle, felt tip marker, tubing adapter, oxygen tubing, humidifier, oxygen flow meter, oxygen source, Elizabethan collar

Placement procedure: A red rubber catheter is pre-measured from the tip of the nose to the medial canthus of the eye and a mark placed on the catheter. 1-2 cc of local anesthetic agent (lidocaine, proparacaine) is instilled in the nostril which will be intubated. Wait 2-3 minutes to allow desensitization following local anesthetic application. Aseptically lubricate the tube with water soluble lubricant. In dogs, push the upper margin of the nose backward and upward. Insert the tube into the nares aiming ventral and medial to engage the ventral meatus (like a horse stomach tube). The tube should pass to the mark with slight resistance. If you meet resistance, **DO NOT FORCE THE TUBE FORWARD**, back out and redirect the tube ventral and medial. If you

induce sneezing, hold the tube in place until it stops. Following placement, a tack suture just lateral to the alar opening is placed to secure the tube. Route the tube on the dorsal midline until over the occiput. Attach tube to fur with non absorbable suture in 2-3 locations. Once placed, connect the catheter via adapter to oxygen tubing which is, in turn, connected to a humidifier and oxygen flow meter.

Management and Care: Check catheter placement 2-3 times per day.

Tracheal oxygen catheter

Purpose: To provide supplemental oxygen to patients with respiratory distress or hypoxemia where a nasal oxygen catheter placement is not possible.

Equipment needed: 14 or 16 G x 5" IV catheter, suture, 18 G needle, bandage material, oxygen tubing, humidifier, oxygen flow meter, oxygen source.

Placement procedure: Aseptically prepare the ventral midline of the neck. The IV catheter unit is inserted in the ventral aspect of the neck approximately 2" posterior to the larynx on the ventral mid line between two tracheal rings. The catheter is advanced and needle withdrawn and secured or removed depending on catheter style. An adapter is attached to the catheter hub and oxygen tubing providing humidified oxygen is attached to the adapter. The catheter is secured by cerclage suture and a light dressing applied.

Management and Care: The site is lightly wrapped and the oxygen line is secured to the bandage. Check several times a day to ensure disconnection does not occur.

Endotracheal intubation

Purpose: To provide airway support in patients who do not have protective airway reflexes or who require breathing support.

Equipment needed: A sterile uncuffed or cuffed endotracheal tube of appropriate size, laryngoscope, gauze ties and 12 cc syringe.

Placement procedure: Placement may require patient sedation for tube acceptance. Visualization of the pharynx and larynx is essential for successful placement. This is accomplished by positioning the head and neck in a favorable plane to visualize the larynx using a laryngoscope or light source. Visually confirm endotracheal tube passage between the laryngeal folds to ensure correct placement. Confirm proper tube placement with external tracheal palpation or by placing a mirror in front of tube to look for moisture condensation. Secure the tube with gauze tie around muzzle or head. Inflate the sealing cuff with a syringe after securing tube.

Management and Care: Short term (<6 hr) placement does not require any special care. If a longer intubation period is anticipated, the tube should be suctioned every 4-6 hours to remove secretions. Gas mixtures (usually oxygen) should be humidified if long term support is needed. Swab the outside of tube with dilute chlorhexidine solution every 24 hours to reduce risk of bacterial colonization.

Tracheostomy tube

Purpose: To relieve upper airway obstruction/resistance by bypassing the nares, pharynx, larynx, and proximal trachea.

Equipment needed: Tracheostomy tube, minor surgical pack, sterile drape, surgical gloves, bandaging material, 12 cc syringe.

Placement procedure: The patient is anesthetized, intubated, and placed in dorsal recumbency with a rolled up towel under the cervical region. A midline approach to the trachea is performed by incising overlying muscles and tissue in the mid cervical region. Following tracheal exposure, an incision (transverse, longitudinal, or “trap door”) is made through the tracheal wall. Guide sutures are placed one ring proximal and distal to the incision. The endotracheal tube is retracted rostrally; the tracheostomy tube is inserted into the incision. Skin distal to the incision is closed with suture leaving enough gap around the tube to permit air escape. The wound is dressed with a split surgical sponge and antimicrobial ointment. The tube is secured with a tie that goes around the neck and anchors to the tube tabs. A light wrap is applied.

Management and Care: Every 4 hours, the inner cannula is removed and rinsed in a 50:50 solution of hydrogen peroxide and water. At the same time, 3-5 cc of saline are injected into the tracheostomy tube and aseptically suctioned using a respiratory suction catheter. A ten minute nebulization is performed 3-4 times per day to reduce secretion viscosity. The wound is inspected daily for signs of infection. Following tracheostomy removal, the wound is allowed to heal by second intention.

Thoracostomy tube

Purpose: To drain air and/or fluid from the pleural space.

Equipment needed: Thoracostomy tube, surgical pack, local anesthesia and sedation drugs, surgical gloves, monofilament suture, tube adapter and 3 way stopcock, bandage material, electrical “tie-wraps”.

Placement procedure: Give oxygen via face mask at a minimum of 10 L/minute during the procedure. Sedate the patient to facilitate cooperation if needed. Identify the mid-thorax region (midway between shoulder and last rib about 4” below the spine) for tube placement. Identify the 7th through 9th rib space at the junction of the upper and middle third of the chest wall. Clip a 6” x 6” area of hair. Identify the 8th intercostal space at the junction of the upper and middle 1/3 of the chest wall. Scrub with surgical prep. Infiltrate the area with 2-3 ml of lidocaine beginning in the skin and injecting into the deep tissues in a “fan” pattern. Make a 1/2” skin incision at approximately the 10th intercostal space (2 rib spaces behind where thorax will be entered).

If using a trocar style drain tube, insert the tube-trocar unit into the wound, angle the unit forward, and advance two intercostal spaces. Tip the tube/stylette unit to a 45 degree angle and position in the interspace to be entered by beginning just off the FRONT EDGE of the back rib. A sharp tap on the tube and stylette system will advance the unit through the intercostal muscles. Following entry into the chest, “aim” the tube to the opposite shoulder and advance the tube off the stylette. The stylette should not penetrate the pleural space more than 1”. Following tube advancement, withdraw the stylette and clamp the tube with a heavy hemostat to prevent air entry.

A similar technique may be performed using a soft rubber catheter “carried in” by clamping the catheter tip in the jaws of a heavy forceps. This unit is advanced through the intercostals as described above. Following entry into the chest, the forceps is opened and the tube is advanced between the jaws of the forceps. Clamp the end of the tube with a heavy forceps to prevent air entry through the tube into the chest cavity.

Quickly seal the tube entry wound with gauze saturated in antimicrobial ointment of sterile petroleum jelly. This prevents air aspiration into the chest cavity. Place a purse string suture around the entry skin wound, do an overhand knot to secure the purse string and then continue the suture up the tube in a “Chinese finger trap” pattern. Do a square knot after each two wrap section. Secure the suture after 8-10 wraps.

Place an adapter on the end of the thoracostomy tube. Draw off air/fluid with a syringe or continuous suction unit. Secure the adapter with electrical “tie wraps”. Following stabilization, lightly wrap the wound site.

Management and Care: Check tube connection hourly to ensure that accidental disconnection does not occur. Monitor wound site for evidence of infection.

Cardiovascular

Peripheral IV catheter (cephalic, metatarsal, saphenous v.)

Purpose: To provide a vascular access for fluid and blood product administration, therapeutic agents, and emergency drugs.

Equipment needed: IV catheter, tape, injection port, heparinized saline, 3cc syringe, 20 G hypodermic needle, gauze sponges, antimicrobial ointment, conforming gauze, Vet Wrap.

Placement procedure: Clip hair over a wide area around insertion site. Scrub area with surgical scrub and rinse. Following aseptic preparation, and while wearing sterile gloves, ask an assistant to restrain the patient and distend the vein. Select an appropriate size catheter. If the skin is “tough” make a small wound with an 18 G needle and insert the catheter through the skin wound. Insert the catheter into vein with needle BEVEL UP. Advance the catheter-needle unit into vein until at least ¼” of the needle is introduced into the vessel lumen. While holding needle in place, advance the catheter only into the vein until the catheter hub is at the point of the skin puncture. Hold catheter hub and withdraw the needle from the catheter.

Place the injection cap on the catheter hub and flush with heparinized saline. Tape the catheter securely in place using a tape butterfly wrapped around the catheter hub and extending around the limb. Place an occlusive bandage at the venipuncture site and apply a second tape wrap. Place a third wrap under the needle hub and wrap around the limb to isolate the catheter hub from the skin level. Place a light wrap of conforming gauze and Vet Wrap over the site.

Management and Care: Periodically flush the catheter system (every 4 hrs) with heparinized saline if fluids are not administered. Apply a restraint device (catheter guard device or Elizabethan collar) if patient tries to dislodge the catheter.

Central IV catheter (jugular v.)

Purpose: To administer fluid and blood products, give parenteral nutrition, and permit measurement of central venous pressure.

Equipment needed: A long (16G x 5”) IV catheter of over the needle or through the needle design, tape, injection port, heparinized saline, 12 cc flush syringe, 18 G x 1” hypodermic needle, gauze sponges, antimicrobial ointment, conforming gauze, Vet Wrap.

Placement procedure: Identify the jugular vein. Clip hair over a wide area around the catheter placement site. Scrub the area with surgical scrub and rinse.

Following aseptic preparation, and while wearing sterile gloves, ask an assistant to restrain the patient and distend the vein. Select an appropriate size catheter. If the skin is “tough”, make a small wound with an 18 G needle and insert the catheter through the skin wound. Insert the catheter with needle BEVEL UP into vein. Advance the catheter-needle unit into vein until at least ¼ inch of needle is introduced into the vessel lumen. While holding needle in place, advance only the catheter into the vein. Stabilize the catheter unit and withdraw the needle. If the catheter is a through the needle design, place the needle guard over the needle to avoid catheter damage. Place an injection cap on the catheter adapter port and flush the catheter with heparinized saline. Tape the catheter securely in place using a tape butterfly wrapped around the catheter hub and extending around the neck. Place an occlusive bandage at the venipuncture site and apply a second tape wrap. Place a third wrap under the needle hub and wrap around the limb to isolate the catheter hub from the skin level. Place a light wrap of conforming gauze and Vet Wrap over the site.

Management and Care: Periodically flush the catheter system (every 4 hrs) with heparinized saline if fluids are not administered. Apply a restraint device (catheter guard device or Elizabethan collar) if patient tries to dislodge the catheter.

PICC line (Peripherally inserted central catheter-medial saphenous, lateral saphenous v.)

Purpose: To provide central vascular access for fluid and blood product administration, therapeutic agents, collection of blood samples and emergency drugs.

Equipment needed: a 3, 5 or 7 F PICC catheter, tape, injection port, heparinized saline, 3cc syringe, 20 G hypodermic needle, gauze sponges, antimicrobial ointment, conforming gauze, Vet Wrap.

Placement procedure: Clip hair over a wide area around the saphenous vein insertion site. Scrub area with surgical scrub and rinse. Following aseptic preparation, and while wearing sterile gloves, ask an assistant to restrain the patient and distend the vein. Select an appropriate size catheter. If the skin is “tough” make a small wound with an 18 G needle and insert the catheter introducer unit through the skin wound. Insert the catheter introducer into vein with needle BEVEL UP. Advance the catheter introducer unit into vein until at least ¼” of the needle is introduced into the vessel lumen. While holding needle in place, advance the catheter introducer only into the vein until the hub is at the point of the skin puncture. Stabilize the introducer hub and withdraw the needle from the catheter. Following needle removal, the PICC line is inserted through the introducer and advanced to the level of the caudal vena cava at the diaphragm. Pre-measurement of the PICC will help the operator understand how far to advance the catheter.

Place an injection cap on the catheter hub and flush with heparinized saline. Tape the catheter securely in place using a tape butterfly wrapped around the catheter hub and extending around the limb. Place an occlusive bandage at the venipuncture site and apply a second tape wrap. Place a third wrap under the needle hub and wrap around the limb to isolate the catheter hub from the skin level. Place a light wrap of conforming gauze and Vet Wrap over the site.

Management and Care: Periodically flush the catheter system (every 4 hrs) with heparinized saline if fluids are not administered. Apply a restraint device (catheter guard device or Elizabethan collar) if patient tries to dislodge the catheter

Arterial catheter

Purpose: To continuously monitor blood pressure and collect blood samples for blood gas analysis.

Equipment needed: 20 or 22 G IV or peripheral arterial catheter, tape, injection port, heparinized saline, 3 cc flush syringe, gauze sponges, antimicrobial ointment, conforming gauze, Vet Wrap.

Placement procedure: Following aseptic preparation, and while wearing sterile gloves, identify placement location by palpating arterial pulsations over proposed insertion site (dorsal pedal, cranial tibial, caudal tibial, femoral a.). In cats and small dogs, infiltrate 2% lidocaine into surrounding tissues to reduce arterial spasm that may be created by catheter presence. Have the catheter enter the skin and maintain a 30 degree angle to the long axis of the limb. Keep one finger over the intended catheter site to “feel” the catheter as it reaches proximity to the artery. Go very slowly advancing the catheter toward the vessel 1-2 mm at a time. When the vessel is entered, a bright red “flash” of blood will be noted in the catheter needle hub. It may or may not be pulsatile depending on the size of the vessel and catheter. Drop the angle of the catheter to the skin level and slowly advance the catheter unit 1-2 mm further into the vessel lumen. If bleeding is still noted, CAREFULLY advance the catheter off the needle and withdraw the needle. Cap the catheter with a flush cap and immediately flush the catheter to remove all blood. Secure the catheter with tape as described above. Once secured, perform a trial blood aspiration to ensure patency. Flush again to remove all blood. Connect to monitoring equipment.

Management and Care: Intermittent or continuous flushing of catheter is important to prevent clotting.

Multilumen catheter

Purpose: To administer large volumes of fluid or blood products, parenteral nutrition, and measurement of central venous pressure.

Equipment needed: A multi-lumen catheter set, introducer kit (if needed), surgical drape, tape, injection port, heparinized saline, 12 cc flush syringe, gauze sponges, antimicrobial ointment, conforming gauze, Vet Wrap.

Placement procedure: Following aseptic preparation, and while wearing sterile gloves, identify placement location (jugular or medial saphenous v). Local infiltration with 1-2 cc of 2% lidocaine HCl will reduce pain and discomfort associated with the procedure. Following lidocaine injection, rescrub the venipuncture site. Surgically drape the proposed venipuncture site.

Introducer method- The introducer sheath unit is passed through a small skin incision and advanced into the vein. This is confirmed by a blood “flash” in the needle hub. Following sheath introduction into the vessel, the unit is realigned parallel with the vein and advanced until approximately 1/3-1/2 of the sheath length is introduced into the vessel. At this point the sheath is advanced off the needle and the needle is completely withdrawn leaving the introducer in situ. The needle is replaced with the multi lumen catheter which is advanced down the introducer lumen and positioned in proximity to the right atrium as estimated by pre-insertion measurement. Following introduction, the sheath is peeled away leaving the catheter in place. The catheter is sutured in place using

nylon suture and a “Chinese finger trap” tie. All blood in the vicinity of the wound is cleaned up. An occlusive dressing applied, followed by a light neck wrap.

Seldinger technique- A guide catheter is introduced through a small skin incision and advanced into the vein. This is confirmed by a blood “flash” in the needle hub. Following catheter introduction into the vessel, the unit is realigned parallel with the vein and the short catheter is advanced into the vessel. At this point, the needle is completely withdrawn leaving the catheter in situ. A thin, flexible guide wire with an end hook (J wire) is introduced into the catheter and advanced 8-12 inches into the vein. The short catheter is removed leaving the guide wire in place. A dilator is threaded over the guide wire and advanced into the vessel lumen to increase the pathway diameter. Following dilator removal, the multi lumen catheter is threaded over the exposed end of the guide wire and advanced down the vein and positioned in proximity to the right atrium as estimated by pre-insertion measurement. Following introduction, the guide wire is removed leaving the catheter in place. The catheter is sutured in place using nylon suture and a “Chinese finger trap” tie. All blood in the vicinity of the wound is cleaned up. An occlusive dressing applied, followed by a light neck wrap.

Management and Care: As per other catheter systems.

Gastrointestinal

Naso-esophageal (NE) /nasogastric (NG) feeding tube

Purpose: To provide nutritional support to patients demonstrating hyporexia or anorexia in which gastrointestinal integrity is present.

Equipment needed: 6 or 8 F feeding catheter, mineral oil, flexible wire stylette, suture material, felt tip marker, tubing adapter, Elizabethan collar, and bandage material.

Placement procedure: The feeding catheter is pre-measured from the tip of the nose to the 11th intercostal space (NE) or last rib (NG) and a mark placed on the catheter. 1-2 cc of local anesthetic agent (lidocaine, proparacaine) is instilled in the nostril into which the catheter will be inserted. Wait 2-3 minutes to permit desensitization. Prepare the feeding tube unit by placing 1-2 drops of mineral oil into the feeding tube and inserting the guide wire the length of the tube. Lubricate the outside of the feeding tube with water soluble lubricant. In dogs, push the upper margin of the nose backward and upward. Insert the tube into the nares aiming ventral and medial to engage the ventral meatus (like a horse stomach tube). The tube should pass to the mark with slight resistance. If you meet resistance, DO NOT FORCE, back out and redirect the tube. If you induce sneezing, hold the tube in place until it stops. Slowly advance the tube into pharynx. Wait for a swallow to pass the tube into the esophagus. Advance the tube until it is positioned according to the pre-measured marks.

Confirm placement in the esophagus with a three step process. 1) Take a 10-20 cc syringe and aspirate 10cc. Some resistance should be noted as air is evacuated from the lumen of the esophagus and mucosal tissue begins to seal the catheter ports. If no resistance is felt, consider intratracheal placement. 2) Place your stethoscope just behind the last rib on the right side, inject 10 cc air and listen for a “gurgling” sound in the stomach. This test should be positive. 3) Inject 10 cc of saline into the tube. Watch for a “cough” reflex. If all three tests are appropriate, 99% confidence of correct placement is

present. IF THERE IS ANY QUESTION ABOUT PLACEMENT, A LATERAL AND AP THORACIC RADIOGRAPH IS TAKEN TO CONFIRM LOCATION.

Following placement, tack suture the tube just lateral to the alar opening to secure the tube. Route the tube on the dorsal midline until over the occiput. Tack suture in 2-3 locations.

Management and Care: Check placement 2 times per day with the three step procedure described above. Follow all feedings with 10 cc water to flush food particles from tube. If tube becomes clogged, inject an effervescent fluid (Coke, Sprite, seltzer water) to flush the tube.

Esophagostomy tube

Purpose: To provide nutritional support to patients with hyporexia or anorexia in which gastrointestinal integrity is assured. This tube is selected for longer term feeding protocols or if facial injury prevents NE/NG tube placement.

Equipment needed: General anesthesia, minor surgical pack, surgical drape, right angle gall duct forceps, long Carmalt forceps, scalpel blade, 12-18 F red rubber or pediatric feeding tube, suture, felt tip marker, tubing adapter, bandage material

Placement procedure: Anesthesia is required for this procedure. Airway support is required for patient protection. The patient is placed in right lateral recumbency. The middle 1/3 of the cervical region is clipped from the lateral midline to ventral midline. Aseptic preparation of the area using surgical scrub technique is required. Surgically drape the proposed site. Following preparation, a long handled (12") right angle gall duct forceps is placed through the oral cavity and placed in the esophagus. The tip of the forceps should be pointed upward. It is advanced as far as possible, but should be a minimum of 2-3" behind the wing of the atlas. Once inserted, the forceps is pushed upward while the overlying tissue is pressed downward. A "tenting" area created by the forcep tip should be visible. A small skin wound is created using a #11 scalpel blade and underlying tissues incised until the forceps tips are visible. The tips should emerge from the surgical wound. Once identified, the forceps is opened such that a feeding tube can be clamped in the forceps tips. The feeding tube-forceps unit is pulled back into the oral cavity while the feeding tube is advanced by hand. The tube-forceps unit should exit the mouth.

Once the tube exits the oral cavity, it is redirected in an aboral direction to reenter the esophagus. A long Carmalt clamp will facilitate this step. The tube is advanced down the esophagus past the point of insertion and advanced to the caudal part of esophagus just before the stomach. Once positioned, the tube is secured with a purse string and "Chinese finger trap" suture around the feeding tube. An occlusive bandage is placed followed by a light neck wrap.

Management and Care: Check placement 2 times per day. Follow all feedings with 10 cc water to flush particles from tube. If tube becomes clogged, inject an effervescent fluid (Coke, Sprite, Seltzer water) to flush the tube. Check the wound site for infection on a daily basis.

Percutaneous Endoscopic Gastrostomy (PEG) tube

Purpose: To provide long term access to the stomach for the purpose of enteral nutrition, water, and medication delivery. PEG tube placement is indicated in cases that are anorexic, hyporexic, or have significant craniofacial, cervical, or esophageal damage.

Equipment needed: Endoscope w/air and water capabilities, suction, biopsy instrument, sterile fenestrated drape, sterile surgery gloves, cotton balls, povidine-iodine, alcohol, sterile 3 x3 Nugauze[®], #11 surgery blade, surgical scissors, hemostats, bandage scissors, 18 G x 2” Angiocath, appropriate sized PEG Tube (modified Pezzer tube- 18 F for adult cats, 24 F for dogs), 3 feet of #3 Supramid Extra II[®] suture, injection cap, pinch clamp, package of sterile povidine-iodine ointment, 1-2 rolls of conforming gauze, 1-2 rolls of cast padding, 1-2 rolls of Vetwrap, tape strips

Placement procedure: Place the anesthetized patient in right lateral recumbency. Surgically clip and prep the left side of the abdomen. The clipped area should begin at the 12th rib and extend about 6”- 8” caudally. A flexible gastroscope or endoscope is advanced into the stomach under direct visualization. Following passage, the clinician insufflates the stomach via the endoscope. Once the stomach inflated, poke the patient using the index finger of your non-dominant hand directly behind the last rib. The clinician will be looking for the indentation of your finger through the stomach wall. This will allow the clinician to see where the tube will be placed. You may have to move your finger cranially or caudally depending on the size of the patient and how insufflated the stomach is. Do not angle your finger so that it moves under the last rib.

Once the tube placement site has been identified, make a SMALL stab incision through the skin using a sterile #11 blade. The incision should only be large enough to allow an 18G x 5” catheter to penetrate it. Insert an 18G x 5” catheter into the stab incision, through the abdominal wall and into the stomach. Be careful not to angle the catheter cranially. You should be able to see the catheter protruding through the stomach on the monitor. Remove the stylette but keep the catheter in place.

Thread suture material through the catheter into the stomach. Once the suture material appears in the stomach, the clinician grabs the suture with a biopsy forcep and pulls it out of the patient’s mouth. The clinician will tie the suture material that is protruding through the patient’s mouth to the PEG tube. Begin to introduce the PEG tube into the stomach by gently pulling the suture back through the catheter that you introduced through the stomach wall. When the knots that join the PEG tube to the suture reach the catheter site, you will have to thread the catheter backwards over the suture to get it out of the way. Place the first two fingers of your non-dominant hand on either side of the incision site. Your fingers should form a “v” around the incision site with the suture material in the middle of the “v”. Apply downward pressure and tension to the skin around the incision site. Tension to the skin is achieved by spreading your fingers apart to make the skin tight between your fingers. This makes it easier to pull the PEG tube through the skin.

Pull the suture and catheter through the stomach and body wall applying steady traction. This requires some strength and will be difficult to do. It is best not to jerk the suture material as you may lose the PEG tube before it emerges through the skin. If this happens you will probably have to begin the procedure again. After the PEG tube comes through the skin, pull the mushroom tip gently but snugly against the stomach wall. Clamp off the PEG tube with a pair of hemostats. This will allow the clinician to endoscopically check tube placement and ensure that the tube is not placed too tightly

against the stomach wall. Check to be sure that the stomach mucosa is not blanched. Placement of the tube too tightly against the stomach wall can cause necrosis of the stomach or skin.

Cut the suture material and plastic dilator off of the PEG tube. Remove the hemostats. Place the cross cut tube over the PEG tube to hold the tube in place next to the body wall. Mark the PEG tube directly above the cross cut tube as a reference. Place a tubing clamp on the tube and clamp it off. Insert the white syringe adapter and injection cap in to the end of the PEG tube. Place sterile gauze with povidine-iodine ointment on the site. Wrap the abdomen using cast padding, Kling and Vetwrap incorporating the PEG tube in to the final layers of the wrap. Be careful not to make the wrap too tight across the chest or abdomen.

Management and Care: Check wound site daily for signs of infection. Rewrap external bandage when soiled. Be sure to check integrity prior to each feeding by first injecting sterile saline through PEG tube and listening for gastric sounds. Be sure to replace clamp following each feeding.

Jejunostomy (J) tube placement

Purpose: To provide enteral nutrition downstream of pylorus and proximal duodenum. This access site bypasses mechanical and endocrine stimuli for release of pancreatic and biliary secretions in cases of hepatitis, cholecystitis, or pancreatitis.

Equipment needed and placement procedure: Described in surgical textbooks.

Management and care: Check wound site daily for evidence of infection. Flush tube after each feeding with 10 ml sterile water or saline. Flush tube with effervescent fluid (Coke, Sprite, Seltzer water) daily to remove food debris. Protect tube with heavy external bandage to prevent accidental or purposeful removal. Protect site with Elizabethan collar placement if needed.

Genitourinary

Urinary catheter

Purpose: To permit continuous drainage of the lower urinary tract

Equipment needed: Urinary catheter, sterile lubricant, mild soap and water, cotton balls, sterile gloves, tape, suture material, Elizabethan collar, vaginal speculum, light source.

Placement procedure:

Male dog: A flexible rubber or polyvinyl catheter of appropriate size is selected. An assistant cleanses the preputial area with a soapy solution using cotton balls. The junction of the prepuce and body wall is caudally retracted to expose the tip and glans of the penis. The penile tip is gently cleansed with soap and water. The operator puts on sterile gloves and is handed the catheter in the sterile package with one end removed to expose the catheter tip. Sterile lubricant is applied to the tip. The catheter is pre-measured to approximate the distance from the penile tip to the bladder. The catheter tip is introduced into the urethra and slowly advanced. Be careful not to force the catheter through the os penis region. When the catheter reaches the ischial arch, gentle outside pressure may be needed to facilitate directional change that occurs around the arch region. The catheter is advanced until urine is noted and is stabilized at this point. A stay suture is placed in the prepuce as it is allowed to return to normal position. A Chinese finger trap stay suture is applied to the catheter to secure it to the stay suture. A

tubing and collection bag set is attached to the catheter adapter. The drain tubing is secured to the body using a circumferential bandage around the TL area.

Female dog: A lighted vaginoscope is lubricated and vertically inserted into the vaginal vault. The scope is advanced upward and forward once past the pelvic rim. It is further advanced approximately 1-2 cm until the urethral papilla on the ventral floor of the vagina is identified. The catheter tip is introduced into the vaginoscope and slowly advanced to enter the urethral papilla and urethra. The catheter is advanced until urine is noted and is stabilized at this point.

Tom cat: A flexible rubber or polyvinyl catheter of appropriate size is selected. An assistant cleanses the preputial area with a soapy solution using cotton balls. The prepuce is extended in a craniodorsal direction exposing the tip and glans of the penis. The penile tip is gently cleansed with soap and water. The operator puts on sterile gloves and is given the catheter in the sterile package with one end removed to expose the catheter tip. Sterile lubricant is applied to the tip. The catheter tip is introduced into the urethra and slowly advanced. The catheter is advanced until urine is noted and is stabilized at this point. A stay suture is placed in the prepuce as it is allowed to return to normal position. A Chinese finger trap stay suture is applied to the catheter to secure it to the stay suture. A tubing and collection bag set is attached to the catheter adapter. The drain tubing is secured to the body using a circumferential bandage around the tail base.

Foley: A catheter of appropriate size is selected. Prior to placement, the inflatable balloon is tested to confirm integrity. The operator wears sterile gloves for the procedure. A sterile stylette is inserted into the Foley catheter lumen. Sterile lubricant is applied to the catheter tip. The catheter is placed as described above. Once location is confirmed, the stylette is removed and the balloon inflated with 1-2 cc of fluid. A stay suture is placed in the perineum just lateral to the vagina for females or on the prepuce for males. A Chinese finger trap stay suture is applied to the catheter to secure it to the stay suture. A tubing and collection bag set is attached to the catheter adapter. The drain tubing is secured to the body using a circumferential bandage around the tail base.

Management and Care: Maintaining asepsis is key to success!!!! A sterile urine collection tubing and bag set is attached to the catheter following decontamination of both ends of the junction components with chlorhexidine solution. This is repeated any time the junction is disconnected. The collection bag is emptied on a regular (every 4 hr) basis. All external portions of the catheter and collection set are regularly swabbed with chlorhexidine solution to prevent ascending bacterial infection. Urine collection bags should be placed in a dedicated tray (disposable freezer containers) or hung above floor level at all times. The goal is to have the urine bag not come in contact with areas that have contamination.