The Operating Room Environment

The reference is written and used by the Southern Illinois University School of Medicine.

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Module includes course work in basic instrument identification, aseptic technique, gowning & gloving, and patient positioning.

Goals and Objectives:

1. The resident will be able to identify basic general surgery instrumentation
2. The resident will be able to demonstrate the technical skill to produce and maintain a sterile operative field
3. The resident will be able to assist with positioning of the patient

Introduction

The term “sterile” refers to the state of “absence of living microorganisms”. Physical and chemical methods are used to achieve sterility. Aseptic technique refers to methods by which contamination with microorganisms is prevented.

To avoid infection, it is essential that any surgical procedure performed, be completed with proper aseptic technique.

Included in the principals of aseptic technique are the following:

- All instruments suture and fluids must be sterile.
- The hands of all operating personnel must be cleansed and covered by sterile gloves.
- Asepsis must be maintained through the entire course of the operation.

PRINCIPLES OF ASEPTIC TECHNIQUE

1. Application of the basic principles of aseptic technique depends primarily on the individual’s understanding and conscience. Every person on the surgical team must share the responsibility for monitoring aseptic practice and initiating corrective action when a sterile field is compromised.

2. All materials in contact with the wound and used within the sterile field must be sterile. When using or dispensing a sterile item, personnel must be assured that the item is sterile and will remain sterile until used. Items of doubtful sterility must be considered unsterile.
3. Gowns of the surgical team are considered sterile in front from chest to the level of the sterile field. The sleeves are also considered sterile from two inches above the elbow to the stockinet cuff. The cuff should be considered unsterile because it tends to collect moisture and is not an effective bacterial barrier. Therefore sterile gloves should always cover the sleeve’s cuff. Other areas of the gown that must be considered unsterile are the neckline, shoulders, areas under the arms, and back. Wrap-around gowns that completely cover the back may be sterile when first put on. The back of the gown, however, must not be considered sterile because it cannot be observed by the scrubbed person and protected from contamination.

4. The sterile area of the front of the gown extends to the level of the sterile field because most scrubbed personnel work adjacent to a sterile table. For this reason the scrubbed person should avoid changing levels, as would occur while moving from footstool to floor. To maintain sterility, scrubbed persons should not allow their hands or any sterile item to fall below the level of the sterile field. Scrubbed persons should neither sit nor lean against unsterile surfaces because the threat of contamination is great. The only time scrubbed persons may be seated is when the entire surgical procedure will be performed at that level.

5. Sterile drapes are used to create a sterile field. Only the top surface of a draped table is considered sterile. Although a bacterial barrier may be draped over the sides of a table, the sides cannot be considered sterile. Any item that extends beyond the sterile boundary is considered contaminated and cannot be brought back onto the sterile field. A contaminated item must be lifted clear of the operative field without contacting the sterile surface and must be dropped with minimum handling to an unsterile person, area, or receptacle. Interpretation of sterile areas versus unsterile areas on a draped patient requires astute observation and use of good judgment.

6. Items should be dispensed to a sterile field by methods that preserve the sterility of the items and the integrity of the sterile field. Good judgment must be used when dispensing items either by presenting them to the scrubbed person or by placing them securely on the sterile field.

7. Motions of the surgical team are from sterile to sterile areas and from unsterile to unsterile areas. Scrubbed persons and sterile items contact only sterile areas; circulating nurses and unsterile items contact only unsterile areas. All must maintain a continual awareness of unsterile areas. Maintaining a safe margin of space can reduce accidental contamination in passing items between sterile and unsterile fields.

8. The patient is the center of the sterile field during an operation; additional sterile areas are grouped around the patient. If contamination is to be prevented, patterns of movement within or around this sterile grouping must be established and rigidly practiced. Scrubbed persons stay close to the sterile field. If they change positions, they turn face-to-face or back-to-back while maintaining a safe distance between.

9. Whenever a sterile barrier is permeated, it must be considered contaminated. This principle applies to packaging materials as well as to draping and gowning materials. Obvious contamination occurs from direct contact between sterile and unsterile objects. When moisture soaks through a drape, gown, or package, strike-through occurs, and the item must be considered contaminated.
Basic Instruments

Clamping and Occluding Category

Hemostat “snap” “hemostat”

- Used for grasping of tissue/vessels to be tied off. Atraumatic, non-toothed, ratcheted handle. Tissue must be grasped near the tip of the instrument to prevent slippage. Held between the thumb and fourth finger. Available as curved or straight.
- Also used for blunt dissection

Curve Clamp

- Similar uses as the hemostat but larger, heavier gauge instrument. Therefore, to be used for larger tissue pedicles and/or larger vessels. At MMC these are usually called “Kellys”
- Kocher Clamp
- Large straight-toothed tissue clamp with ratcheted handle. Traumatic instrument generally used to clamp transected bowel or to hold tissue, which is to be discarded.

Grasping and Holding Category

Tissue Forceps

The basic purpose of tissue forceps is to grasp tissue, in a minimally traumatic manner, for stabilization or retraction while performing another action such as dissecting. Tissue Forceps are also referred to as thumb forceps or pick-ups.

- Non-Toothed – atraumatic. Smooth, for fine manipulation of tissues and application of traction and dissection. Held between thumb and index finger, usually in the non-dominant hand. Controlled by fine finger movement.
- Toothed forceps – traumatic. Firmer grip required for application of counter traction in dense tissues or tissue to be discarded.
- Allis forceps – Use for grasping intestine. Allis has a firmer hold and more traumatic than Babcock.
- Babcock forceps – Also used for grasping intestine. Babcock has a non-crushing non-ataumatic grasp.
Needle Holders

A needle holder is used to grasp and hold curved surgical needles. A needle holder has short, sturdy jaws for grasping a needle without damaging it or the suture material. The size of the needle holder should match the size of the needle, that is, heavy jaws for larger needles and slim jaws for small needles.

-Heavy tipped-

- Use with heavy suture and/or large size needles.
- Hold between the thumb and fourth finger of your dominant hand.
- Ratchet usually not used for suturing.
- Manipulate by using pronation and supination of the wrist, practice with various sutures.

-Fine Tipped-

- Vascular or Ryder Needle Driver
- Used for fine, vascular suture 4-0 to 5-0

-Spring Action Lock (Castro-Viejo)-

- Generally used for microsurgery, 6-0 suture or finer
- Ratchet locks and opens alternatively with each squeeze of the handles
- Hold like a pen between thumb and first finger
- Manipulation is a combination of fine hand movement and pronation/supination of the wrist

-Regular Needle Driver-

- Use with relatively fine suture 3-0 to 6-0. Action is the same as for heavy driver.

NOTE – do not try to use these with heavy needles as the jaws of the instrument will be damaged. This will not be recognized by the OR cleaning staff so you will eventually get these damaged forceps back in your set up! Try to use them with a fine needle and have it spin around in the jaws!

Exposing and Retracting

Soft tissues, muscles, and other structures should be pulled aside for exposure of the surgical site.

Handheld Retractor

Most retractors have a blade on a handle. Blades vary in width and length to correspond with the size and depth of the incision. The curved or angled blade may be solid or pronged like a rake. These blades are usually dull, but some are sharp. Some retractors have blades at both ends rather than a handle on one end. Handheld retractors are usually used in pairs.
Self-Retaining Retractor

Holding devices with two or more blades can be inserted to spread edges of incision and hold them apart. A self-retaining retractor may have shallow or deep blades. Some retractors have ratchets or spring locks to keep the device open; others have wing nuts to secure the blades. Some retractors have interchangeable blades of different sizes. Some self-retaining retractors can be attached to the operating table for stability.

Cutting and Dissecting
Scalpel Blades and Handles – CMMC uses disposable scalpels with attached blades primarily.

The type of scalpel most frequently used has a reusable handle with a disposable blade. The handles can be held like a pen or underhand dependent on the user’s preference. Handles vary by width and length. Blades come in various sizes and shapes. The larger ones are used for long incisions in thick skin while the smaller and finer blades are used for small, thin skin incisions or incisions to vessels.

Blade Handle and corresponding blades that will fit:

- #3 Handle – Regular or Long #10, #11, #12, #15
- #7 Handle – Regular #11, #15

Suctioning Items
Blood, body fluids, tissue, and irrigating solution may be removed by mechanical suction. Many of these items are available in disposable models. The style of the suction tip will depend on where it is to be used and the surgeon’s preference.

-Poole Abdominal Tip-
The Poole abdominal tip is a straight hollow tube with a perforated outer filter shield. It is used during abdominal laparotomy or within any cavity in which copious amounts of fluid or pus are encountered. The outer filter shield prevents the adjacent tissues from being pulled into the suction apparatus.

-Frazier Suction Tip-
The Frazier tip is a right-angle tube with a small diameter. It is used when little or no fluid except capillary bleeding and irrigating fluid is countered, such as in brain, spinal, plastic, or Orthopaedics procedures. The Frazier tip keeps the field dry without the need for sponging.

-Yankauer Tip-
The Yankauer tip is a hollow tube that has an angle for use in the mouth or throat, and surface suction.
SKILLS

Surgical Scrub

Members of the surgical team may perform an anatomical scrub prior to participating in a surgical procedure.

- Scrub time is approximately 5 minutes however with this method it is the number of strokes not the time element that is utilized.
- Hands and forearms are to be held out from scrub clothes.
- Hands to be at higher level than elbows at all times.
- Scrub solution is applied to hands and arms to approx. two inches above the elbow.
- Each nail is cleaned under running water with nail stick. The arms are rinsed and re-lathered.
- Each nail is scrubbed for 30 circular strokes.
- Each finger is then scrubbed on all 4 sides – 10 strokes/side.
- Back of hand and palm is scrubbed from base of fingers to wrist (10 strokes).
- Small overlapping circles are used to scrub from wrist to 2 inches above elbow. The procedure is the same on the other upper extremity.
- Hands and forearms are rinsed from finger tip to elbow.

Hand Drying

- Drying towel is lifted up and away from the field without dripping water into that field. Do not obtain the towel from the sterile back table. The towel will be handed to you or you may obtain one from the gown table.
- Bend forward at the waist, fingers and hand are dried thoroughly, then the same part of towel is used to dry remainder of forearm.
- The other end of the towel is then used to dry the other hand and forearm.

Gowning and Gloving

- The individual then moves into an area where the gown may be opened without contamination of self or gown.
- The gown is held away from the OR nurse's body and unfolded so that the inside is toward the wearer.
- The hands are slipped into the gown while keeping them away from the body and at shoulder level.
- The hands are advanced up the sleeves of the gown to the proximal end of the cuffs.
- “Gloving” is performed by the assisted method or closed method. The open method is usually reserved for procedures that require only gloves (ie. foley catheter insertion).
- The individual turns to allow the circulating nurse to pull the gown over the shoulders and to tie the neck and waist of the gown at the back.
• The surgeon then hands the sterile right tab of the gown to the scrub nurse, turns left 280 degrees and then takes back this tab. He/she then ties this to the other sterile tab to wrap the gown.

**Gloving – Closed Method**

This is the technique of choice if there is no one to assist the participant. The bare hands never come in contact with the outside of the gloves. The gloves are handled only through the material of the sleeves of the gown. The hands are only pushed through the cuff as the gloves are pulled on. This technique is used when gloving oneself.

**Gloving – Assisted Method**

In this technique, the scrub nurse assists the scrubbed individual with gloving:
• The glove (right first) is grasped under the everted cuff by the scrub nurse.
• The palm of the glove is turned towards the hand of the physician so that the thumb of the glove is opposite the thumb of the physician.
• The cuff is stretched by the scrub nurse to open the glove widely.
• Then the resident inserts the right hand into the glove.
• The same is then done with the left hand.
• The cuffs of the gloves can then be adjusted.

**Removal of Dirty Gown, Gloves and Mask**

The proper method of gown and glove removal will prevent skin contact with soiled outer layer of gown, gloves and mask.
• The waist tie of the gown is untied.
• Grasp a shoulder of the gown and pulls it inside out off one gloved arm, pull that sleeve off leaving the glove on, but with the cuff now everted.
• This step is repeated with the other arm.
• The gown is pulled off completely, held away from the body and is placed into the appropriate waste container.
• The gloved fingers of one hand are placed under the everted cuff of the contra lateral glove; the glove is pulled off and inverted at the same time.
• The everted cuff on the remaining glove is then grasped with the bare free fingers of the other hand and is pulled off in the same way. **Remember “GLOVE TO GLOVE / SKIN TO SKIN”**
Patient Skin Preparation

Sterilization of the living skin is not possible. The use of appropriate antiseptics can make it “surgically clean”.

Prepping
• A scrub detergent solution of povidone can be used to clean surface dirt and oil from the skin’s surface. Start at the center of the field and moves outward in reverse concentric circles.
• A sterile towel is placed over the cleaned field to dry the area.
• The towel is removed from end to end rather than being lifted up from the center.
• An antiseptic “paint” is then applied, leaving a thin film of iodophor on the skin. Again, this is done from the center of the field working outwards.
• After the antiseptic solution on the skin has been allowed to dry, sterile towels are placed around the field and are held in place by self adhesive or by the use of towel clips.
• Sterile drape(s) are then placed over the remainder of the patient.

-Dura Prep-
Dura Prep solution is a film-forming surgical skin prep with superior resistance to being washed away. It provides rapid, long-lasting broad-spectrum antimicrobial activity.

• Use the Dura Prep sponge applicator to prep operative site.
• Prep a circular motion working outwards from center of the field. Only one application is necessary so be sure not to leave any gaps when applying.
• Begin draping only after Dura Prep solution is dry. Alcohol is present in the solution and must be allowed to vaporize or ignition is possible with use of an ESU.

One major advantage of Dura Prep over a betadine scrub is the time factor. Dura Prep leaves a resistant iodine film after only one application. This film can be removed. It is suggested however that Dura Prep be left on under the dressing. It will continue to kill bacteria up to 12 hours.

-Chloraprep-
Chloraprep provides and instant as well as a 48 hr perpetual kill. It is recommended to wipe the area dry after prepping with Chloraprep. Avoid draping until the prepped site is completely dry. Minimum drying time is 3 minutes on hairless skin.

• Once solution is visible on the skin, use a back-and-forth motion to prep the incision site for at least 30 seconds, and then continue to work outward to the peripheral area
• For dry surgical sites use repeated back-and-forth strokes of the sponge for approx 30 seconds. For moist surgical sites (inguinal fold or axilla) continue strokes for approximately 2 minutes.
• Approximate dry time is 3 minutes. Do not blot or wipe away excess.
Positioning the Patient

**Preliminary Considerations**- Proper positioning for a surgical procedure is a facet of patient care that is as important to the surgical outcome as is adequate preoperative preparation and safe anesthesia. It requires knowledge of anatomy and application of physiologic principles, as well as familiarity with the necessary equipment. Safety is a prime consideration.

Patient position is determined by the procedure to be performed, with consideration of the surgeon’s choice of surgical approach and of anesthetic administration technique. Factors such as age, height, weight, cardiopulmonary status, and preexisting diseases, also influence position and should be incorporated into the plan of care. Preoperatively, the patient should be assessed for alteration in skin integrity, joint mobility, and presence of joint or vascular prosthesis. The expected outcome is that positioning for the surgical procedure will not harm the patient.

**Responsibility**- The surgeon in consultation with the anesthesiologist makes choice of position for surgical procedure, and adjustments are made as necessary. Responsibility for placing the patient in surgical position may be that of the circulator, with guidance, approval, and sometimes assistance of the anesthesiologist and the surgeon. In essence, it is a shared responsibility among all team members. In cases of complex positioning or obese, heavy patients, the plan of care will include the need for additional help in lifting and/or positioning the patient.

**Peripheral Nerve Consideration**- Prolonged pressure on or stretching of peripheral nerves can result in injuries ranging from sensory and motor loss to paralysis. Extremities, as well as the trunk area, must be well supported at all times. Appliances, restraints, and equipment in contact with skin must be well padded. Most frequent sites of injury are divisions of the brachial plexus and the ulnar, radial, peroneal, and facial nerves.

**Soft Tissue Considerations**- Body weight is distributed unevenly when the patient lies on the operating table. Weight concentrated over bony prominences can cause skin pressure ulcers. These areas must be protected from constant external pressure against hard surfaces, particularly in thin or underweight patients. Pressure injuries are more common after surgical procedures that last two hours or longer.

**Modifications for Individual Patient Needs**- Avoidance of unnecessary exposure, whether the patient is unconscious or conscious, is an essential consideration for all patients. Objectively observe the patient’s position before skin preparation and draping to see that it adheres to physiologic principles. Careful observation of patient protection and positioning facilitates expected outcome.

**Safety Measures**- Safety measures must be observed while moving and positioning patients. These include:

1. Operating table and transport vehicle must be securely locked in position, with the mattress stabilized during transfer to and from table.
2. Two persons should assist an alert patient with the transfer by positioning themselves on each side of the patient’s transfer path. The person on the side of the transport stretcher assists the patient to move toward the operating table. The person on the opposite side prevents the patient from falling over the edge of the table. Take care not to allow the patient’s gown or blanket to become lodged between the two surfaces.

3. Adequate assistance in lifting unconscious, obese, or weak patients is necessary to prevent injury. A minimum of four persons is recommended. Transfer devices and lifters may be used. The patient is moved on the count of three. The anesthesiologist gives the signal. Sliding or pulling the patient may cause dermal abrasion or injury to soft tissues.

4. Anesthesiologist guards the anesthetized patient’s head at all times and supports it during movement. The head should be kept in neutral axis and turned as little as possible to maintain airway and cerebral circulation.

5. Physician assumes responsibility for protecting an unsplinted fracture during movement.

6. Anesthetized patient is not moved without permission from anesthesia.

7. Anesthetized patient must be moved slowly and gently to allow the circulatory system to adjust and to control body during movement.

8. No body part should extend beyond the edges of the table or contact metal parts or unpadded surfaces.

9. Body exposure should be minimal to prevent hypothermia and to preserve dignity.

10. Movement and position should not obstruct or dislodge catheters, intravenous (IV) infusion tubing, and monitors.

11. Arm must be guarded to avoid hyper-extending the arm or dislodging the infusion needle.

12. When the patient is prone, the thorax must be relieved of pressure to facilitate chest expansion with respiration.

REFERENCES
Berry & Kohn’s, Operating Room Technique and Alexander’s Care of the Patient in Surgery.