UNIT Two

Lesson 2D
Surgical Instrumentation

Introduction

The surgical team uses many different surgical instruments during a surgical procedure. It is the perioperative nurse’s responsibility, as a key member of that team, to know the appropriate names, care, and handling of the surgical instruments used during the procedure. By being knowledgeable of the surgical instrumentation, the perioperative nurse is promoting an optimal surgical experience for their patient by adhering to practices that protect the client.

Learning Outcomes

1. Identify the three types of finishes available for surgical instruments.

2. Identify the five main categories of surgical instrumentation and examples of surgical instruments in each category.

3. Match the common surgical blades with their appropriate surgical handle.

4. Identify the anatomy of a ringed surgical instrument in terms of the tips, jaws, box lock, ring handles, and ratchet.

5. Differentiate between which scissors are used for cutting tissue and which scissors are used for cutting suture.

6. Differentiate between hand held retractors and self-retaining retractors.

7. Identify the two types of surgical forceps and examples of each.

8. Describe the different types of surgical sponges.

9. Correctly identify the proper steps in the loading and passing technique for the following instruments/supplies:
   a) sponge stick
   b) peanut on a kelly
   c) surgical blade
   d) sutures (loaded on a needle driver)
   e) ties
   f) ligating clips
10. Identify what is meant by a “neutral zone”.

11. Describe some commonly used endoscopic instruments.

12. Identify some commonly used powered surgical equipment and their handling.

13. Describe some key scrub nurse responsibilities when handling surgical instrumentation throughout the different perioperative phases.

14. Review the different methods available for decontamination of surgical instruments.

15. Review the techniques used for instrument preparation and packaging, prior to sterilization.
 Required Readings

- Instrument Care, Section 2, page 117-118
- Power Equipment, Section 2, page 127

Phillips, N. (2013). *Berry & Kohn’s Operating Room Technique. (12th ed.)*. Toronto: Mosby,
- Instrumentation, Chapter 19, page 329-349
- Coordinated Roles, Chapter 25, page 464-474

- Instrumentation, page 198-209

Tighe, S.M. (2012). *Instrumentation for the operating room* (8th ed.). St. Louis: Mosby,
- Inspection and Testing, page 11-13
- Classification, page 16-21
- General Surgery Instruments, page 30-48

 Required Video


 Optional Video

Instrumentation

As surgical technology continues to advance, so does the type and complexity of surgical instrumentation. New materials such as stainless steel, titanium, and various polymers have enabled the design and manufacture of new and improved surgical instruments. Minimally invasive instruments have exploded in operating rooms providing surgeons with the tools to perform invasive procedures once only possible with large incisions. This improvement in technology has improved patient outcomes, reduced post-op complications and pain, as well as shortened length of stay.

Quality of Instruments

The bulk of surgical instruments commonly used are made of 400 grade stainless steel (Phillips, 2013). Most of the manufacturing process is automated but the final stages of assembly and inspection are done by hand. Stainless steel instruments are made with one of three types of finishes before a passivation process occurs.

<table>
<thead>
<tr>
<th>Three Types of Finishes</th>
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<tbody>
<tr>
<td>Highly Polished</td>
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<tr>
<td>Reflects light and can cause glare/eye strain</td>
</tr>
<tr>
<td>Satin or Dull</td>
</tr>
<tr>
<td>Does not reflect light and eliminates glare</td>
</tr>
<tr>
<td>Ebony or Black</td>
</tr>
<tr>
<td>Eliminates glare (designed for use with laser)</td>
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Stainless steel, in most respects, is an ideal material that resists rusts, nicks, maintains a fine point, and, in the case of scissors, retains a keen edge for cutting. However, many are misled by the name "stainless," since stainless steel can spot and stain. In actuality, stainless is a "misnomer." There really is no "stainless" type of steel. Many surgical instrument companies "passivate" instruments prior to selling them, to assure the least amount of staining and spotting.

Passivation is a process in which stainless steel instruments are soaked in a nitric acid bath. This allows for the removal of carbon particles and the development of a coating of chromium oxide. This coating is important because it enables the instrument to resist corrosion, spotting, and staining thus prolonging its life.

Instruments made from other metals (e.g., titanium) require special cleaning and handling. Laparoscopic/endoscopic instruments provide a great challenge to disassemble, clean effectively, reassemble, and ensure adequate exposure to the sterilization processes of the institution.
Categories of Instrumentation

Instrument names are not standardized; therefore the names of specific instruments must be learned in the clinical practice setting at each health care facility.


All instruments can be classified according to their function as listed below (Note: this is not an all-inclusive list):

**Dissecting and Cutting Instruments**

Dissecting instruments have sharp edges to cut, separate, incise, or excise tissues (Phillips, 2013).

1. **Sharp** (cut tissue)
   - **Scalps:** consists of reusable handles and disposable blades
   - **Scissors:** tips are sharp and/or blunt; straight or curved
     - **Mayo**
       - Straight Mayo- cuts sutures and surgical supplies
       - Curved Mayo- cuts heavy tissue (fascia, muscle, uterus, etc.)
     - **Metzenbaums** (”Metz”) - cut delicate tissue; not sutures

2. **Blunt** (separate delicate tissue or tissue planes)
   - **”Peanut on a Kelly”** - a small round peanut shaped sponge on a Kelly clamp. It is also called a kittner or cherry.
   - **”Sponge-on-a-Stick”** - folded 4x4 ROP on a sponge stick
   - **Surgeon’s fingers:** Don’t laugh, it’s true!
   - **Elevators and dissectors**

**Clamping and Occluding**

These instruments are used to compress vessels and other tubular structures to impede or obstruct the flow of blood and other fluids.

- **Hemostats:** to clamp blood vessels. The jaws may be straight or curved, and the serrations in the jaws maybe horizontal or longitudinal. There are several sizes of hemostats:
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- mosquito
- hemostats (snaps/arteries)
- kelly
- gallbladder (mixter, right angle/gemini/lahey)
- tonsil

- **Occluding Clamps** are used to temporarily occlude major vessels, bowel, or ducts that have to be re-anatomized with minimal tissue trauma.
  - Vascular clamps (satinsky, glover, debakey, etc.)
  - Doyen intestinal clamp

**Grasping and Holding**

There are a variety of instruments in this group; however each are designed to hold/pick up tissue & vessels without causing injury. Usually are non-ratcheted style. Tips may be smooth, serrated, or toothed.

- **Allis Clamp**: have fine teeth that hold tissue gently, but secure.
- **Babcock Clamp**: have no teeth. They are designed to fit around or hold a tubular structure (e.g., bowel, ureter, fallopian tube) without injury.
- **Kocher Clamp**: have teeth and transverse deep serrations. Grasp heavy, tough, and slippery tissue (e.g., fascia, muscle).
- **Tenaculum Clamp**: to grasp the cervix and apply traction, for manipulation.
- **Duval Lung Clamp**: non traumatic; to hold lung tissue.
- **Non clamp graspers (forceps or pick-ups)**:
  - Adsons (with teeth and without teeth)
  - Russian
  - Debakey (GI, cardiac, vascular procedures)
  - Potts (with teeth and without teeth)
  - Bonney
  - Ramsey
  - Smooth forceps (“pick ups” or “thumbs”)
Exposing and Retracting (Retractors)

These are designed to hold back or pull aside wound edges, organs, vessels, nerves, or other tissue to gain access to operative site.

**Hand-Held Retractors:** consist of a blade attached to a handle, which is pulled back or held in place by user.

- Richardson (right-angle)
- Appendix (Goelet)
- Army-Navy
- Deaver
- Skin Hook
- Senn
- Allison Lung Retractor

**Self-Retaining Retractors:** holding devices which has a ratchet, crank, spring or locking device that holds it open.

- Weitlaner
- Balfour
- Bookwalter
- Omni retractor

Accessory

- **Clip Applier:** identify tissue and occlude vessels or small lumens.
- **Needle Holder (aka Needle Driver):** grasp and hold surgical needles
- **Rigid and Flexible Endoscopes:** viewing
- **Suction:** remove blood, fluid, and debris from operative site
  - Frazier
  - Yankauer
  - Poole
  - On & Off
- **Stapling:** used to ligate, anastamose, or approximate tissues (Nemitz, 2014). More on stapling devices will be covered in the upcoming lessons.
Blades

Blade handles are designed to hold various blades to create a scalpel. The following diagram shows the more common blade handles and the common blades.

<table>
<thead>
<tr>
<th>Blade</th>
<th>Appropriate Surgical Handle</th>
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<tbody>
<tr>
<td>#10</td>
<td>#3 or #7</td>
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<tr>
<td>#11</td>
<td>#3 or #7</td>
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<tr>
<td>#12</td>
<td>#3 or #7</td>
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<tr>
<td>#15</td>
<td>#3 or #7</td>
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<tr>
<td>#20-23</td>
<td>#4</td>
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</tbody>
</table>
Ringed Instruments

Most ringed instruments are joined at the centre by a box lock. A locking ratchet mechanism secures the clamp and remains locked when closed tightly (Fuller, 2013).

![Image of scissors with labels: Tips, Jaws, Box lock pin, Box lock, Ring handles, Ratchet]

Scissors

A large variety of scissors are utilized in the surgical suite to include many lengths, styles, curved, straight, sharp, and blunt.

- In general, curved scissors are used to cut and dissect tissue, while straight scissors are used for cutting sutures and any tissue when a smooth, straight cut is desired, such as a damaged nerve or blood vessel.

- Scissors (e.g., metz) can be used for probing, dissecting, and spreading tissue. These scissors should never be used to cut paper, tubing, or sutures. Straight mayos or bandage scissors may be utilized for cutting paper, tubing, or sutures.

- Scissors may also have tungsten carbide cutting edges which provide finer cutting with longer lasting wear. Scissors with tungsten carbide inserts are identified by gold plated ring handles. Some needle holders also have the gold plated ring handles.

- See Tighe page 17 and 30 for examples of the above listed scissors.
Clamps

A clamp can be referred to any instrument that closes over tissue to hold or occlude it (Fuller, 2013). Please refer to Phillips (2013) page 333-335 for a detailed description of clamps, such as Hemostats, Kellys, Kochers, etc.

Retractors

The body contains many complex tissue layers. Even a shallow incision requires retraction of the upper tissue layers in order to expose deeper structures (Fuller, 2013).

- Hand held retractors
  - range in size
  - may be single ended or double ended
  - may be sharp or dull

- Self retaining retractors
  - Hold tissue against the wall of the surgical incision by a mechanical action using a ratchet or another locking mechanism (Fuller, 2013)
  - Range in size and shape
  - Retractor is first positioned against the tissue to be retracted and then opened manually
  - Sometimes cushioned with a laparotomy sponge so that the blades do not press directly against the tissue (e.g., when using bookwalter) (Fuller, 2013).
  - If using a sharp or superficial retractor, a sponge is not usually used (e.g., sharp weitlaner)

Forceps

- A forcep is used for grasping tissue and suture needles during suturing and for general tissue manipulation (Fuller, 2013). Forceps are usually categorized into toothed or non-toothed (smooth).

  - **Toothed forceps**: usually used on skin, fascia, and other connective tissues. Examples of toothed forceps include Adson forceps with teeth, Bonney tissue forceps, Russians, Potts with teeth, etc.

  - **Smooth forceps**: usually used on delicate tissue such as bowel, blood vessels, or ducts. Examples include smooth Adson forceps, Debakey forceps (small fine non traumatic teeth), dressing forceps, etc.
Common Basic Set of Instruments

Below is an example of a set of common general surgery instruments. The pictures are labeled with the corresponding names on the following page. Every facility will have different names for their trays and different configurations of what instruments comprise them. Tighe (2013) page 45-46 has another example of laparotomy set.
Item Lists

1. BLADE: HANDLE#7
   BLADE: HANDLE#4
   BLADE: HANDLE#3
2. FORCEP: RAMSEY
3. FORCEP: BONNEY x2
4. FORCEP: SHORT W/OUT TEETH
5. FORCEP: DEBAKEY on top and POTTS on bottom
6. FORCEP: ADSON with teeth x2
7. HANDLE: LIGHT
8. CUP
9. SUCTION: ABD POOLE
10. RETRACTOR: APPENDIX
11. APPLIER: HEMOClip MED BLUE
    APPLIER: HEMOClip LG ORANGE
12. RETRACTOR: RICHARDSON SM
    RETRACTOR: RICHARDSON MED
    RETRACTOR: RICHARDSON LG
The pictures are labeled with the corresponding names on the following page.
Item Lists

1. SCISSORS: METZ CVD
2. SCISSORS: MAYO STR
   SCISSORS: MAYO CVD
3. NEEDLE DRIVER: MED LONG
   NEEDLE DRIVER: G I HEAVY
   NEEDLE DRIVER: SHORT FINE
4. CLAMP: HEMTOSTAT CVD 5.5"
5. CLAMP: ALLIS 4X5 6"
6. CLAMP: KELLY CVD 6.5"
7. CLAMP: BABCOCK 6.25"
8. CLAMP: GALLBLADDER 7.5"
9. CLAMP: KOCHER STR TEETH 7.25"
10. CLIP: TOWEL NON/PREF 5.5"
11. CLAMP: SPONGE STICK STR 9" SERRATED
Surgical Sponges

Surgical sponges are used for hemostasis and a variety of other purposes such as
- Soak up blood and fluids
- Retract tissue in surgical incision
- Dissect tissue

All surgical sponges must be marked with radiopaque markers (ORNAC, 2013). A radiopaque marker is usually a blue strip of materials which allows a sponge to be easily seen on plain radiograph. The radiopaque marker distinguishes sponges from cotton gauze dressings which don't contain markers and are used to cover the surgical wound.

Types of Surgical Sponges

1. Laparotomy sponges (lap sponge): used in a variety of services (general, thoracic, urology, cardiac, gyne, etc.)
   - 12x12: frequently called sponges
   - 18x18: frequently called tapes, packs

2. 4x4 sponge (aka ROP, raytec): square of loosely woven guaze in 4x4 square pad
   - Sponge stick: 4x4 is mounted on sponge stick for deep in incision

3/4. Neurosurgical patty: flat sponge with a string attached
   - Comes in a variety of sizes and used during neuro, ENT, and vascular procedures (Fuller, 2013)

5. Tonsil sponge: round sponge with a string attached used in throat surgery (e.g., tonsillectomy) and used to help control bleeding.
6. Small dissectors (aka peanuts, cherries, kitner): small round or oval sponge which is always mounted on a clamp (e.g., Kelly) used to separate or dissect tissue.

See Rothrock (2015) page 207 for a further description on Surgical Sponges or Soft Goods.

**Loading Instruments**

Instruments can be used for various purposes. The following will provide you with examples of how to load certain instruments that will be used for a particular function (Note: This is only a few examples and there are many different techniques used to load particular instruments).

**Sponge Stick**

A sponge on a stick is often used to absorb fluid, push tissue aside, or for blunt tissue dissection. To create a sponge on a stick, a radiopaque 4x4 gauze (e.g., ROP) is folded first into one thirds and then in half so that both of the ends of the gauze are together. Open the jaws of the sponge forceps and insert the ends of the gauze approximately two thirds of the way. This will leave the folded edge of the gauze at the tip of the forceps. Now close the ratchet two or three clicks. Some healthcare facilities are particular about whether the radiopaque blue strip is visible on the outside of the folded 4x4-please check your facility P&P.

**Peanut Sponges/ Kitners/ Cherries**

To load a peanut, the scrub nurse will usually use a Kelly clamp; however, a hemostat or gallbladder may also be used. Open the jaws of the Kelly clamp and grasp the peanut in its holder. Pull the peanut out of the holder and reposition the peanut in the tips of the Kelly so that approximately one third of the peanut is past the tips of the clamp. This will produce a soft non-traumatic sponge tip. Close the ratchet two to three clicks to keep the sponge firmly in place. It is important that the used peanut
A peanut should either be on the end of an instrument or in its original holder, whether it is unused (clean) or used (bloody).

**Surgical Blades**

A needle holder (typically used) should be used to attach a surgical blade to a blade handle. Never use fingers (Phillips, 2013). The use of a needle holder decreases the risk of accidental inoculation.

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**Safety Alert!**

Safety is of the utmost importance when handling surgical blades. Do not force a blade on or off of the handle. Stop the movement and readjust according. **You must protect yourself, the patient, the other OR team members, and your sterile set-up from potential inoculation.**

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**Anatomy of Blade Handle**

**Handle:** The handle of the scalpel blade is the part of the instrument that is gripped by the surgeon. The handles are made such that both right- and left-handed individuals can use the same handle safely and effectively.

**Blade lock:** The blade lock is the longitudinal groove on the end of the scalpel handle. The blade lock engages with the slot on the blade, locking the blade onto the handle. The angled base of the blade and the blade lock are not necessarily interchangeable. When loading a scalpel, make certain that you select the correct number blade to fit the correct numbered scalpel handle—see above.

To load a blade on a scalpel handle:

- Make sure you have the correct orientation for the blade (the number should be visible e.g., 10, 15, etc.) and the correct orientation for the handle (the number should be visible e.g., 3, 4, 7, etc.)

- Grasp the blade just above the opening/blade slot in the middle of the blade with the needle holder-on the dull side of the blade at a 45-90° angle. **Do not grasp the sharp edge of the blade. This is unsafe and will dull the cutting edge.**
- Once the blade is secured properly in the needle holder, align the slot in the blade over the blade lock on the scalpel handle. Carefully slide the blade down the track until the slot in the blade snaps into place on the blade lock.

- While loading the scalpel, if the blade lodges on the blade lock, carefully pull it off with the needle holder. Then reinsert the blade, making sure it slides smoothly within the track of the blade lock. Never force the blade onto the handle. The scalpel is now loaded and ready for use.

**Un-loading the blade from the handle:**

Just as in loading a scalpel, it is very important to learn how to un-load a scalpel correctly in order to avoid potentially serious injury.

- When **removing the blade** always point the handle and blade downward to avoid any injuries. New learners to this skill are encouraged to unload over a kidney basin, or something non-penetrable, to prevent the blade from tearing/puncturing the back table cover.

- To remove the blade, grasp it with the needle holder just below the opening/blade slot and slightly lift upwards as you slide the blade forward off the handle. Make certain that you have a firm grasp on the blade base so that the needle holder does not slip off.
• Be careful not to puncture your drape or back table cover when removing this blade.

• Dispose of the used blade properly by placing it in a specified “sharps” container, either the needle board on back table or sharps container in room (at end of case), being careful not to touch any non-sterile surfaces during blade disposal.

**Sutures**

When mounting a suture onto a needle holder, it should be positioned so that the surgeon does not have to reposition it for suturing.

• Chose an appropriate sized needle holder for the size of the needle being used. For example a small needle requires a smaller needle holder. As the needles get larger, the jaws of the needle holder should also increase in size/heaviness.

• The length of the needle holder must also be considered. The length of the needle holder depends on how deep the surgeon is working in the body (e.g., skin, abdominal cavity, pelvic cavity, etc.).

• Open the suture package (suture is usually placed in the package with the point of the needle aimed up) and grasp the back of the needle with a needle holder.

• To load the suture for a right-handed surgeon, stabilize the needle with your free hand and place the needle holder approximately one third of the distance from the swagged end of the needle.

• Do not clamp on the swagged as this weakens the suture and makes it off balance (Fuller, 2013; Phillips, 2013).

• For a left-handed surgeon, grasp the needle from the package in the same way as described above and rotate the suture needle so the point of the needle is aimed to the floor (down). Place the needle holder one third of the distance from the suture end of the needle.
Ties/ Ligatures/ Suture Strands

Suture strands (no needle attached) are available in precut or full-length strands ranging from 12-60 inches. Ties can be presented as any of the following depending on surgeon preference or the surgical procedure:

- free tie- which is placed in the open hand of the surgeon or left near the incision where the surgeon will grasp with a forceps/pickup;

- placed on the end of a clamp (hemostat, kelly, gallbladder, etc).
  a. Ties are often placed on clamps with the longer end of the tie extending from the tip of the clamp. Insert the tie between the jaws and close the ratchet two to three clicks to firmly hold the tie. Give a gentle tug on the tie to make sure that it is firmly secured.

  b. Ties may also be loaded on the end of a clamp with a small amount of tie (e.g. 0.5cm) extended from the tip of the clamp. The remaining tie extends down the other side of the instrument.

- Please see Phillips (2013) page 473 for additional picture on loading ties.

- **Suture Reels**- continuous reels or rolls of suture are also used for blood vessel ligation. The surgeon holds the reel and uses the amount needed (Fuller, 2013).

Ligating Clips/ Hemoclips

Ligating clips are commonly referred to as Hemoclips, and are used for hemostasis or to ligate vessels, nerves or ducts. They may be reusable or disposable. There is a picture of a disposable clip applier in Tighe (2012) on page 64 and 65.

Re-useable Hemoclip Appliers

- The hemoclips appliers are reusable and sterilized in the instruments sets.

- Disposable colored clip cartridges (small, medium, and large) are available that match the colored handles of the appliers-see Tighe page 112.

- To load a hemoclip onto a clip applier, the tip of the clip applier must be **perpendicular** to
the clips. Grasp the clip applier at the joint/box lock near the tips and hold the instrument as you would a pencil. Firmly press straight down onto the clip while holding the clip container steady with the other hand (you may or may not hear a click). Place the clip applier flat making sure not to squeeze together the finger rings of the instrument, as this will cause the clips to loosen and fall out.

- Clinically, the scrub nurse should reload the clip applier as soon as possible when it is returned because multiple clips are usually required in surgical procedures.

- There are also disposable hemoclip appliers (AKA ligating and dividing LCD stapler) available. They are automatically re-loaded. Examples are in Tighe (2012) page 65.

**Passing Instruments**

Handling and passing surgical instrumentation are important tasks for the perioperative scrub nurse. Passing instruments correctly and safely is a skill itself and takes time to develop speed and coordination (Fuller, 2013).

The goal when passing instruments is to be able to pass the correct instruments, in the correct orientation and pass it safely. The surgeon should be able to ask for an instrument and expect to simply hold their open hand out and have the instrument placed in the middle of their palm firmly.

Refer to Phillips (2013) page 470-473 for sample pictures of passing instruments.

**General Principles Passing Instruments**

- Pass instruments in their closed/locked position, unless surgeon request otherwise
- Some surgeons prefer to hear the name of the desired instrument repeated as the scrub nurse passes it. They should not have to take their eyes off the surgical procedure to receive it (Fuller, 2013).
- Try to avoid over-managing the instruments. In other words, try to pick up the instrument and manage it with the same hand, if possible. Hence, avoid picking up the instrument in one hand and shifting to the other hand to pass (Fuller, 2013).

**Ringed Instruments**

- Pass instruments in their **closed position** unless the surgeon requests otherwise.
- Pass instruments so the handles are placed in the surgeons palms.
• Pass instruments "crisply" with some force so the surgeon knows that the instrument is in their hand.
• In general, the tip of a curved instrument should be pointing upward and the curve of the instrument should point in the direction in which the surgeon will use the instrument, toward the incision (Fuller, 2013). See Phillips page 473.

Neutral Zone (Blades, Sutures, other Sharps)

The neutral zone or hands-free technique was developed in response to sharps injuries. This technique uses a hands-free space (e.g., designated receptacle) on the sterile field where sharps can be placed and picked up so that the scrub nurse and surgeon do not hand instruments to each other directly. This is especially true when using sharps instruments such as blades, sutures, IM needles, etc. Examples of hands-free zones are kidney basins, square pans, bowls, etc. and can be placed over a certain zone of the sterile field and/or by a magnetic pad (Fuller, 2013). See Rothrock page 209 for further discussion on neutral zones.

Retractors

Retractors are passed in the direction/position they will be placed in the wound.

Blades

If blades are not passed in the neutral zone, the scrub nurse passes the scalpel by grasping the handle in the middle with the cutting/sharp side of the blade “down”. The scrub nurses hand must always be above the handle (Fuller, 2013). It should not be released until the surgeon has complete control. The blade should always be monitored and accounted for at all time.

Sutures/ Ties

The loaded needle holder must be passed so the surgeon does not have to reposition it in the hand or look up from the surgical site (Fuller, 2013). Make sure the surgeon also has a pair of forceps/pickups available to hold the tissue and manipulate the needle as he is suturing (Phillips, 2013).
• Once the suture is securely loaded (either right or left handed) on the needle holder, turn the needle holder by the box lock so the needle now points toward the surgeon.
• Make sure your hand is underneath the tip holding the sharp needle—usually holding the needle holder at the box lock.
• Hold the free end of the suture in one hand while passing the loaded needle holder with the other hand (Phillips, 2013).
• Pass the ringed part of the needle holder to the surgeon’s outstretched palm making sure the surgeon grasps the needle holder firmly.
• Once the suture is passed, make sure the surgeon has a pair of suture scissors (e.g., metz) to cut the suture/tie.

**Specialty Instruments**

**Endoscopic Instruments**

Endoscopic equipment may be rigid and/or flexible. This equipment is used to view the body organs, either through an orifice such as the mouth or anus, or through small puncture sites (e.g., over joints, in the abdomen, etc.). Endoscopic instruments are complex and may consist of several lenses carefully aligned along the instrument, one or more lumens, and may contain fiber-optic bundles. All endoscopy equipment requires extreme care during use and cleaning. Detailed procedures and information for sterilization are required to prevent unnecessary damage to the equipment.

Examples are:

- Rigid endoscopes include cystoscopes, resectoscopes, laparoscopes, arthroscopes, and hysteroscopes.

- Flexible scopes include gastrointestinal scopes, bronchoscopes, sigmoidoscopes and colonoscopes.

More on endoscopic instrumentation will be discussed in later lessons.

**Power Equipment**
The use of powered equipment is widespread in the modern operating room, especially in Orthopedics and Plastics. Advances in equipment technology have allowed surgeons to work faster, with more precision, reduce the amount of tissue trauma, ultimately resulting in better patient outcomes. The power equipment in use today is driven by one of three power sources – battery, electric, or pneumatic (compressed air or nitrogen). Power equipment can be of a standard size for large bones such as femurs and tibias, and a “micro” size for small bones such as the metatarsals, the acromion, and the radius.

Powered surgical equipment currently designed for use include: Saws, drills, reamers, and wire drivers.

**Saws** are of three basic styles (see Tighe (2012) pages 127-128 for additional pictures):

**Oscillating Saw**

oscillating with a blade moving side to side at a 90-degree angle to the hand piece

**Reciprocating Saw**

reciprocating with a blade moving forward and back in the vertical plane

**Sagittal Saw**
**Wire drivers** are designed to insert Kirschner wires (k-wires) of various diameters into bone for either permanent or temporary fixation of fractures, or as guide wired for the insertion of cannulated screws.

**In/out drills** do just that, they drill into bone to make a pilot hole for the insertion of screws and operate at a high speed.

- Accessories for drills allow them to drive wires – with a jacobs chuck and key, or insert screws with the screwdriver attachment.

**Nursing Considerations Power Equipment**

- Manufacturer’s guidelines for cleaning and sterilization must be followed.

- When using pneumatic instruments ensure that the wall panel pressure settings meet the manufacturer’s recommendations. Excessive pressure may damage the hose or the hand piece, while insufficient pressure causes excess strain on motors.

- When using battery powered instruments ensure batteries are sufficiently charged and/or there is a sufficient quantity of batteries for the length of the procedure.

- Ensure that the blade, burr or drill bit is well seated in the handle before handing the instrument to surgeon or other surgical team member as this will prevent the blade, burr or drill bit becoming dislodged during the procedure.

- Ensure that when handing a powered instrument to a surgeon the **safety switch is engaged**. Careful attention to grip near the trigger switch will prevent an inadvertent activation of the hand piece and potential injury to the patient or surgical team member.

- When not in use, the hand piece must be stored in a basin or on a separate mayo tray. Power equipment should never be stored on the patient for the case as injury can occur from either the weight of the hand piece or from accidental activation.
• Powered instruments should have gross soil removed with a damp sponge prior to leaving the OR. Power equipment should never be immersed in liquid nor placed in a set with other instruments as inadvertent immersion can occur in Sterile Processing Department. (ORNAC, 2013).

**Basic Scrub Nurse Responsibilities for Surgical Instrumentation**

Once the instruments are opened on the back table, the scrub nurse is responsible for:

• Inspecting all instruments prior to use ensuring that jaws are in alignment, box locks and ratchets function easily, and those edges are smooth and sharp. Check that the tips of tissue forceps approximate and that needle drivers can securely hold the suture.

• Being knowledgeable regarding the intended purpose of each and every instrument. Use for any other purpose may damage or destroy that instrument.

• Proper handling of fiberoptic light cords. These cords should be loosely coiled and placed on top of the set or by itself in a tray. Twisting, bending, and crushing can destroy fibers and reduce the usefulness of the cord. Damaged fiberoptics are also expensive to replace or repair.

• Organization of heavy instruments, which should be laid out on the back table.

• Rinsing instruments during and after the case. Cleaning of instruments should be done with sterile water and never saline. Saline can cause corrosion which results in pitting. Pitting may allow bio-burden to remain on instruments impeding the sterilization procedures. This can result in instruments which can no longer be used.

• Handling instruments carefully. Place instruments. Do not toss them into basins or trays after use or as needed to clean them during the case. Do not put heavy instruments on top of fine/delicate instruments as damage may result.

• Separating sharps and delicate/fine instruments at the end of the case to prevent damage in the decontamination process. The scrub nurse should place delicate or sharp instruments in a separate basin or pan (e.g., K-basin).

• Setting damaged instruments aside to be cleaned then repaired and/or replaced.
• Please read more details on handling instruments throughout the immediate preoperative phase, intraoperative phase, and immediate postoperative phases in Phillips (2013) page 347-349.

**Instrument Cleaning and Preparation (Review)**

After the surgical procedure is completed, all instrumentation needs to be carefully contained. Proper instrument care and handling can preserve the life of the surgical instrument and reduce expenditures for repair. Instruments that are damaged, out for repair, or are processed incorrectly can result a delayed surgery and frustrated surgical team.

**Instrument Cleaning**

Instruments contaminated with blood, body fluids, or tissue should be rinsed during and immediately following the procedure. The scrub nurse should be wiping each instrument with a sponge moistened with **sterile water**. If using instruments with lumens (e.g., frasier suction), then a syringe should be used with sterile water and irrigated below the surface of the water to prevent aerosolization of blood, body fluids, or tissue (Rothrock, 2015).

Instruments should be cleaned as soon as possible after the procedure. All instruments must be in the open position (e.g., box locks opened) or dissembled for proper cleaning and sterilization (ORNAC, 2013). When a delay in cleaning is necessary, they should be treated with an enzymatic solution that prevents debris from adhering to the instruments. Instruments should be transported in leak proof containers, covered trays, or a specially designed cart to the decontamination area. The following is a list of different methods of decontamination that are used at health care facilities.

**Methods of Decontamination**

**Mechanical Washer/ Decontaminator**

- An automated processing unit that washes instruments for the purpose of decontamination.
- Includes a washing, rinsing, and a chemical or thermal process.
- Most common and preferred method of decontamination.

**Hand Wash**

- Delicate microsurgical instruments, laparoscopic instruments, bone reamers, powered instruments.
- For instruments that cannot be put through the mechanical washer or that will not tolerate immersion in water.
Ultrasonic Cleaners
- Use sound waves to remove debris from all parts of the instrument.
- Instruments must be able to be immersed in water/cleaning solution
- Loosens bioburden/debris, but does not kill pathogens left in the solutions

Note: All instruments should be cleaned according to manufacturer’s instructions.

Review Cleaning Instruments During Surgery
- Instruments used are wiped with moistened sponge
- Suction tips are flushed with sterile water frequently
- Non-immersible equipment should be wiped down
- Sharp instruments should be separated to avoid injury
- A closed or covered cart should be used for transport

Question: What are some examples of non-immersible items?
Answer: Camera heads, light cables, drills, other power equipment, etc.

Instrument Preparation Prior to Sterilization (Review)
The final steps before sterilization for reuse include instrument preparation and packaging (Rothrock, 2015).

- Cleaned/washed instruments are inspected to ensure that they are clean, intact, dry, and functional (ORNAC, 2013). This is always done in a clean and separate area from where the instruments were washed. Damaged or instruments that are not working correctly are sent out for repair.

- If necessary, some parts of instruments may require lubrication with water-soluble lubricants. Oil-based lubricants can leave a residue on the instruments which can compromise the sterilization process (Rothrock, 2015).

- The instruments are now ready for packaging. The instruments are arranged in mesh pans for placement in rigid containers. Instruments pans are arrangement according to size, design, weight, and density to ensure that the conditions required for proper sterilization can be met (Phillips, 2013). Trays should never be overloaded. According to Tighe (2012), the combined weight of an instrument set and its containment device should not be more than 25 lbs. According to ORNAC (2013), sets weighing more than 22lbs increase risk of injury to health care worker. Instruments requiring wrapping are wrapped in a double-thickness wrap or double wrapped.
• The instruments in the tray are arranged with joints/box locks and hinges open. The instrument tips should be protected. Fine/delicate instruments should be wrapped separately or placed on top of heavy instruments if they must be contained in same instrument tray.

• Multipart instruments (e.g., retractors, abdominal poole suction) are disassembled to facilitate steam contacting all parts of the item to render it sterile.

• Ringed instruments are placed on “stringers” or holders designed to hold the instruments (Phillips, 2013). The curved jaws of the instruments on the string should all point in the same direction. Also, like instruments should be grouped together.

• A chemical indicator (e.g., process indictor-tape, arrow, etc.) must be placed on the outside of the wrapped instruments or on the rigid container. A chemical integrator will also usually be placed on the inside of the container or inside of the wrap (Phillips, 2013). The instruments are labeled with their intended use (e.g., laparotomy tray, abdominal hysterectomy tray, etc.), the date sterilized, the sterilizer used and the control number (Phillips, 2013). The instruments are now ready to be sterilized.

• The instruments are sterilized (as per sterilization lesson). Once instruments are cooled they are ready for storage and ready to be put back in circulation for use in the operating room.
Summary

Knowing the names of the surgical instruments and how they are used is fundamental to perioperative nursing. The perioperative nurse must be knowledgeable of the instruments, equipment, and the surgical supplies being used to provide safe patient care and to enable the surgeon to effectively perform the invasive surgical procedure. The perioperative nurse must also be knowledgeable of how to assemble and pass this surgical instrumentation to prevent injuring themselves, the surgical team, and potentially the patient.
Learning Check

1. Instruments with an ebony finish are used in ________________ surgery.

2. The two types of scissors most commonly used in general surgery are ________________ and ________________.

3. A clamp used to control a "bleeder" is called a ________________.

4. A surgeon asks you for a "Deaver", you know that he/she wants a:
   a) hemostatic clamp
   b) non-toothed tissue forceps/pickup
   c) hand-held retractor
   d) suction tip that has an outer sleeve to protect the bowel.

5. Instruments are kept clean during the case by wiping them with a sponge dampened with saline.
   □ True □ False

6. Match the instrument to its use:

   A. Hemostat _____ blunt dissector
   B. Richardson _____ self-retaining retractor
   C. Weitlander _____ controls bleeding
   D. Peanut/Kelly _____ hand-held retractor
   E. Metzenbaums _____ scissors
Learning Check Answers

1. laser
2. Metzenbaums, Mayos
3. hemostat/snap
4. (C) hand-held retractor
5. False
6. D
   C
   A
   B
   E
References


