Surgical Instrumentation: Use, Care and Handling

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# Surgical Instrumentation: Use, Care and Handling

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PURPOSE/GOAL
The purpose of this study guide and accompanying video is to provide information to perioperative staff members on the use, care and handling of all surgical instruments including minimally invasive, powered and endoscopic instruments.

OBJECTIVES
After viewing the video and completing the study guide, the participant will be able to:

1) State the principles of instrument care.
2) Describe the four major categories of surgical instruments.
3) Name the basic components of powered instruments.
4) Discuss special considerations for endoscopic instruments.
5) Discuss intraoperative instrument handling including proper passing techniques.
6) Describe the proper cleaning required for each category of instrument.
INTRODUCTION

Surgical instruments are high quality tools that are designed for accomplishing a specific desired effect during invasive procedures. Instruments are integral components of all surgical procedures. Perioperative staff members must understand the use, handling, and care of surgical instruments. Proper cleaning and handling minimizes damage, increases instrument life expectancy, and protects instruments, which are a major financial investment for facilities. Careful planning, preparation, and use of instruments will contribute to an efficient and effective surgical procedure within a safe environment.

Surgical instruments perform basic functions such as holding or retracting tissue; dissecting, cutting, or incising tissue; and assisting with suturing and or closure of the surgical incision. Most surgical instruments are made of stainless steel or other metals. The metal selected must be easily cleaned, disinfected, and maintained.

Surgical procedures are becoming more complicated and intricate and as a result surgical instruments are becoming more complex, more precise in design, and more delicate in structure. With the development of new tools, instrument care and handling becomes more challenging. There are currently hundreds of different types of surgical instruments and more are being developed everyday as surgical procedures change and evolve.

MANUFACTURING PROCESSES

Surgical instruments are the surgeon’s tools. Each one is designed and carefully crafted for an intended surgical purpose. They must be durable and not prone to rusting, chipping, or denting with normal handling, which is why most are made with stainless steel, a combination of carbon, chromium, iron, and a few other alloys (i.e., metals). With advances in modern technology, other materials such as titanium and vitallium, and other polymers are also used, but stainless steel continues to account for the majority of instruments produced. It is important for perioperative staff members to know what each instrument is made of. The metal alloys used in surgical instruments must be resistant to corrosion, which can result from exposure to blood, body fluids, cleaning solutions, sterilization, and the atmosphere.

Stainless Steel

Instruments made of stainless steel begin the manufacturing process with the conversion of raw steel into instrument blanks. There are more than 80 different types of stainless steel and these are graded based on quality and composition. The most common grades used for surgical instruments are the 300 and 400 series grades and of those, the 400 series is more commonly used. Instruments such as retractors and speculums are generally manufactured from the 300 series, while cutting and non-cutting instruments are made from the 400 series.

Titanium

Titanium has excellent metallurgical properties for use in microsurgical instruments. The most notable and useful properties of titanium are that it is nonmagnetic and inert. It is harder, stronger, lighter in weight, and more resistant to corrosion than stainless steel.

Vitallium

Vitallium, the trade name for a cobalt/chromium/molybdenum alloy, is suitable for orthopedic devices and maxillofacial implants because of its strength and corrosion-resistant properties. Vitallium instruments must be used with vitallium implants to maintain electrolytic compatibility.

Other Metals

While most instruments are made of steel alloys, some are made from brass, silver, or aluminum. Some cutting blades, tips, and jaws are laminated with tungsten carbide, which is an exceptionally hardened metal.

The cutting or drilling of instrument blanks is accomplished by different methods, one of which is the precision blasting of the instrument blank sheath with garnet sand while it is submerged in a bath of bubbling coolant. The cut needed is programmed into a computer that directs the cutting arm of the machine. The measurements are precise, sometimes within a fraction of an inch, to make sure the component parts fit and meet in the exact manner needed. The machines designed to produce surgical instruments meticulously follow the computerized engineering designs and warn the operator if errors occur during drilling and cutting. When this process is complete, the raw steel material has become an instrument that is designed to do a particular job and function in a particular manner.
The next step in the manufacturing process is providing corrosion resistance. This is accomplished by the removal of carbon steel particles through immersion of the instrument into diluted nitric acid. The final step is to polish the instrument.

Manufacturers of surgical instruments add one of three finishes during fabrication: satin (i.e., dull), highly polished, and ebonized.

- A highly-polished finish, increases resistance to corrosion, but can affect the ability of the surgeon to see because of light reflection.
- A satin finish is less reflective and reduces glare.
- An ebonized finish is black chromium, is nonreflective, and virtually eliminates glare.

For most procedures, either satin or highly-polished instruments will be used. Ebonized instruments are typically used in laser procedures to prevent laser beam reflection off the instrument.

**Instrument Names**

Surgical nomenclature lacks standardization, but will generally follow certain patterns. For example, instruments may be named:

- by the action that the instrument is designed to perform (e.g., scissors, knife),
- to recognize the inventor (e.g., Debakey forceps), or
- a combination of how the instrument is to perform in a particular type of surgery and an inventor’s name (e.g., a Lambotte osteotome, a tool that is designed to cut bone, invented by Lambotte).

Names of instruments also vary by the region of the country in which they are used, the surgeon’s preference for a name, and the facility’s commonly used name.

Because instruments represent a major financial investment for a facility, proper care and handling should be a primary concern for all personnel who work with instruments. After instruments are received from the supplier, they should be carefully examined, cleaned, decontaminated, and sterilized according to the manufacturer’s instructions before use in the sterile field.

**TYPES OF SURGICAL INSTRUMENTS**

Many different kinds of surgical instruments and tools have been invented over the years. Instruments may be designed for general surgical use or for use during a specific procedure.

Generally, there is a natural progression of instrument use during a surgical procedure. Paying close attention to what is happening on the surgical field and knowing this progression will help the scrub person to anticipate which instrument will be needed.

- An incision is made using a cutting instrument, such as a knife or scissors. Clamps or forceps may be used to control superficial bleeding at this point. Electrosurgical energy delivered through an active electrode may be used to create hemostasis or to extend the excision.
- Cutting of internal tissue layers is accomplished with scissors.
- Exposure of the surgical field is made possible by retractors.
- Suction evacuation is used to eliminate the surgical smoke plume created by the electrosurgical unit and to suction fluid or blood from the surgical field.

It is easy to see that surgical instruments can be classified into four main categories:

- cutting and dissecting,
- clamping,
- grasping or holding, and
- exposing and retracting.

A fifth category exists for other accessory instruments that do not easily fit into these main classifications. These will be discussed later in this study guide.

**Cutting and Dissecting Instruments**

Basic cutting and dissecting instruments, sometimes referred to as “sharps,” do exactly what their name implies; they cut and dissect tissue or other materials. The useable part of the instrument has a sharp or cutting edge. Cutting instruments include knives, scalpels, and scissors of all types and shapes.

**Knives and scalpels**

The words **knife** and **scalpel** are used interchangeably, but generally, a scalpel has a detachable, disposable blade and nondisposable handle, while the term knife refers to single-unit cutting device such as an amputation knife. The handle size and configuration of scalpel handles varies to accommodate the area of use. Knife blades may have curved edges or sharp, stabbing points. When using a knife, care must be taken to avoid injury to self or others.
Passing Knives and Scalpels

When required to pass a sharp item to the surgeon, AORN’s Guidance Statement: Sharps Injury Prevention in the Perioperative Setting calls for the use of a “neutral or hands-free technique whenever possible or practical instead of passing hand to hand.” A neutral zone is a designated area on the sterile field where the scrub person and the surgeon place all sharp instruments (including needles). If it is absolutely necessary to pass a knife hand-to-hand, it should be held carefully between thumb and fingers and presented handle first to the surgeon with the cutting edge of the blade pointing down and away from both of you.

Caution must be taken when loading or removing blades from a knife handle. Typically, an instrument such as a needle holder or clamp is used to hold the blade during removal. Many health care facilities provide disposable scalpels for use as a way to reduce the risk of injury and exposure to bloodborne pathogens.

Scissors

Scissors are designed in short, medium, long, and heavy lengths and may be blunt or sharp with straight or curved tips on their cutting edges. Scissors consist of a pair of metal blades connected in such a way that the edges of the blades cut materials placed between them when the handles are brought together. A conventional scissors requires one movement to open the jaws and another to close them. Some scissors, particularly those used in delicate plastic and eye surgery, have a spring that holds the jaws open. Squeezing the handle together closes the blades and relaxing of the grip opens them.

When preparing for a surgical procedure, it is important to check the alignment of the scissors blades. For scissors to cut smoothly, the blades must meet at the swivel (i.e., the point where the rivet or screw connects the blades) and the cutting point.

The blades of the scissors also must be sharp. Cutting anything other than what the scissors were designed to cut (i.e., using tissue scissors to cut suture) will dull the blades and result in their misalignment. Routinely check to ensure that the blades are sharp and that the screw joining them together has not loosened. This can be accomplished by holding the scissors horizontally by one ring handle. If the blades open freely, the scissors need to be tightened. The two basic types of scissors are: tissue and suture scissors.

Tissue Scissors

Tissue scissors are used for tissue dissection. Most tissue scissors have curved tapered points. Metzenbaum scissors are used to cut medium to delicate tissue while the sturdier Mayo scissors are used to cut heavy or thicker tissue or structures such as fascia. A Metzenbaum scissors can be distinguished from the Mayo scissors by its narrow shaft and tips.

The curvature on the Metzenbaum and other tissue scissors is desirable to surgeons because it facilitates the ability to see the tips of the scissors during dissection and because they can reach around other structures. Small, fine scissors with sharp tips (e.g., iris scissors, Castroviejo scissors), are used for delicate ophthalmic or reconstructive surgery.

Suture Scissors

Suture scissors usually have straight blades and blunt points. Straight Mayo scissors are used primarily to cut suture. Angled bandage scissors can be used to cut bandages and dressings. Wire scissors should be used to cut wire and very heavy sutures.

Passing scissors

To pass any curved instrument, including scissors, hold the instrument at the joint and place the handle of the instrument firmly in the surgeon’s hand, in its position of use. The tips of
the instrument should always be visible. Curved tips should point down. Gently snap or flip the wrist when placing the instrument in the surgeon’s hand so the surgeon knows where the instrument is. This eliminates the need for the surgeon to stop and look for the instrument. Release the instrument as soon as the surgeon has a firm grip on it.

**Other Cutting and Dissecting Instruments**

Other specialized cutting instruments include chisels, curettes, osteotomes, rasps, rongeurs, saws, and trephines.

- **Chisels** are used to sculpt bone and have one beveled edge. A mallet is used in conjunction with a chisel.
- **Curettes** are used to scrape soft tissue or bone. They are manufactured with different size cupped ends and several angles and lengths. Uterine curettes are used to scrape the endometrial lining of the uterus.
- **Osteotomes** are bone-cutting instruments used for shaping or marking bone. They have a double, beveled edge and come in several widths and are both curved and straight in design. They may be used to remove periosteum from bone. A mallet is used in conjunction with an osteotome.
- **Rasps** can be used to smooth rough bone surfaces or to evacuate the medullary canal in preparation for insertion of an orthopedic prosthesis. They may be single- or double-ended, with curved or tapered blades. Rasps may be forward- or backward-cutting, with fine or coarse teeth.
- **Rongeurs** are biting instruments used for cutting tough tissue or bone. The biting cup comes in various sizes and angles. When the surgeon squeezes the handles together, the two sharp, cup-like ends come together to bite into the tissue and remove a small section. Rongeurs are most commonly used on bones or heavy ligaments. They may be double- or single-action.
- **Saws** include any notched blade used for cutting bone.
- **Trephines** are used to cut bone from the skull. A trephine has a circular, sharpened edge.

**Powered Cutting Instruments**

Powered cutting instruments are precision devices designed to make working with bone and cartilage easier and quicker than working by hand. They are used most often for precision drilling, cutting, shaping, and beveling bone. There are many interchangeable attachments available for powered surgical hand pieces, and they are used in a wide variety of procedures. Some uses include:

- Drilling holes for placement of a metal plate to hold a fracture together. This requires drill points, screws, and a screwdriver.
- Removing, reshaping, and reaming of bone at the knee or hip joint for placement of a total joint prosthesis. This requires saw blades and drill bits of various sizes and shapes. Both forward and reverse speeds are necessary for some of these activities.

The first powered surgical instruments were powered by electricity, air, or nitrogen under pressure stored in large portable tanks. The electrically powered instruments were difficult to maintain because the electrical cords deteriorated rapidly due to processing. For pneumatic instruments, a pressure gauge controls the flow at a specified pounds per square inch (PSI) pressure. Alternatively, compressed gas can be piped directly into the operating suite. In this type of system, a wall unit acts as the pressure gauge and controls the flow of gas, delivering a specific PSI. Special high-power hoses connect the gas source to the handpiece of the instrument. Surgeons found these pneumatic hoses unwieldy which promoted the development of battery-operated surgical instruments, that have now become commonplace. After use, the battery pack is recharged and is sterilized immediately before the powered instrument is used.³

**Clamping and Occluding Instruments**

Surgical clamps can be used to either compress or grasp a structure. They can be either occluding or nonoccluding (also referred to as crushing or non-crushing). The types of clamps needed for a particular procedure will depend on the kind of tissue to be held (i.e., delicate or tough) and the depth of the surgical procedure (i.e., near the surface or deep). Hemostats and occluding clamps should never be used to attach items to the surgical drapes because this could bend their tips and strain the box lock, making the instrument unsafe to use on tissue.
Hemostats
Hemostats are the most common of all clamping instruments. They are used to grasp bleeding vessels and prevent blood loss with minimal tissue damage. Hemostats range in size from short to long and from delicate to heavier in design. They can be straight or curved. Examples of hemostats are the mosquito, Kelly, and Crile.

- **Mosquito clamps** are used to control surface bleeders and handle delicate tissue (e.g., plastic surgery hand surgery);
- **Kelly clamps** are used to control bleeders in muscle tissue, to pass drains, and to hold Kittner or peanut sponges; and,
- **Crile clamps** are used to control bleeders in subcutaneous tissue.

Perhaps the most important design feature of a hemostat is the jaw portion between the box lock and the tip. Some hemostats are very slender and tapered to a fine point; others are thicker, with more blunt tips. The inside surfaces have deep grooves or serrations, which may go from side to side or run longitudinally in the same direction as the jaws. These serrations allow bleeding vessels to be compressed with sufficient force to stop bleeding. The serrations must be cleanly cut and perfectly meshed to prevent the tissue from slipping free from the ends of the clamp.

Occluding clamps
Occluding clamps are used to occlude or constrict tissue and to clamp or grasp bowel, ducts, and other structures with lumens. These instruments are used to apply pressure. They typically have vertical serrations or special jaws with finely meshed, multiple rows of longitudinally arranged teeth. They function to prevent leakage and minimize trauma to vessels that are to be reanastomosed. Examples of occluding clamps are Babcock, Allis, and Kocher clamps.

- **Babcock clamps** have curved fenestrated tips without teeth. They are used to grip or enclose delicate structure such as bowel, appendix, ureters, or fallopian tubes. The smooth edges and bowed shape allow grasping without penetrating, crushing, or traumatizing tissue.
- **Allis clamps** also allow grasping and holding without crushing. They have multiple, tiny, fine teeth that curve slightly inward. Allis clamps will hold slightly heavier tissue than Babcock clamps because they have serrations along their edges.
- **Kocher clamps** are easily identified by the transverse serrations and the large teeth at the tips. This enables the surgeon to grasp and tightly hold heavy, tough, or slippery tissue such as fascia, bone, and cartilage. The Kocher is also known as an Ochsner clamp.

Other types of clamps include hemostatic clips that may be loaded singly onto an applier or may come as a preloaded, disposable unit. These clips come in multiple sizes and the clip appliers are available in long and short lengths. These will be covered in more detail under “Suturing and Stapling Instruments.”

A general rule of thumb for selecting a clamp is to use delicate clamps for delicate tissue, heavy clamps for heavier or tougher tissue. This concept can also be applied to the depth of the surgical procedure; shorter clamps for superficial areas, longer clamps when working deep within a cavity. Another concept to note is that finer clamps should be used on smaller vessels and heavier clamps on thicker structures.

Anatomy of a clamp

The two parts of a clamp fit together at a box lock which, when closed or clamped together, remains locked until the ratchets are released.

The easily identifiable parts of a clamp are:

- The point of the tip which, when closed, should fit tightly together unless it is designed to only partially compress tissue.
- The jaws of the instrument are either smooth or are serrated to hold tissue securely.
- The box lock is the hinge point of the instrument tip and handle.
• The shank is the area between the box lock and the finger rings.
• The ratchet is part of the finger ring handle and interlocks to keep the clamp shut when the instrument is closed.

Passing clamps
Refer to the preceding section on Passing Scissors. Ensure that the clamp is closed and locked (if applicable). The tips and curve of the instrument should always be visible.

GRASPING AND HOLDING INSTRUMENTS
Grasping or holding instruments allow the surgeon to dissect and suture tissue without causing injury. Forceps and some varieties of clamps are referred to as grasping instruments because of how they perform.

Forceps, or pickups as they are sometimes called, are two-bladed, tweezer-like instruments that are designed to pick up, grasp, and hold tissue to facilitate dissection or suturing. There are many varieties of tips available on forceps. The selection of forceps depends on the intended use.

• Smooth forceps have simple serrations and smooth, tapered points for use on delicate tissue. Examples of smooth forceps include Adson forceps and Cushing or bayonet forceps.
• Toothed forceps may be either single-toothed or have multiple teeth that interlock. These are used on dense structures such as tough skin, fascia or cartilage when a firm grip is needed. They will tear or puncture more delicate tissues.
• Atraumatic forceps are used to grasp fine, delicate tissue with minimal trauma. They have either straight or angled tips and come in various lengths and jaw widths. Examples of atraumatic forceps are DeBakey vascular forceps and bulldog and Cooley forceps.

When checking forceps, the perioperative nurse must ensure that the tips meet correctly and that there are no barbs on the tips that could cause tissue damage.

Other grasping instruments
Grasping instruments also may be designed like clamps with ring handles. They may have smooth or serrated tips for grasping tissue.

• Sponge forceps have ring-shaped jaws and are used to hold gauze sponges which are then used for retraction, blunt dissection, or to absorb blood from the surgical field. Sponge forceps may be straight or curved. Examples of these are Fletcher sponge forceps and sponge sticks.
• Towel forceps are typically used to attach and secure draping material but also may be used to hold cartilage or scar tissue or to apply traction. They are available in perforating and nonperforating varieties.
• Tenacula have sharp points that are used to penetrate and grasp tissue firmly. An example is a uterine tenaculum that is used to manipulate the cervix of the uterus. Tenacula may be single- or multitoothed.

Other grasping and holding instruments include stone forceps which are used to grasp calculi (e.g., kidney or gallstones).

Passing forceps
The scrub person should grasp the top of the instrument where the two arms meet, and with the points down, pass it to the surgeon allowing the surgeon access to the full length of the instrument to adjust his or her grasp. Clamp-type forceps should be passed as stated above under Passing Clamps.

EXPOSING AND RETRACTING INSTRUMENTS
These instruments are used for two major purposes:

• to hold open the incision to provide exposure of the surgical site, and
• for holding back surrounding organs and tissue to facilitate the surgeon’s ability to see during the procedure.

Retractors come in many different sizes and shapes. Retractors are referred to as either hand-held or self-retaining. Smaller types can be held by the fingers or hands to retract skin and subcutaneous tissue in shallow surgical areas while larger, heavier types may be self-retaining and are used to retract muscle tissue and organs in deeper surgical sites.

Hand-held retractor
Hand-held retractors consist of a shaft with a curved, hooked, straight, or angled blade on one or both ends. They usually come in pairs. Some examples of hand-held retractors are:

• Army-Navy retractors or USA retractors are used in shallow incisions. These double-ended retractors are
eight inches long and have a different-sized blade at each end.

- **Senn** retractors – used to maintain exposure in small areas, such as in carpal tunnel surgery. These retractors are double-ended and have both sharp and blunt prongs.

- **Malleable ribbon** retractors – flat metal ribbons that can be shaped or bent by the surgeon into the needed shape to adequately retract tissue. They can be used to protect soft tissue during dissection or to provide retraction of bowel and soft tissue. Many sizes and lengths are available.

- **Richardson** retractors – frequently used in abdominal surgery to retract subcutaneous tissue. They come in many sizes and can be used singly or in pairs.

- **Volkmann** retractors – hand-held rake retractors that come with two to six sharp or dull prongs. They must be handled very carefully to prevent injury. They are used to retract superficial tissue.

### Passing hand-held retractors

Retractors should be handed to the surgeon handle first, in position for immediate use. Place the retractor handle gently, but firmly, into the surgeon’s hand.

### Self-retaining retractors

Self-retaining retractors have holding devices, locks, and catches which keep the retractor in a preset position after it is inserted and adjusted. Some may be clamped in situ or suspended at the end of a robotic arm or attached to the operating room bed and kept in place by clamps. All pieces of self-retaining retractors with multiple detachable parts should be checked and accounted for before and after the surgical procedure to reduce the risk of retained surgical items. Examples of self-retaining retractors include the following.

- **Jansen** retractors – frequently used in biopsies, they have two blunt blades held apart by a ratchet with either 3 or 4 prongs on each side.

- **Weitlaner** retractors – used to maintain wound exposure during procedures such as inguinal hernia repairs and are similar to a Jansen. Weitlaners may have sharp or blunt jaws and either an arrangement of teeth that is 2 x 3 or 3 x 4.

- **Balfour** retractor – used to retract the abdominal wall during abdominal surgery. The blade on a Balfour is a separate piece of this retractor and is attached and adjusted on the spreader with a wing nut. The spreader can have shallow or deep blades.

- **O’Conner-O’Sullivan** retractors – also used in abdominal surgery but more specifically for hysterectomies. This retractor comes in various configurations with both permanently attached and adjustable blades.

- **Bookwalter** retractors – table mounted and most frequently used in hepatic and thoraco-abdominal procedures.

### SUTURING AND STAPLING INSTRUMENTS

#### Needle holders

Needle holders may look somewhat like clamps, but they are designed specifically to grasp and firmly hold curved suture needles, not tissue. Although they resemble hemostats, they usually have shorter, stubbier jaws. The jaws may be straight, curved, or angled. Most have many small serrations on the insides of the jaws that hold the needle in place during suturing.

Standard needle holders have a longitudinal groove or pit in the jaw that releases tension, prevents flattening of the needle, and holds the needle firmly. “Diamond jaw” needle holders have tungsten carbide inserts that are designed to prevent the needle from rotating or slipping while passing through tissue. Some needle holders have crosshatched serrations that prevent damage to the needle and some are smooth. The smooth-jawed needle holders are used for small needles (e.g., plastic, eye surgery).

Needle holders may have a ratchet similar to that of a hemostat, or they may use a locking or non-locking spring action. Needle holders come in many shapes and sizes to fit different needles as well as the procedures to be performed. Examples include the following:

- **Mayo-Hegar needle holders** – long and narrow, used to hold medium to heavy-gauge needles to apply heavy sutures in deep abdominal areas, such as during cardiothoracic surgery. They are also widely used in general surgery.
• Collier needle holders – hold medium-gauge needles.
• Brown needle holders – hold small-gauge needles to apply sutures in superficial tissue (e.g., for plastic surgery).

Because needle holders must grasp metal rather than soft tissues, they are subject to greater damage than other instruments. As a result, they must be carefully inspected and replaced as needed. They are designed to withstand some amount of tension, but are not intended to be used as pliers. Always select a needle holder that matches the size needle being used and the depth of the surgical incision.

To load a needle on the needle holder, place the jaws near the suture end of the needle, allowing about two-thirds of the point of the needle free for passing through the structures to be sewn. Load the needle so that the tip of the needle will point to the surgeon’s thumb when the needle holder is passed. When the surgeon receives it, the needle should be in position and, ready to be passed directly into the tissue. If the surgeon is left-handed, load the needle in the needle holder in the opposite direction.

Needles should only be passed hand-to-hand to the surgeon when absolutely necessary. AORN’s Guidance Statement: Sharps Injury Prevention in the Perioperative Setting calls for the use of a “neutral or hands-free technique whenever possible or practical instead of passing hand-to-hand.”

If it is necessary to pass the needle holder to the surgeon, take care to prevent the suture from getting tangled or bunching up in the surgeon’s hand. Pass the loaded needle holder into the surgeon’s hand as you would pass any clamp, paying particular attention to the direction of the needle.

Staplers and hemostatic clip appliers
Surgical stapling instruments are often used to suture tissue quickly. As surgeons have gained experience in the use of stapling devices, many different types have been developed to suture and resect tissue. They can come as a single-use device or a stainless steel instrument with disposable staple cartridges.

Staplers are widely used in a variety of procedures that require ligation and division, anastomosis, resection, and skin and fascia closure. Skin staples have become one of the most frequently chosen methods of skin closure.

These tiny surgical staples are made of stainless steel or an absorbable, non-metallic material that minimizes tissue reaction and infection. They may be preloaded on the stapling device. Staples are packaged in various assortments of numbers and types of staples, depending on the length of the incision, and the type of tissue to be stapled. Nonreactive metal staples will remain permanently in the tissue. If staples must be removed, as with skin staples, an extractor is required.

Staplers are easy to use. Most employ a similar anvil type mechanism for forming the staple, but they vary in terms of weight, handling characteristics, ease of application, and view of the site during application. They may fire individually or lay down multiple rows in a straight or circular pattern. Devices to cut or anastomose bowel and other structures are available for open wound use or through endoscopic cannula.

Hemostatic clip appliers are small V-shaped staples that are used to occlude a vessel. These staples are usually placed one at a time with the use of a stainless steel instrument. The staples are hand loaded and passed to the surgeon who places them around the vessel and then closes the applier to close the staple.

Accessory Instruments
In addition, there are accessory instruments that do not fit into any of these categories by nature of their function. These include items such as suction tips, towel clips, probes, trocars, and ring forceps.

Suction tips are used to remove blood and/or body fluids as they accumulate to provide better ability to see the surgical site. Suction tips are available in different sizes and designs and may be provided as nondisposable or disposable. If nondisposable suction tips are used it is very important that the lumens are cleared with a stylet and flushed when processing. If the suction tip has multiple parts, the parts must
be disassembled and sterilized separately and then re-assembled on the sterile field. The diameter of the suction shaft determines the size. Narrow diameter suction tips are indicated for use in small delicate areas. Examples of suction tips are Yankauer, Andrews, and Frazier.

**Ruler, probes, and grooves** are used to measure and to dilate and probe vessel lumens.

**Towel clips** with sharp points are sometimes used with sterile cloth towels during the draping process. Once towel clips have been placed, they cannot be repositioned. Nonperforating towel clips are available that can be used to secure drapes and tubing.

**Mallets** are hammer-like instruments used for striking objects like chisels or osteotomes.

**Speculum**s are used to hold open and provide access to an orifice (e.g., vagina, eye, nose).

**ENDOSCOPIC (MINIMALLY INVASIVE) INSTRUMENTS**

With the development and increase in endoscopic and minimally invasive surgical procedures, laparoscopic and other minimally invasive instruments have been developed and are used routinely. Their functions within a sealed peritoneal cavity are similar to traditional surgical instruments, but their care can be much different. Perioperative nurses need to be familiar with the specific cleaning, disinfection, decontamination, and sterilization methods used for these types of instruments. Endoscopes are inserted into a body orifice or through a small incision to allow surgeons to examine and operate in the interior body cavities, hollow organs, or other structures.

All of the instruments used in endoscopic procedures must function through the narrow lumens of scopes and cannula that are often only 5 mm to 10 mm in diameter. Endoscopic instruments typically have long shafts, with handles at the proximal end to control the working tip at the distal end. Endoscopic graspers have a locking mechanism to hold the tips firmly in place. Many of these instruments are single-use devices, but others are reusable and need specific cleaning protocols.

**Endoscopic Electrosurgical Instruments**

Endoscopic electrosurgical instruments require special care and attention. These instruments provide cutting and coagulating capabilities. Endoscopic spatulas and hooks are routinely used with monopolar current, but virtually any type of dissector, blunt grasper, or scissors can be manufactured with this option. The shafts of such instruments are insulated to avoid injury. This insulation must be carefully checked during processing and immediately before use to avoid patient injuries.

As with standard surgical instruments, it is important to be familiar with the anatomy of these specialized instruments. The identifiable parts are the:

- handle (can come in several different configurations, controls the movement of the instrument),
- locking mechanism (allows the instrument to be secured in position),
- shaft (allows movement and rotation within the endoscopic surgical field), and
- tip (consists of the working end of the instrument and may include a grasper, scissors, retractor, or electrosurgical devices).

**Endoscopes**

Endoscopes may be rigid, semirigid, or flexible. Their lenses may allow various viewing angles. Diagnostic endoscopes are designed for observation only and have no operating channels. Operative endoscopes have a second channel for irrigation, suction, and insertion and connection of other instrumentation. They come in various diameters and lengths, depending on patient and procedural requirements. Endoscopic forceps and grasping instruments enable the surgeon to manipulate tissues.

**Trocars and cannulas**

When no natural orifice exists for insertion of a diagnostic or operative endoscope, such openings can be created using a trocar and cannula. The cannula is inserted into the operative site using a sharp trocar as an obturator or by making a small surgical incision and inserting the cannula with a blunt-tipped obturator. Once the port of entry has been made, the trocar or
obturator is removed and the hollow tube cannula is left in place.

Trocars and cannula may be disposable or reusable and come in several sizes. Those used for arthroscopy, for example, are much smaller than those used in the chest or abdomen. More than one size of trocar/cannula system may be required for a given procedure. If more than one size instrument will be inserted through a given cannula.

**INSTRUMENT CARE AND HANDLING ON THE STERILE FIELD**

Each surgical procedure requires a specific set of instruments. Instrument sets may start with a basic or standard set of surgical instruments. Then special instruments are added that meet the specialized needs of each procedure.

When setting up the sterile back table, the scrub person should handle each instrument separately to prevent them from interlocking which can cause damage. The scrub person should also check each instrument for functional readiness. Instruments should be laid side by side, avoiding piling them one on top of another. This prevents denting and nicking. Instruments such as scissors and forceps should be checked for proper alignment of the tips and working order. Any damaged or defective instruments should be handed off the sterile field and marked for repair or replacement. Ring-handled instruments should be kept together with the box locks closed on the first ratchet. The scrub person should point the curvatures and angles of clamps and scissors in the same direction. Retractors and other heavy instruments should be laid out flat on the table. Sharp blades, edges, and tips should be protected from touching other metal surfaces.

It is important that the scrub person know the name and use of each instrument as well as how to handle them. During surgery, the scrub person is responsible for passing the correct instrument needed, handling instruments individually, keeping instruments debris-free and clean, flushing suction tips and tubing, and cleaning each instrument after use. To pass the appropriate instrument, the scrub person must understand what is taking place at the surgical site.

Sharp instruments should be placed in a neutral zone from which the surgeon can pick up the instrument. Keep instruments free of gross soil by wiping them with a moist sponge and sterile distilled water. Instruments no longer needed for a procedure may be cleaned and immersed in a basin of sterile, demineralized, distilled water. Flush any cannulated instruments with sterile water. Also flush suction tips and tubing with sterile water.5

For a minimally invasive procedure, the same principles apply. The instrumentation may include a basic open setup as well as the required endoscopic instruments for the procedure. The variety and configuration of the instrument setup will include the appropriate trocars and specialized instruments needed for the type of procedure being performed. Additional required video equipment should be available in the procedure room.

Attachments for powered surgical instruments should be properly affixed to the units and tested before use. The scrub person should place trigger handles in the safety position when changing attachments or passing to the surgeon. If air powered equipment is going to be used, the manufacturer’s written instructions should be followed for proper pressure settings.

Never rest powered surgical instruments on the patient. If the instrument is too large or cumbersome to be placed on the back table when not in use,
prepare a separate sterile table or Mayo stand to hold it. This practice prevents serious injury to the patient from the weight of the instrument or from accidental activation. It also prevents the instrument from falling off the sterile field and avoids accidental contamination from saws and blades tearing through draping materials.

**INSTRUMENT CARE AFTER PROCEDURE**

After surgery, all instruments (used and unused) are considered contaminated. To ensure that no instruments are inadvertently discarded with the draping materials, instrument counts must be finished and the sterile field must be checked before removing drapes. Refer to AORN’s Recommended Practices for Prevention of Retained Surgical Items for complete information about surgical counts.4

Guidelines for instrument care and cleaning are essential and are based on manufacturer’s recommendations. When new, the instruments arrive packaged with written guidelines, booklets, and/or audiovisuials supplied by the manufacturer. These guidelines, when followed, direct perioperative and sterile processing staff members on safe and effective methods of cleaning, disinfecting, and sterilization and should always be followed. The proper care and handling of valuable surgical instruments will improve their longevity and function. Cleaning protocols should be established and followed. The perioperative nurse should ensure that instruments are cleaned, sterilized, handled, and used properly.

The process for the care and cleaning of instruments includes several steps: decontamination, cleaning, inspecting, lubricating and testing, packaging, and sterilizing.

**Decontamination**
The first step is decontamination. Decontamination renders instruments safe to handle. The decontamination and cleaning steps are often combined.

The decontamination process may begin in the procedure room with prerinsing and presoaking. Presoaking prevents blood and debris from drying on the instrument. Instruments are organized, contained, and transported to the central processing area using closed case carts. The Occupational Safety and Health Administration requires that items placed on top of a transport cart must be contained (e.g., in a plastic bag). Blades and drill bits should be removed from powered equipment by the scrub person in the procedure room before sending to the decontamination area. Power equipment should not be immersed or placed under running water unless indicated in the manufacturer’s written instructions.

Decontamination and cleaning may be done manually or automatically using detergent, water, and friction. The manufacturer’s instructions should be followed for mixing of detergents as this can affect proper rinsing.

**Cleaning**
Separate from other instruments those instruments that are delicate, small, or have sharp or semi sharp edges and process them according to the manufacturer’s directions. Powered and endoscopic instruments also should be handled separately. Instruments with removable parts should be disassembled to expose all surfaces. Reusable endoscopic or laparoscopic instruments need to be specially prepared before terminal sterilization and use. Hinged instruments should be opened to expose box locks and serrations. Instruments of dissimilar metals should be separated to prevent the electrolytic deposition of metals.

As noted earlier, many surgical instruments are made of stainless steel. It should be noted that stainless steel is by nature, stainless, but it is not stain-proof. This is an important consideration when subjecting stainless steel instruments to chemicals and detergents.

Instrument washing takes place in the decontamination area of central processing. Proper attire and personal protective equipment must be worn by staff members in this area. The purpose of cleaning is to remove residual blood and debris before terminal sterilization. Some instruments require precleaning by hand to remove gross debris before going into the washer, sterilizer, or decontaminator. Other instruments (e.g., delicate or complex ones) requiring disassembly, may need to be cleaned and dried by hand.

When washing by hand, keep the instrument submerged to prevent microorganisms from splashing and aerosolizing. Instruments with multiple parts should be disassembled and box locks opened. Use a clean, warm water solution that is noncorrosive and low-sudsing, and a prerinsing liquid detergent. Thoroughly rinse the instruments in deionized water.
An automated unit also can be used to mechanically clean and decontaminate instruments. These systems clean with cycles that include a cold water prerinse to dissolve blood and protein, a detergent wash, a rinse, and a final cycle of steam and heat. Instruments should be arranged in perforated trays, placing heavy instruments in separate trays. If heavy and lightweight instruments are combined in one tray, place the heavier ones on the bottom and the smaller, lightweight ones on top. Turn instruments with concave surfaces, such as curettes, so that the bowl side is down to promote drainage. Open box locks and pivots of hinged instruments to expose the maximum surface area. Separate instruments of dissimilar metals to prevent electrolysis, which can cause etching. Do not mix stainless steel instruments with other metals. Place sharp instruments in their own tray. Arrange instruments neatly, and do not randomly pile them on top of one another. Avoid placing delicate instruments into the washer because mechanical agitation may damage them.

Another type of automated method is the ultrasonic cleaner. Ultrasonic energy uses high frequency sound waves to thoroughly clean instruments by a process called cavitation. It removes the tiniest particles of debris from serrations, box locks, and crevices of instruments that may be impossible to clean by other methods.

When pneumatic hand pieces are cleaned, the air hoses should be left attached. The outside of the hand piece should be wiped with a detergent or germicide and dried. Hoses should be inspected for damage or excess wear before and after decontamination. Powered equipment and attachments should be lubricated with a manufacturer’s recommended lubricant.

Inspecting
Inspect and test the function of each instrument after decontamination. They should all be clean, and those with moveable parts should be lubricated according to the manufacturer’s directions.

Endoscope cleaning
Endoscopes are fragile devices and require special handling and care to prevent damage. To avoid fogging, the proximal end must be free of moisture. The endoscope should be held by its housing body and/or eyepiece. Do not drop or shake the endoscope. When processing, endoscopes should never be placed in an ultrasonic cleaner as this will damage the optics. Endoscopes should be cleaned and processed separately from other instruments.

Endoscopes should be inspected before use. Scrub personnel should look for any scratches or dents, which might indicate a defect in the endoscope. No distortions should appear on the outside, or in the lens. If there is any moisture present or the rod lens is damaged, cloudiness and possibly a loss of image may result. Associated light cords and connectors also should be inspected to confirm that damage has not occurred during processing. The light appearing through the cord should be even, without any darkened areas, which indicate broken fibers.

Cleaning laparoscopic instruments
Laparoscopic instruments can be challenging to clean. They have evolved from first generation devices that were extremely difficult to clean, to second generation devices that include a cleaning port, to modern instrumentation which allows for complete disassembly for proper cleaning.

After use and before the next surgical procedure, laparoscopic instruments must undergo several preprocessing steps, before being cleaned, lubricated, and sterilized for reuse.

Preprocessing. The reprocessing of laparoscopic instruments begins at point of use. As with all devices, excess body fluids and tissues must be removed immediately in the surgical suite. Several steps are necessary before laparoscopic instruments are processed. Devices must be disassembled by carefully following the manufacturer’s written instructions because of the variability in how these instruments are designed (i.e., some models of laparoscopic instruments can be completely disassembled, some have flush ports, some have neither). The required cleaning agents should be prepared according to the manufacturer’s use, dilution, and temperature recommendations.

Instruments should be inspected for any obvious insulation damage and bent or missing parts. If any insulation damage or missing parts are discovered, this should be reported immediately for patient follow-up to assess whether the patient has been harmed.

Cleaning. Remember these basics when cleaning laparoscopic instruments:

- Manual cleaning is required for all instruments with lumens and hollow spaces. Automated cleaning with a washer/disinfector alone may not be effective.
- Metal brushes or scratch/scouring pads should not be used on insulation because they damage the instrument’s surface and finish. Instead, use soft-bristle, nylon brushes and cotton-tip swabs.
• Use deionized or softened water, especially for the final rinse. Note: Water with high mineral content (i.e., hardness) can leave residues that affect performance.

• Neutral pH enzymatic detergent cleaning agents are recommended. Alkaline detergents, if used, must be completely rinsed from the devices. Do not use corrosive fluids such as bleach-based products to avoid damaging the instrument.

• Cold soak sterilization is not typically recommended and, as is always necessary for all instrumentation, the manufacturer’s instructions for specific devices should consistently be followed.

• Totally immerse instruments during cleaning to prevent aerosolization. Do not use steel wool, wire brushes, pipe cleaners, or abrasive detergents. Anything other than high-quality brushes specifically designed for instrument cleaning may damage the device.

After disassembly, the following manual cleaning steps are important:

• All components should be immersed (i.e., soaked) in a blood-dissolving, enzymatic solution prepared according to the manufacturer’s instructions for at least five minutes with gentle agitation. Note: Soak longer if protein-containing material is present. It is advisable to soak instruments vertically to reduce the possibility that air bubbles will form. Vertical soaking also enables the solution to enter, rise through, and exit the device if the solution is sufficiently deep.

• Remove the device from the enzyme solution, and rinse it thoroughly under running tap water for at least three minutes.

• Immerse all components in a detergent solution prepared according to the manufacturer’s instructions and clean all surfaces.

• Use a hand-held, soft bristled brush with a back-and-forth motion to brush all surfaces. Pay special attention to the cord connector, crevices, grooves, fittings, and joints.

• While still submerged, use a soft-bristled brush with a gauge recommended by the manufacturer to clean inner lumen surfaces. If a recommendation is not made, select a brush with soft bristles that are slightly larger in diameter than the actual lumen. Use complete strokes and ensure that the bristles exit the lumen. Push and pull the brush completely through the lumen several times. If necessary, repeat the brushing process by entering the opposite end of the lumen.

• Flush irrigation channels with deionized water and use a stylus, if necessary, to remove clogs. If instruments have cleaning ports, a Luer lock syringe filled with enzymatic solution can be attached to the cleaning port to flush the lumen. Note: Keep the distal end of the lumen under water. If there are no cleaning ports, a three-inch piece of tubing can be inserted over the distal tip, and a syringe can be attached to the tube’s opposite end for flushing. Compressed air can also be used for flushing if a precise nozzle is available and if the pressure can be controlled. Ultrasonic irrigators also are a useful way to flush instruments with lumens to remove debris from hard-to-reach areas, and they can do so more effectively in a shorter time than a manual process.

• Some detergent solutions may leave a residue on the gold electrical post connector surface that can cause occasional cord alarms. The residue can be removed with an alcohol-soaked swab rotated completely around the gold connector surface.

• Remove the device from the detergent solution and rinse thoroughly under running distilled or de-ionized water for at least three minutes.

• Most instruments can be processed through a washer/disinfector after manual cleaning is complete using the instrument cycle. If this is done, assure that no residue remains.

Remove excess moisture and allow the instrument to dry before sterilizing.

**Inspection**

Laparoscopic instrument insulation is susceptible to pin holes, cracks, tears, and overall loosening. These defects must be discovered as the instruments are assembled before sterilization to reduce the risk of electricity escaping through insulation failure points and to minimize the risk of
inadvertent patient burns. Patient infections, extended recovery times, and the need for a possible return to surgery may result from these burns. If defects are observed, a process should be in place for patient follow-up to determine if the insulation failure occurred during the last surgical procedure and injured the patient. To inspect the insulation, locate the metal collar at the distal tip. The insulation should fit tightly against the collar with no spaces visible. Next, grip the insulation, and try to slide it back. If the insulation slides (i.e., moves), the instrument needs repair. Finally, check the instrument shaft for insulation cuts, cracks, and nicks and inspect the handle for chips or cracks because these defects indicate the need for repair or replacement. Some facilities have insulation failure testers that are used routinely on all insulated instruments.

**Powered Surgical Instruments**

Powered instruments use nitrogen, compressed air, electricity, or batteries to be operational. Powered instruments are available for use in many different surgical specialties. Their use enables the surgeon to work more quickly and efficiently, decreases surgical time and causes less trauma to tissues and surrounding structures. Powered surgical instrument systems are complex and have varied assemblies of gears, rotating shafts, seals, and other diverse components. Most, however, have the following basic parts:

- A power source, which may be compressed gas, alternating current (AC), or direct current (DC)
- A hose or cord that connects the power source to the handpiece (AC and pneumatically powered instruments only)
- The handpiece itself
- Hand- or foot-operated controls
- Accessory attachments

The action of a powered surgical instrument may be facilitated by attachment of a blade, drill bit, reamer, or bur to achieve reshaping, removal, pinning, reaming, or carving of bone. Power saws have either a reciprocating or oscillating action, while power drills operate via rotary action. The rotary action may be fast such as when drilling a hole for pin placement, or slower as when used for reaming the shaft of a long bone.

When cleaning powered instruments, make sure that the cleaning methods chosen follow the manufacturer’s written instructions. Many powered instruments may not be immersed in water. Guidelines for cleaning powered equipment are to:

- leave air hoses attached to the hand pieces
- use manufacturer-recommended detergents
- rinse all traces of detergent solution
- wipe air hoses clean with damp cloths
- remove excess water
- dry the outside of the equipment with lint-free towels

For battery-operated power tools, the batteries should be removed and processed according to manufacturer’s recommendations.

**Packaging**

The next step in preparing surgical instruments for future procedures is packaging. Instruments must be thoroughly dried and lubricated as necessary before packaging. Instruments are arranged to prevent air and moisture from being trapped and/or retained. Important concepts to remember are to:

- place instruments in a container that is large enough to evenly distribute metal mass in a single layer
- if steam sterilization is used, instruments with concave surfaces should be placed on edge to facilitate drying
- hinged instruments should be opened and unlocked
- instruments with removable parts should be disassembled
- delicate and sharp instruments should be protected with loose-fitting tip protectors that have been validated for use with the selected sterilization method
- heavy instruments should be placed on the bottom of the tray
- use only validated containment devices to organize or separate instruments
- flush suction tip lumens and other channeled devices with softened or deionized water before steam sterilization
- remove stylets from lumens
- line the instrument tray or basket with an absorbent, lint-free surgical towel as needed

Powered equipment should be disassembled before being packaged for sterilization. Delicate parts should be protected and air hoses loosely coiled. Regardless of what sterilization method will be used, instruments must be packaged to allow the sterilizing agent to directly contact all surfaces. Steam sterilization under pressure is the recommended method for
all instruments when possible. Steam makes direct contact with all surfaces, and water condensate revaporizes producing a dry, sterile instrument.

**Sterilization**
The final step in preparing instruments for future use is sterilization. There are multiple methods of sterilization or high-level disinfection that can be used. The process chosen must be compatible with the type of instrument and the packaging material chosen. Please refer to AORN’s recommended practices for complete information about sterilization methods. Also available is the video “Sterilization in the Perioperative Setting” from the AORN Perioperative Nursing Library.

**SPECIAL PRECAUTIONS**

**Ophthalmic Instruments**
Special precautions must be taken when reprocessing ophthalmic surgical instruments to reduce the risk of patient injury from toxic anterior segment syndrome (TASS). Most reported cases of TASS appear to be the result of inadequate instrument cleaning and sterilization.

Special precautions should also be taken when cleaning robotic instruments because these instruments have lumens with complex and difficult-to-clean internal and external components, both. Lumens and internal components should be flushed with compressed air after cleaning to prevent subsequent microbial growth.

**Prion Diseases**
Special considerations should also be taken to minimize the risk of transmitting prion diseases. Prion diseases are thought to be transmitted through direct inoculation (e.g., oral ingestion, inoculation of scratched skin) and iatrogenically transmitted through transplanted contaminated tissue (e.g., cornea, dura mater). Prions are resistant to chemical disinfection and routine sterilization methods. Patients should be screened for the possibility of exposure to prion diseases and consideration should be given to what instruments will be used on patients suspected of having prion disease because of the extreme difficulty in sterilization of reusable instruments.

**Personal Protective Equipment (PPE)**
Personnel handing contaminated instruments and equipment must wear appropriate PPE consistent with the anticipated exposure. Personnel should expect splashes, splatters, and skin contact to occur during the processing of contaminated instruments. A fluid-resistant gown, heavy-duty gloves, and a mask and face protection are required PPE. Two pairs of gloves should be worn when cleaning instruments and equipment. Hands should be washed after removing gloves as perforations can occur in gloves and provide an avenue for contamination. The Occupational Safety and Health Administration requires that a hepatitis B vaccination be offered to all employees at risk for exposure to blood-borne pathogens.

**SUMMARY**
The perioperative nurse must ensure that surgical instruments are selected based on their intended use and that they are inspected, maintained, and sterilized adequately. Properly functioning tools are essential for performing surgical procedures and for the safe care and well-being of patients.
REFERENCES

SURGICAL INSTRUMENTATION: USE, CARE AND HANDLING

1) Compared to conventional hand-held instruments, powered surgical instruments:
   a) enable the surgeon to work more quickly  
   b) cause less trauma to surrounding tissues  
   c) decrease surgical time  
   d) all of the above

2) Powered surgical instruments are used for all of the following except:
   a) cutting and fixation of bone  
   b) splitting the sternum  
   c) harvesting of skin for grafting  
   d) suturing of tissue

3) All of the following have a rotary action except:
   a) femoral reamers  
   b) automatic screwdrivers  
   c) bone rasps  
   d) k-wire drivers

4) Direct current is the source of power for:
   a) pneumatic instruments  
   b) battery-operated instruments  
   c) instruments that plug into wall current  
   d) all of the above

5) When regulating the gas flow for pneumatic instruments, the correct pressure (PSI) should be set:
   a) by the manufacturer  
   b) before the instrument is activated  
   c) while the instrument is activated  
   d) before attaching the hose

6) When not in use, powered surgical instruments should be placed:
   a) on the patient  
   b) on a nonsterile table  
   c) on a separate sterile table or Mayo stand  
   d) any of the above

7) When decontaminating and cleaning a pneumatically powered surgical instrument:
   a) the gas hose should remain attached to the handpiece  
   b) a detergent/disinfectant solution should be used  
   c) the outside should be dried with lint free towels  
   d) all of the above

8) When packaging powered surgical instruments for sterilization, small, delicate parts should be:
   a) protected by placing in appropriate section of container or packaged separately  
   b) left unpackaged  
   c) placed under the instrument to prevent movement during sterilization  
   d) placed loosely in the container to prevent stress and tension on the parts

9) A hemostat is classified as a _________ instrument.
   a) cutting  
   b) clamping  
   c) grasper  
   d) retractor

10) When passing sharps during a surgical procedure, the best way to protect all members of the surgical team is to use:
    a) extra care  
    b) an assistive device  
    c) a neutral zone  
    d) a knife handle

11) Curved Mayo scissors are usually used to cut:
    a) delicate tissues  
    b) heavier tissues  
    c) suture  
    d) any of the above.
12) A biting instrument used for cutting tough tissue or bone is called a(n)
   a) rongeur  
b) rasp  
c) osteotome  
d) curette

13) The portion of a hemostat that runs from the finger rings to the box lock is called the
   a) jaw  
b) ratchet  
c) joint  
d) shank

14) A popular type of occluding clamp that has no teeth is the
   a) Babcock clamp 
b) Allis clamp 
c) Kocher clamp  
d) Ochsner clamp

15) Sponge forceps are used for
   a) retraction  
b) absorbing blood in the operative field  
c) blunt dissection of soft tissue  
d) all of the above

16) Compared to hemostats, needle holders have
   a) shorter, stubbier jaws  
b) longer jaws 
c) more teeth  
d) no ratchets

17) The depth of the surgical site will help determine
   a) the number of teeth on the instruments used 
b) the length of the instruments used 
c) the number of instruments required  
d) all of the above

18) Flat metal retractors that may be shaped or bent by the surgeon at the field are called
   a) Army-Navy retractors  
b) Richardson retractors  
c) malleable ribbon retractors  
d) Volkmann retractors

19) The abdominal wall may be held open by a self-retaining retractor called a
   a) Balfour retractor 
b) Weitlaner retractor 
c) Jansen retractor  
d) Richardson retractor

20) The hemostatic clamp used to control superficial bleederors and to handle delicate tissue in plastic surgery and hand surgery is called a(n):
   a) Oschner clamp  
b) Kocher clamp  
c) Mosquito clamp  
d) Peon clamp

21) Which of the following is used to create an opening in an operative site for endoscopy?
   a) cannula  
b) trocar and cannula 
c) scalpel with a #10 blade  
d) tissue scissors

22) Surgical instruments are crafted for intended surgical purposes. Each instrument is designed to do one of the following: cut, grasp, occlude, expose, retract, aspirate, and suture.
   a) true  
b) false

23) The perioperative nurse is precepting a new scrub person. The scrub person picks up a disposable scalpel blade with gloved fingers and is attempting to attach it to the reusable scalpel handle. What is the most important skill the perioperative nurse should teach the new scrub person?
   a) Continue to use fingers to attach the blade since fingers are more dexterous  
b) Lay the blade on the Mayo stand and slide the handle onto the blade  
c) Hold the blade in a clamp or needle holder and advance it onto the handle  
d) Convince the OR to purchase disposable scalpels only

24) The most common type of clamping instrument is a hemostat. Non-crushing hemostats are designed to occlude which of the following:
   a) bronchus  
b) esophagus  
c) blood vessels  
d) trachea
25) The surgical team is ready to close the surgical wound and has requested specific suture material. What instrument will the scrub person use to deliver the suture to the surgical team?
   a) needle holder
   b) hemostat
   c) Kocher
   d) thumb forcep

26) The identifiable parts of a clamp or forceps are:
   a) point and jaws
   b) box lock and shank
   c) finger rings and ratchet
   d) all of the above

27) Surgical instruments must be made of metal alloys that will resist corrosion. Exposure to which of the following will result in corrosion:
   a) sterilization methods
   b) cleaning solutions
   c) blood or body fluids
   d) all of the above

28) The scrub person must know the name and intended use of each instrument. As part of the surgical team the scrub person should:
   a) keep several clamps in hand at once
   b) not worry about cleaning since the instruments will continue to get dirty
   c) discard the suctions when they become clogged
   d) pass the instrument appropriately and for the intended use

29) When preparing a tray for the washer, it is acceptable to randomly place instruments and retractors in the tray as long as all areas are exposed to the cleaning process.
   a) true
   b) false

30) The instruments are being assembled for sterilization in their respective trays. Some of the retractors still have visible blood on them. These retractors should be:
   a) wiped off with a wet towel and placed with the others
   b) assembled anyway, the sterilizer will destroy any bacteria
   c) left out of the tray
   d) none of the above
POST-TEST ANSWERS

SURGICAL INSTRUMENTATION: USE, CARE AND HANDLING

30. d
29. d
28. d
27. a
26. c
25. a
24. c
23. a
22. b
21. a
20. c
19. a
18. c
17. a
16. a
15. d
14. a
13. c
12. a
11. b
10. c
9. c
8. c
7. c
6. c
5. c
4. c
3. c
2. d
1. d