Section Four: Surgical Instrumentation

Estimated Contact Time:
80-110 minutes

This module covers:

….an overview of surgical instrumentation and its use. It will provide a foundation for the learner to build on as s/he becomes more familiar with specific instrumentation through daily tasking.

Following instruction, you should be able to perform the following:

- ☑ Label basic instruments and identify their use.
- ☑ Demonstrate proper placement of instruments for trays, sets, containers, and stringers.
- ☑ Identify processing, handling, and testing procedures for basic surgical instruments.

The Role of Surgical Instrumentation

As surgical technology continues to advance, so does the type and complexity of surgical instrumentation. Surgical instruments are a major investment for the medical center and they require special care and handling to maintain proper function and longevity.

Surgical instruments are highly specialized, finely crafted medical tools. They include handheld devices such as scalpels, retractors and forceps, endoscopic equipment, and a variety of powered equipment for special applications. Instrumentation may vary from facility to facility, but SPD technicians and operating room staff must be able to recognize, assemble, and use thousands of different types of surgical instruments and devices.

Reusable surgical instruments require careful processing in order to assure a longer life and to prevent the transmission of infection. SPD is responsible for inspecting the instruments prior to sterilization and ensuring that they have been:

- properly cleaned

- tested
- checked for functionality and damage
- assembled according to an accurate and detailed procedure list.

Damaged instruments must be sent for repair and a replacement placed in the set.

The three common types of equipment are:

- handheld
- endoscopic
- powered

Each type has its own special functions and processing requirements. New technologies are constantly emerging and SPD must be prepared to accept and process new devices on an ongoing basis.

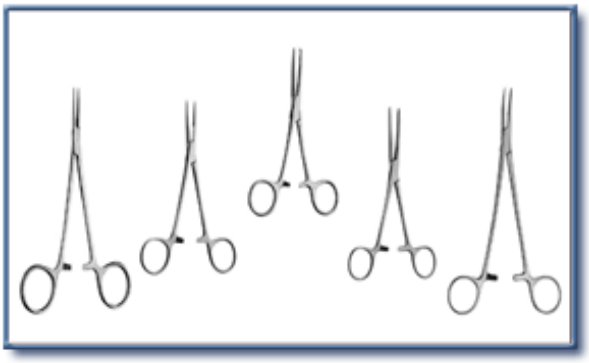
Handheld Instruments

Handheld instruments, which are the most common, can be general use, microsurgical, or laser. They come in a wide assortment of designs, sizes, and applications, and can be categorized by their

- type,
- use,
- composition, and
- processing requirements.

Once you have learned to recognize the type of instrument and what it is used for, it will be easier to distinguish between the many different sizes and varieties. The basic groups or types include the following.

Hemostatic Forceps



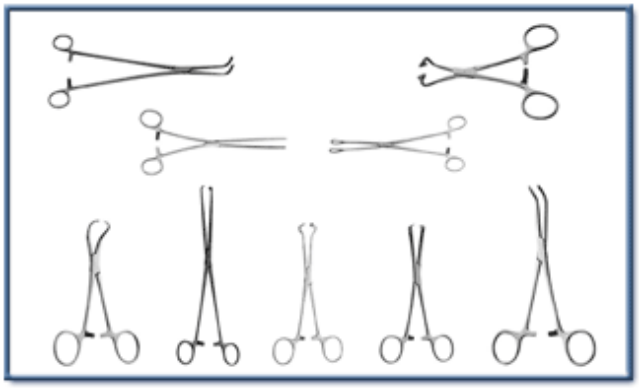
Hemostatic forceps can be called clamps, artery forceps, and hemostats. The main purpose of hemostats is to achieve hemostasis (arrest of bleeding). Most hemostats are available:

- in different lengths
- curved and straight
- with serrated jaws (some also have toothed ends)

There are a number of different kinds:

- Mosquito
- Kelly
- Kocher
- Carmalt
- Tonsil

Soft Tissue Ring Forceps



Soft tissue forceps are used for holding and retracting soft tissue. They have fine teeth or ridges on the jaws to provide a delicate grip without causing trauma to tissue. Like hemostatic forceps, they have ring handles and box locks.

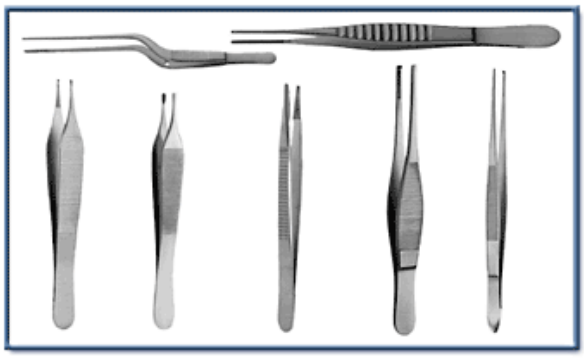
There are a variety of types:

- Backhaus Towel
- Allis Intestinal
- Babcock Intestinal
- Lahey
- Mixter Gall Duct

- Doyen Intestinal
- Right Angle
- Sponge
- Non-perforating Towel Clamp

Soft Tissue Thumb Forceps

Thumb forceps do not have box locks or ring handles. They have spring handles which are held closed by thumb and finger pressure.



Sometimes, when the jaws are serrated and the instrument is used to grasp delicate tissue or wound dressing, this type of forceps is called a dressing forceps.

A heavier version of this type of forceps is referred to as thumb tissue forceps. They have teeth that will provide a more secure grasp on heavier tissue.

The various types include:

- Adson
- Brown-Adson
- Dressing
- Thumb with Teeth
- Russian
- Cushing
- DeBakey

Needle Holders

Needle holders are used to hold needles, which are attached to sutures. Sometimes referred to as needle drivers, this type of instrument is similar to hemostats but with shorter and thicker jaws. They generally have ring handles.

Needle holders are available in a variety of lengths and styles and may be curved or straight. Some of the varieties include:

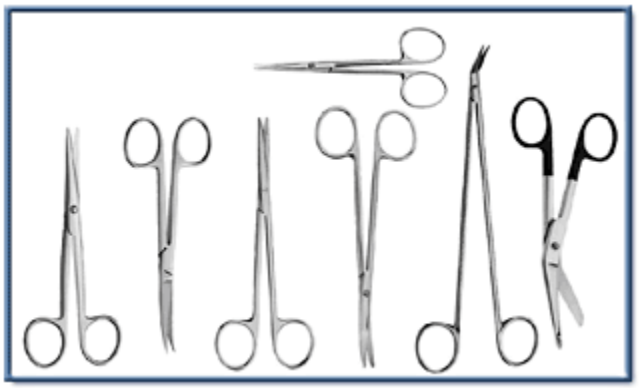
- Mayo-Heagar
- Crile-Wood
- Olsen-Hegar
- Collier
- Webster
- Castroviejo

Needle holders have inserts in the jaw to prevent excessive wear. The inserts are usually made from tungsten carbide granules in a cobalt or other metal paste. Needle holders with tungsten carbide inserts are normally identified with gold plated handles. The

inserts can be replaced as they wear down. This prolongs the life of the needle holder and defrays the cost of replacing the entire instrument.

Needle holders can have spring handles. This allows the user maximum results with minimum rotation of the wrist and hand. Most spring handled needle holders will have a lock or catch to secure the needle. They are used in surgical procedures that require delicate suturing in tight or poorly exposed areas. Spring handled needle holders may also contain replaceable inserts.

Scissors



A variety of scissors are used in the surgical suite.

- Curved scissors are generally used to cut and dissect tissue.
- Straight scissors are generally used for cutting sutures and tissue when a smooth, straight cut is desired—such as a damaged nerve or blood vessel.
- Scissors can be used for probing, dissecting, and spreading tissue.

Surgical scissors should *never* be used to cut paper or tubing. Bandage scissors may be utilized for this purpose. Scissors used for cutting suture should not be used on tissue because sutures can damage delicate scissors, keeping them from giving a clean cut.

There are a number of different types of scissors in use:

- Mayo Dissecting Straight
- Mayo Dissecting Curved
- Metzenbaum
- Metzenbaum Delicate

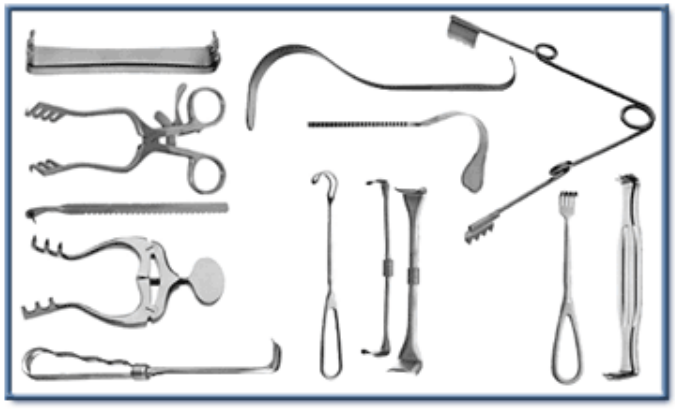
- Lister Bandage
- Iris Straight
- Stevens Tenotomy
- Potts-Smith

Mayo scissors are identified by heavy curved or straight blades with rounded tips. Straight mayo scissors are often used for cutting suture. Metzenbaum (Metz) scissors, are similar to Mayo, only lighter in pattern and more delicate. Iris (dissecting) scissors resemble cuticle scissors but are more delicate in style.

Operating or general use scissors can be used for cutting sutures and gauze. The heavier types are used for cutting fine wire sutures and can be identified by their serrated, angular blades with a groove for holding the wire as it is being cut.

Scissors can 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.

Retractors



Retractors are used for holding the incision open to provide exposure to the surgical site. Many varieties and sizes of retractors are available, and the use of specific retractors will depend on the type of surgical procedure being performed.

Smaller types, held by the fingers or hand, retract skin and subcutaneous tissue in shallow surgical areas. Larger, heavier, models retract muscle tissue and organs in deeper surgical sites. Some retractors are held in place by an assistant while the surgeon completes the procedure. Self-retaining retractors are held open by

their own action and require no assistant to hold them. They may be used in conjunction with the hand-held retractors. Varieties include:

- Richardson-Eastman
- Richardson-Kelly
- Mayo
- Jansen Mastoid
- Weitlander
- Gelpi
- Spring Wire
- Volkman Rake
- Green Goiter
- Army-Navy
- Deaver
- Sweetheart

Miscellaneous

Probes, biopsy needles, and suction tubes are a few of the miscellaneous instruments required for use in surgery and clinical procedures.

Probes may be used to explore the depth and direction of body ducts, sinuses, or cavities. They may also be used as an aid in dilating or irrigating an area of the body, such as a duct.

Knife handles are available in several styles and require disposable blades that may be changed frequently during the surgical procedure.

Examples of probes and knife handles are:

- probe with eye,
- optical probes, and
- knife handles number 7, 4, and 3.

Biopsy needles are used to remove fluids or tissue for the purpose of microscopic examination. Many sizes and varieties of biopsy needles are available in stainless steel, as well as disposable varieties. Disposable needles do not require sharpening and inspection as do reusable biopsy needles.

Reusable biopsy needles must be sharp and free of burrs to assure proper function and avoid tissue damage.

Suction tubes are used to remove blood, tissue, and fluids from the surgical site to allow surgeons a clear view of the anatomical structures during the operative procedure. The tube is attached to suction tubing connected to a graduated reservoir to measure the amount of fluid removed. Several types of tubes may be used, depending on the procedure. Many will have removable tips that require close attention during the cleaning process.

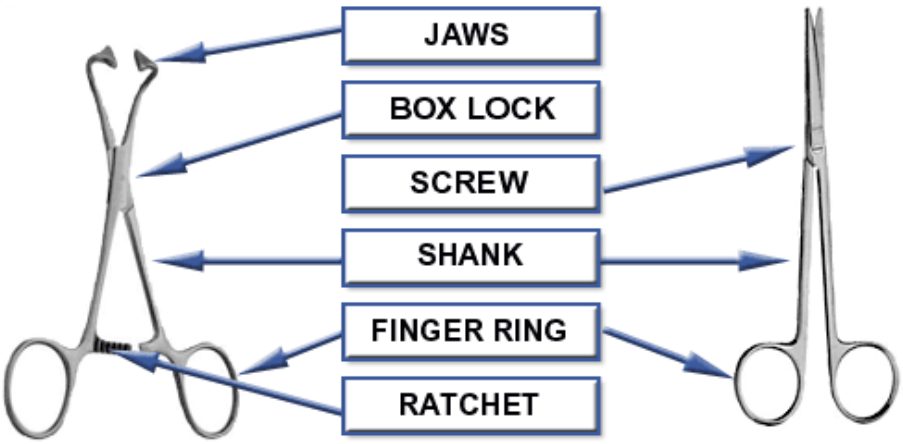
Composition of Handheld Surgical Instrumentation

Surgical instruments are finely crafted tools, fabricated to resist corrosion and to deliver high-quality performance through multiple uses. This section examines the structure, composition and grades of surgical instruments.

Components

The structure of a typical handheld hemostat or clamp consists of jaws, box lock, shanks, ratchets, and finger rings. Surgical scissors consist of jaws, shanks, finger rings, and a screw.

The box lock on clamps employs a rivet, and is the weakest part of the instrument. The box lock needs to be carefully examined for fractures after each use.



Surgical scissors—like ordinary scissors—employ a screw mechanism to allow cutting action. If the scissors are loose they must be sent for professional repair.

Never tighten the screw, it will strip and render the scissors useless.

Composition

Stainless steel is an ideal material for surgical instruments because it:

- resists rust and nicks
- maintains a fine point
- retains a keen edge for cutting

Stainless steel varies in grade. Despite its name, stainless steel can spot and stain. In actuality, there is no truly "stainless" type of steel.

Many surgical instrument companies use a technique called "passivation" to assure the least amount of staining and spotting. Passivation occurs by exposing an instrument to the atmosphere or certain other oxidizing agents which results in a thin, protective surface or film. Repeated processing increases resistance to corrosion by further passivating the surface, which explains why older instruments tend to stain and spot less than new ones.

Other metals used in the construction of surgical instruments are:

- Titanium Alloy
- Copper

- Brass

There are four basic types of instrument finishes. Each finish has its own characteristics and applications.

- **Mirror**—A shiny or mirror finish does not spot and discolor as easily as other finishes. Mirror finishes tend to reflect light and can restrict the surgeon's vision of surgical site.
- **Satin**—A satin finish, also called a "patina", reduces the glare at the wound site, but tends to stain and spot more frequently.
- **Matte**—A matte or dull finish, like a satin finish, reduces the glare at the wound site but tends to stain and spot more frequently. A matte finish is attained by a sandblasting technique using glass beads or silicone.
- **Ebonized**—An ebonized finish is a black, microscopically irregular surface which scatters and absorbs laser energy. It is created by placing the instruments in a chemical bath. During laser surgery, this non-glare finish keeps energy from bouncing onto healthy tissue surrounding the intended target.

Electroplating

Electroplated instruments have a highly polished finish that is often easier to keep shiny. The electroplating process can leave holes in the finish, resulting in potential rust and deterioration.

Once electroplating starts to deteriorate, the instrument should no longer be used because it cannot be sterilized and there is a possibility that the plating will chip into the surgical site and cause infection.

Grades

There are two grades of surgical instruments.

Floor Grade	• Made from forgings of lower grade quality metals—usually plated • Bend or break easily, and are more subject to chipping and rust • Less precise than the higher quality O.R. grade instruments • Once plating is chipped, instrument cannot be sterilized
O.R. Grade	• Made from 300-4 grade stainless surgical steel • More resistant to corrosion and wear • Must be processed separately from the Floor Grade instruments, since rust can spread if these instruments are mixed

Cleaning and Decontamination

Surgical instruments represent a significant expense for the medical center. Their proper handling can help control costs by extending the useful life of these precision tools. Care of the surgical instrument begins in surgery during their use. The instruments should be rinsed or wiped periodically to prevent blood and body fluids from drying. Blood and saline are the most common causes for deterioration of stainless steel. Exposure to these two elements will result in corrosion and, ultimately, pitting. Other chemicals to avoid include:

- Mercury bichloride
- Phenol
- Mercury salts
- Potassium thiocyanate
- Ferrous chloride

- Hydrochloric acid
- Iodine
- Aluminum chloride
- Barium chloride
- Calcium chloride
- Blood
- Carbolic acid
- Chlorinated lime
- Dakin's solution

After surgery, all instruments must be treated as if they were contaminated. They should be placed in covered containers in the *case cart* for transportation to SPD.

DO NOT bounce or drop instruments, or place large, heavy instruments on top of delicate ones.

DO count instruments carefully. Accurate counts are vital for patient care, and for preventing loss by accidentally discarding them or mixing them with surgical linens.

Reprocessing of surgical instruments involves several steps, starting with safe transport to the decontamination area and including cleaning, safe handling and decontamination.

Safe transport after use is designed to prevent contamination of personnel and the environment. Instruments and items should be placed in covered containers and/or impervious bags for transport to the decontamination area. All instruments set up in the operating room will require reprocessing, regardless of whether they were used during surgery.

Instruments should be handled to avoid damage and to prevent injury to the technician. Heavy rubber or plastic gloves should be worn, as well as the required decontamination apparel. Handle instruments in small groups to avoid tangling and damage. Separate needles and process them separately. Scalpel blades still

attached to knife handles should be removed and disposed of in sharps containers.

Many instruments contain sharp edges and parts, and require extreme care when handling.

Cleaning

Inspect instruments for tissue or bone remaining in the teeth or grooves. Remove this debris by holding the instrument under the surface of the water and scrubbing the area with an instrument brush. Brushes are available in many sizes. There are brushes specially designed for cleaning cannulated areas.

Open all instruments for cleaning. Instruments with box locks should not be in the locked position. Multi-piece retractors, staplers, etc., should be disassembled prior to cleaning. This allows for all areas to be exposed to the cleaning process.

Use only non-abrasive cleansers for instrument cleaning. Abrasive cleaners can damage the surface of the instrument, resulting in corrosion and rust. Detergents that are used should maintain a pH between 6 and 8 since a pH level too high (alkaline) or too low (acidic) will damage the surface.

Decontamination

After gross soil has been removed by washing, place the instruments in the ultrasonic. If the gross soil has been removed properly, the ultrasonic will remove the remaining soil, penetrating into the box locks, joints, and screw areas. After instruments are removed from the ultrasonic, visually inspect them for cleanliness, then rinse and place them in the washer/sterilizer.

Preparation and Sterilization

Once instruments have been decontaminated, they are inspected, assembled and packaged for sterilization. You must examine them to make sure they are working properly, and are not bent, broken, or missing parts. Once inspected, they can be assembled and packaged for sterilization.

The preparation and sterilization process is accomplished in six steps which are summarized below and thoroughly detailed in Module 5, Packaging, and Module 6, Sterilization.

Inspection

Once the instruments have been received into the preparation area, they must be thoroughly inspected for cleanliness and proper function. Any instrument with visible evidence of soil should be returned to decontamination for reprocessing. Check for nicks, rust, corrosion, burrs, pitting, and cracks in the box lock.

Certain instruments should be checked for proper jaw alignment, proper tension, freely moving box locks, loose screws, and freely moving hinges on scissors or other multi-jointed instruments. Test instruments with box locks and ratchets to assure proper function. Test by locking the ratchet into the notch and gently tapping it against the palm of your hand or a counter edge. If the ratchet disengages or pops open, the instrument requires repair. The tips of instruments with jaws should just meet before the ratchet is engaged.

To check a needle holder, place a piece of suture (2-0 silk) in the tip and close it to the first ratchet. Lift the suture, the needle holder should remain securely attached. When visible wear, such as a gap is noticed between the tungsten carbide inserts, they should be replaced.

Scissors should be tested for sharpness by cutting a single layer of gauze. A sharp pair of scissors will cut cleanly through, all the way to the tips. (This is for scissors 4 ½" or longer.) Paper should never be used to test scissors. There are also new products, which resemble the texture of tissue, available for testing the cutting edge of scissors.

Repair or Replacement

It is critical that malfunctioning instruments be pulled for repair rather than being returned to an instrument set. An improperly functioning instrument could cause delays or harm to the patient during the course of the surgery. SPD should:

- Establish a detailed instrument repair program
- Set aside a designated area for damaged instrumentation
- Contract with a reliable company to ensure correct and timely repairs
- Carefully track the cost of instrument repair

Set or Tray Assembly

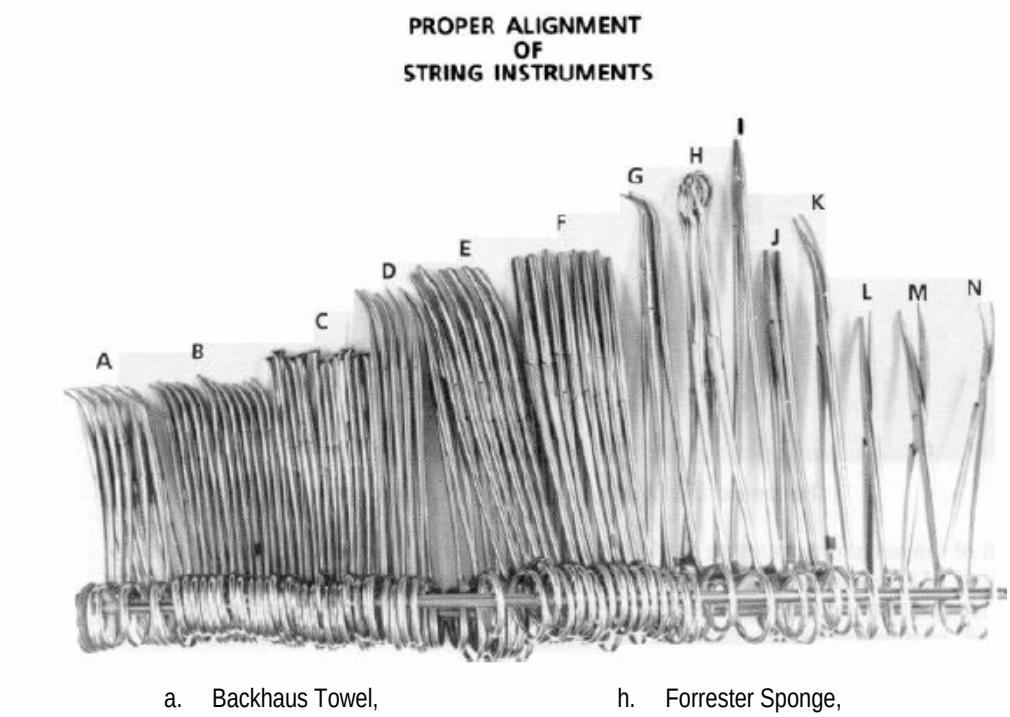
Basic sets have the tendency to expand over time to the point that there may be a large number of instruments included that are not being used. Periodic review of basic instrument sets should be done routinely, with input from the surgeons, nursing staff, and SPD supervisor. The set should be maintained so that it is functional yet not overloaded with unused instruments. Excessive instruments increase the weight of the set, and require excessive cleaning and assembly time.

The recommended weight for an instrument set is 16 to 17 pounds, but the size of the tray will determine how many instruments can be placed on it and safely sterilized. Instruments should not be overcrowded into a tray that is too small. This will prevent the proper exposure to the sterilizing agent. If the set becomes too large and the staff requires all the instruments, the set can be broken down into a regular basic set and a smaller, supplemental set. Placement and tray size are as vital, if not more important, than weight.

Color coding of instruments, using instrument tape, is not recommended.

Instrument trays should be assembled using a detailed photo procedure. The instruments should be placed in a definite or fixed pattern within the tray to allow easy access to the instruments by the scrub nurse. Ring-handled instruments should be placed on a stringer, instrument rack, or other means that allows them to remain in an open or unlocked position. This will allow the sterilant to come into contact with all surfaces. Instruments with multiple parts, such as a Balfour retractor or tonsil snare, may be disassembled to ensure all parts are exposed to the sterilant. Large

heavy items, such as retractors, should be placed on the bottom of the tray. The stringed instruments should go in last and be placed on the stringer or rack in a manner that prevents damage to the instruments and allows easy, orderly access by the operating room scrub nurse.



a. Backhaus Towel,
b. Kelly Forceps,
c. Allis Intestinal Clamps,
d. Crile Forceps,
e. Carmalt,
f. Kocher Clamps,
g. Right Angle Clamps,
h. Forrester Sponge,
i. DeBakey Needle Holder,
j. Mayo-Hegar Needle Holder,
k. Curved Metzenbaum Scissors,
l. Straight Mayo Scissors,
m. Curved Mayo Scissors,
n. Curved Metzenbaum

Knife handles, tissue forceps, pickups, probes, etc., may be wrapped in medical grade paper or placed in pockets to allow easy access to the items.

Many facilities use towels or absorbent disposable tray liners to prevent instruments from protruding through tray perforations. Specific trays can be purchased for sterilization of micro surgical instruments and delicate ophthalmic (eye) instruments. These trays contain inserts that prevent movement and allow greater protection for these instruments.

Preparation

Once a set is assembled, items to be sterilized are packaged using a set of assembly guides or count sheets. The technician who prepares the tray should initial the content inventory. A quality assurance program must be implemented to ensure that instrument sets are complete. Each item assembled and sterilized must be marked with the name of the set or item and the initials of the technician who packaged them.

The set is *sequentially double wrapped* with muslin or non-woven disposable wrap, or placed into a container system, and placed flat on the sterilization rack. Never tip a surgical instrument set on its side. Tipping will cause displacement of the instruments and may damage them.

Individual instruments can be packaged in peel packs (paper/plastic pouches). When using peel packs, place the handle or holding end toward the opening end of the pack to assure aseptic presentation. Double peel packs or paper plastic pouches may be required for items used in surgery. Sequential double wrapping in muslin or non-woven disposable wrap accomplishes the same effect.

Sterilization

The sterilizer cart or rack must be loaded to allow for free circulation of the sterilizing steam or gas. Leave at least enough space to place an open hand between items. Linen items should be on the top shelf and trays and metal items on the bottom. This prevents condensation from the metal items from dripping on the linen packs. Condensation can cause staining.

Staining and spotting may be an indication of contamination. Several conditions can cause it. Steam may contain minerals and rust deposits from the steam line (steam line filters can be installed to help prevent this). Residual soap from improperly rinsed linen can redeposit on instruments during sterilization. For this reason, it is recommended that surgical linen packs be processed alone. Other causes of staining and spotting are listed in the following chart.

Stain	Cause
Rust colored	• Mineral deposits from tap water in the final rinse • Detergent residues from improperly rinsed laundry • Incorrect pH detergent used in the washer/sterilizer • Combining imperfect chrome instrument with stainless steel instruments
Bluish gray	• Cold sterilizing solutions inadequately rinsed from instruments
Purple black	• Ammonia in detergents • Amines from impure steam in lines
Corrosion/rust	• Insufficient rinsing of instruments and/or linen during processing • Dried blood or residual soil in box locks • Prolonged exposure to harsh chemicals • Inferior grade instruments
Pitting	• Exposure to saline, potassium chloride, blood, or other compounds • Detergent residue or high pH • Metals with dissimilar composition processed together

Storage & Transport

Once the sets/packages are sterilized, a cooling time is required prior to dating and handling. Containerized systems may be labeled and moved prior to complete cooling, since the metal or anodized aluminum containers will provide protection and will not allow for strikethrough. Wrapped sets must be entirely cool prior to dust covering and handling. Due to moisture present in the packaging, the sterility of wrapped sets that are handled prior to cooling may be compromised.

A sterile storage area must be provided for all sterilized sets kept in SPD. The sets should be placed on the shelves so that dust covers and wraps remain intact. Containerized systems may be stacked. Instrument sets should never be tipped sideways during storage. If instrument sets must be stored in the operating room, they should be transported in clean, impervious covered, or contained carts and handled with care and good judgment during transportation.

Endoscopic Equipment

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 over joints or in the abdomen. 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 endoscopic equipment requires extreme care during use and cleaning. Detailed procedures and information for sterilization are required to prevent unnecessary damage. Inservice training should be provided for each specific instrument to assure that technicians possess the skill and knowledge required to process the equipment safely and effectively.

Rigid endoscopes

Includes gastroscope, cystoscopes, resectoscopes, laparoscopes, and arthroscopes

Always follow the manufacturer's recommendations concerning proper cleaning and sterilization procedures for rigid endoscopes. They may contain channels, ports, hinges, and stopcocks that must be cleaned and rinsed properly to remove debris, such as mucus, blood, and other body fluids. Close attention is required when cleaning these items. Air and water pistols must be used to dislodge debris from recessed areas and protective attire is required to prevent exposure to aerosols that might be produced. A neutral pH detergent should be used to prevent damage to sensitive equipment parts.

Some rigid endoscopes, such as a Jako Laryngoscope, do not contain lenses and may be processed through the washer/sterilizer. Telescopes used with rigid sheaths should be hand washed and dried. Never process a telescope through an ultrasonic or washer/sterilizer. Some sheaths and resectoscopes (for example, a Berry rotating sheath used for cystoscopys) will not tolerate the ultrasonic due to the type of epoxy used to manufacture the sheath.

Preventive care should include the following:

- Do not autoclave telescopes or resectoscopes (unless they are specifically designed to be autoclaved).
- Never bend, drop, or pile instruments on top of telescopes.
- Do not use ultrasonic cleaning which tends to loosen optical cement from the lens.
- Routinely lubricate stopcocks or moving parts with silicone lubricant.
- Use only nonabrasive metal polish on metal parts only.
- Be very careful while cleaning the lens on rigid telescopes. Alcohol, if used repeatedly, may cause the glass to appear scratched.

Telescopes should also be checked for clear vision. If the field is not clear, the telescope should be washed, dried, and reinspected. Inspect the cover glass on the working end for cracks or chips. A half-moon but clear view could indicate a dent on the outside of the scope. If the view appears foggy, this denotes a leak, which has allowed moisture to enter, somewhere on the telescope. The shaft of the telescope and the light cord contain bundles of glass rods that conduct light to allow examination of internal body parts. The telescope and light carrier are attached to a powerful light source which allows the light to travel through the glass bundles. The light carriers or cords are manufactured to withstand steam sterilization but care must be taken not to bend the cords or light carriers so that the glass bundles are damaged.

Always check the light carriers by holding one end to the light while looking through the other. Look for any black areas or dots. Black dots denote areas where the fiberoptics are broken. Light carriers or cords in this condition must be repaired or replaced.

All rigid sheaths, telescopes, and any instrument containing lumens should be thoroughly dried prior to storage or ethylene oxide sterilization. If moisture is allowed to remain during storage, bacterial growth may occur. Moisture remaining during ethylene oxide sterilization can cause a chemical reaction that may harm the patient. All rigid telescopes used in the operating room should be terminally sterilized prior to use. Disinfection produces a clean but nonsterile item. A new process recently introduced involves a liquid sterilizing agent called paracetic acid. A 30-minute

processing time is required, and the telescope may then be introduced to a sterile field utilizing aseptic technique. Some telescope manufacturers claim their telescopes may be steam sterilized. It is important to recognize that the expansion during heating and contraction during cooling are completely different for metal and plastic. The difference in contraction and expansion may damage the plastic parts and will shorten the life of the instrument. To maintain the longest life expectancy from any rigid telescope, it is recommended that ethylene oxide be used for sterilization.

Regardless of how the telescope is processed, all completely metal components of endoscopic instruments can, and should, be steam sterilized. Telescopes and other items not designated for steam sterilization should be packaged separately.

Flexible scopes

Includes esophogusgastroduodenum (EGD) scopes, bronchoscopes, sigmoidoscopes, and colonoscopes

Flexible endoscopes consist of fiberoptic glass bundles arranged around a lumen or lumens, a series of lenses and mirrors, coils, springs, and cables running the entire length of the instrument to control the movement of the tip. The covering is an impervious material that protects the working parts from moisture and other fluids. The insertion tube length is marked so the surgeon knows how far the tube has been inserted into the body. The insertion tube is attached to the head or viewing lens of the flexible scope. An attachment can be added to the head of the flexible scope that has a flexible viewing cable with a lens attached, so someone assisting with the procedure may view what the surgeon is seeing. Attached to the head of the scope is another cable containing fiber bundles called the universal cord. This cord is inserted into the light source to enable light to be transmitted through the insertion tube, which allows enough light to illuminate inside the body. Included in the head of the scope is a knob which allows the surgeon to turn and move the distal tip of the insertion tube. This enables complete viewing of the area.

Some flexible endoscopes will have a biopsy, air, and water channel. The biopsy channel allows insertion of flexible biopsy forceps, grasping forceps, and snares to obtain a biopsy or remove polyps. Immediately following the procedure, these ports and channels should be flushed, brushed, and rinsed to prevent any debris from drying. The flexible scope can be processed on an endoscopic processor which cleans and disinfects the scope. Many endoscopic processors will also provide a drying cycle. If terminal sterilization is indicated, an air hose with a pistol end should be used to assure no moisture has been left in any port or channel. If indicated, the EtO cap should be placed on the designated area of the scope to assure equal pressure and sterilant contact during the sterilization cycle. Newer endoscopes may contain a tiny camera or micro-chip to allow photos during the procedure. Also, newer versions may not require the EtO cap.

Always check the manufacturer's information prior to processing any scope.

Accessories used with these flexible scopes consist of long, small wire springs, and adequate cleaning is difficult to achieve. Submersion in a blood and protein dissolving solution is recommended, followed by processing in the ultrasonic and washer/sterilizer. These items, once thoroughly dried, may either be placed in the tray with the flexible endoscope for ethylene oxide sterilization or packaged separately and steam sterilized. Many facilities have switched to the costly disposable accessories due to the difficulty cleaning the reusable ones.

The procedures that a scope is used for, along with input from infection control, will normally determine the type of processing and the level of disinfection or sterilization required. Regardless of the point of use, all reprocessing should be accomplished within SPD. Clinics, the operating room, and the Chief, SPD, should work out methods of transportation, time schedules, and cleaning procedures to assure adequate support to the services for the cleaning, care, and handling of all endoscopes.

Powered Equipment

Powered equipment used in surgery includes a wide variety of equipment and several different power sources. Power sources may be electrical, either line current or battery, or compressed medical gasses, such as carbon dioxide, nitrogen, or compressed air. Equipment powered by gasses is referred to as pneumatic or air-powered instruments. Examples of power equipment are: reamers, drills, screwdrivers, and saws used by orthopedic and some neurosurgeons. Craniotomes, drills, and perforators are used by neurosurgeons. Dermatomes are used by plastic and general surgeons to take skin grafts, and sternal saws are used by thoracic surgeons to cut the sternum.

Powered equipment should be cleaned and cared for according to the manufacturer's recommendations.

In general, power instruments should not be immersed in a solution of any kind. They should never be processed through an ultrasonic cleaner or washer/sterilizer.

Processing

Close attention should be given to ensure the powered equipment and attachments are thoroughly inspected and cleaned. Attachments used with powered equipment, may be processed in the same manner as most stainless steel surgical instruments. Attachments include:

- chucks
- chuck keys
- burr guards
- hudson and trinkle adapters
- wrenches

All attachments must be removed from the equipment before processing.

- Skull perforators should be checked frequently and sent for sharpening on a routine basis.
- Air hoses should be inspected for any damage prior to cleaning, then washed with a mild detergent and lukewarm water.

- If the equipment has an electrical cord, the cord may be washed with a cloth soaked with mild detergent solution. Never immerse the cord in any solution.
- Sterilization by a pre-vacuum steam sterilizer is recommended for most equipment.
- Electrical equipment should be sterilized by ethylene oxide to prevent damage to the electrical parts.

Lubrication

Older equipment requires some lubrication, and this should be done during the testing process. Newer powered equipment requires no lubrication since it is self-lubricating, within a sealed casing. Pneumatic equipment should be hooked up to compressed air and tested within the required pounds per square inch (PSI).

New Technology

As surgical procedures and techniques change, so do the types of surgical instrumentation and implants, making it difficult for medical centers to keep pace with the instrumentation required to perform newer procedures (for example, orthopedic implants are being developed and improved upon so fast that equipment is outdated almost as soon as it is used). To alleviate this problem, many companies loan the necessary instrumentation to the medical centers. It is more cost-efficient for both parties.

Loaner instrumentation must be brought directly to the decontamination area of SPD with a detailed list of every item in the set. The sales representative and the SPD supervisor or technician should review the list against the instrument set. If any item is not in the set, it should be noted. The instrument set is then processed through decontamination, assembled, and wrapped for terminal sterilization. The name of the set, operating room number, case number, and, preferably, the patient's name, should be listed on the instrument set. After sterilization, the set is placed on the case cart. If the medical center does not utilize a case cart system, the instrument set should be hand delivered to the operating room. After surgery, the loaner instrument sets must be returned to decontamination, processed, and reassembled (?but not sterilized?). Prior to leaving the medical center, the SPD supervisor or

technician should again check the set against the list to ensure all parts have been accounted for. In the event a piece is missing, the sales representative or SPD personnel will check with the surgical suite or with SPD to attempt to locate the part.

By using a check list, SPD will not be inadvertently charged for an instrument or part that was not present when the set was sent to the medical center. In some cases, instrument sets are shipped to a medical center without the sales representative being present. Insist that the company send a list with the loaner sets. In the event an instrument set contains implantable pieces, the sets should be received by SPD at least 48 hours prior to the scheduled case to assure the quarantine time is achieved.

To maintain a loaner program, cooperation between the operating room and SPD is vital. Details should be worked out between the two areas, and all companies that supply loaner instrument sets should be notified of the program. This system is extremely important since SPD is responsible for all items sterilized, and must ensure that all items leaving the medical center have been thoroughly cleaned to prevent any cross contamination.
Before processing any new technology, the technician should consult all manufacturers' instructions.

Summary

Surgical instruments, flexible and rigid scopes, and powered equipment come in many varieties and complexities, and include numerous pieces, parts, and attachments. A good working relationship between the operating room staff and the SPD staff is vital to provide the information, service, and continued support to assure safe patient care. SPD technicians should routinely observe surgery to understand the necessity of accurate tray and set assembly and proper function of all equipment. Training programs can be established by SPD to aid in the training of new operating room nurses, nursing students, and SPD technicians in instrument identification and set assembly. With technology and innovative instrumentation always changing, we must continue to sharpen our skills and knowledge.

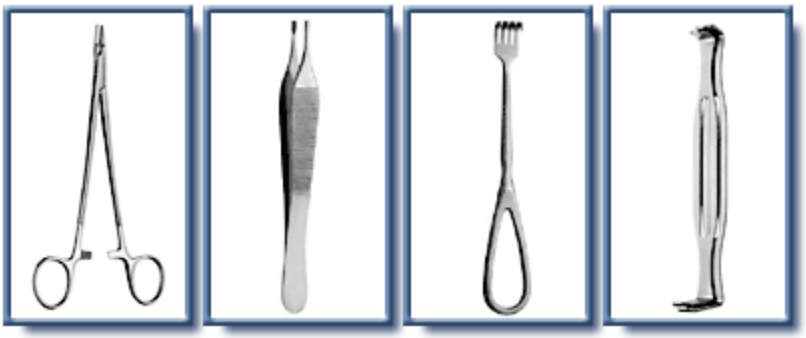
In this module you have learned:

- The names and function of basic instruments (what they are called, how they are used)
- The proper placement of instruments for trays, sets, containers, and stringers.
- The processing, handling, and testing procedures required for basic surgical instruments—including handheld, endoscopic, power, and new technology.

✓ Check What You Know

Answer these questions to gauge your understanding of the material covered in this module.

1. What type of instrument is this?



A B C D

A. _____

B. _____

C. _____

D. _____

2. Draw a line from each picture to its name.

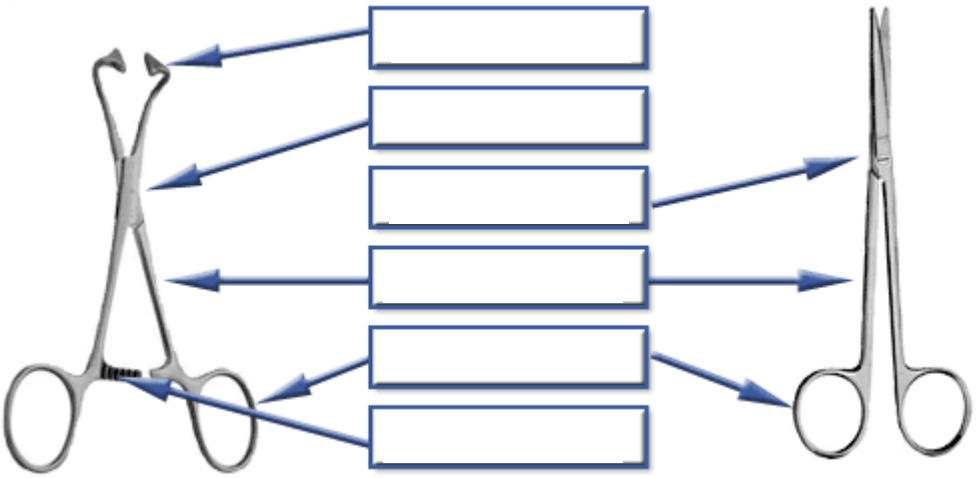
Needle Holders – Castroviejo

Hemostatic forceps – Mosquito

Soft Tissue Ring forceps – Lahey

Soft tissue Thumb Forceps – Dressing

3. Label each instrument component.



4. The advantage of a mirror finish is: _____.
   a. It does not spot or discolor easily
   b. It is easier to clean than a matte finish
   c. Mirror finishes are less expensive to produce
   d. Mirror finish helps illuminate the work area

5. An ebonized finish is a non-glare surface primarily used for _____ :
   a. Microsurgery
   b. Neurosurgery
   c. Laser Surgery
   d. General Surgery

6. What is the recommended pH level of detergent for cleaning handheld instruments?

   _____

7. What should you do when inspecting a soft tissue forceps?

   _____

_____

8. How do you test a needle holder?

_____

_____

_____

_____

9. When arranging an instrument set to be wrapped and sterilized, what is the proper order?

_____

_____

10. Which of the following are flexible endoscopes? Circle them.

Gastrointestinal scopes	Colonoscopes	Laparascope
Hysteroscope	Resectoscopes	Sigmoidoscopes
Arthroscopes		

11. Which of the above are rigid endoscopes? Underline them.

Terminology

The following terms were used in this module.

cannulated	having a small tube designed to be inserted into a body cavity, duct, or vessel
case cart	a mobile unit equipped with supplies and equipment that are specific to a certain procedure or "case"
gross soil	excessive blood or body tissue that would impair the use of a surgical instrument.
lumen	a long hollow cavity
passivation	passivation is a process which helps ensure an uninterrupted protective layer of chromium oxides is present on the surface of the instrument. This protective layer helps prevent corrosion, spotting, and staining
terminally sterilized	sterile and ready for use on a patient