CIS Self-Study Lesson Plan
Lesson No. CIS 268 (Instrument Continuing Education - ICE)

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General Instrumentation: An Overview

LEARNING OBJECTIVES

1. Discuss the most common metals used to manufacture general instruments, and the importance of proper instrument care and handling
2. Review the categories of general instrumentation
3. Review the decontamination and assembly processes for general instruments

Instrument Continuing Education (ICE) lessons provide members with ongoing education in the complex and ever-changing area of surgical instrument care and handling. These lessons are designed for CIS technicians, but can be of value to any CRCST technician who works with surgical instrumentation.

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IN THE HEALTHCARE SETTING, "GENERAL INSTRUMENTS" REFER TO surgical instruments that are generally used in most surgical instrument sets/trays; these instruments may also be found in complex trays. This lesson will provide an overview of instruments commonly categorized as general instrumentation.

OBJECTIVE 1: DISCUSS THE MOST COMMON METALS USED TO MANUFACTURE GENERAL INSTRUMENTS, AND THE IMPORTANCE OF PROPER INSTRUMENT CARE AND HANDLING

Surgical instruments are made from various materials, including:

- **Stainless steel –** This metal is used for the majority of general instruments because of its durability and corrosion resistance.
- **Titanium –** This metal is corrosion resistant and contains no iron (non-ferrous). This metal is used for implantable devices because of its biocompatibility with the human body. Titanium is 40% lighter than stainless steel, has a high tensile strength (does not break easily), and stays sharper longer than stainless steel. Titanium is also non-magnetic. Titanium instruments are usually blue in color, but may be found in different colors. Because of its higher cost, not all types of instruments are made of titanium. Scissors, needle holders, some forceps and scalpel blades are the most common instruments made from this metal.
- **Tungsten carbide –** This metal is welded to stainless steel instruments when the instrument needs to maintain a hard edge. Tungsten carbide inserts are generally considered more cost effective, and when properly maintained, they can last approximately five times longer than stainless steel.

Each individual surgical instrument is meticulously manufactured to fulfill its design function. The manufacturing process for instrumentation is a time-consuming, multi-step process that encompasses the following:

- **Forging –** During forging, a rough stamp of the instrument is created from a sheet of metal.
- **Milling –** This multi-step process creates the instrument's serrations and ratchets, as well as the male/female halves of the instrument.
- **Grinding/filing –** This step removes excess metal from the instrument and

smooths surface imperfections.

- **Heating –** The heating process hardens the instrument.
- **Fixing –** The fixing process aligns the instrument for proper function.
- **Passivation –** The passivation process cleans the surface of the instrument and increases the instrument's corrosion resistance.
- **Polishing/buffing –** The polishing stage creates the desired finish for the instrument.

Note: At each stage of manufacturing, the instrument is quality checked.

Instruments can be very costly, so they should be handled with care. Even though surgical instruments look sturdy, they are, in fact, delicate devices that must be handled with care. Instruments may be inadvertently broken during surgery or in the Central Service/Sterile Processing (CS/SP) department. Failure to handle instruments carefully will result in damage that could result in delayed cases and jeopardized patient safety.

Some facilities allow CS/SP technicians to observe surgical cases so they can see how the instruments are being used and understand the importance of cleaning, decontaminating, assembling, wrapping and sterilizing items according to the manufacturer's instructions for use (IFU). When instrument technicians understand how the entire process in the Operating Room (OR) works, that helps the CS and the OR build a better working team.

OBJECTIVE 2: REVIEW THE CATEGORIES OF GENERAL INSTRUMENTATION

Because general instruments form the foundation of various trays/sets, learning the general instrument categories will help instrument technicians complete sets with confidence and efficiency.

Learning instrument names is one challenge technicians will face. Some facilities have created their own name (nickname) for a particular instrument; therefore, it is important to ensure the proper name of the instrument (or a local term) is being used. Learning both names will be especially helpful. For example, one facility may have an instrument it calls a blue-handled scissor; this may be the only name the facility uses for that instrument, however the proper name used in most facilities is a utility scissor.

The manufacturer's product/catalog number is typically placed on each instrument, and this is helpful when learning instruments; still, instrument technicians must keep in mind some sets will have the same instrument manufactured by different companies, so the product numbers will differ. Using instrument images is a helpful way to identify instruments.

Technicians should take time to familiarize themselves with the instruments and their functions, as well as the cleaning, inspection and sterilization processes recommended for each.

There are several families of general instruments, each with multiple types of the same family name (e.g., scissors). The following are the most frequently-used families with some of the most popular instruments within that category.

- **Knife handles –** Knife handles are used in almost every surgery. The knife handle, plus the cutting blade, makes a scalpel. There are several shapes and sizes of knife handles; the surgeon chooses the type of knife handle depending on the type of tissue to be cut and its location. Knife handles should be manually prepped prior to mechanical cleaning. After cleaning, the entire handle and blade mount area should be carefully inspected for cleanliness. If the instrument has multiple parts, they should be assembled and checked for function, and disassembled for sterilization. Most knife handles can be steam sterilized. Figure 1 shows some of the most common knife handles.

Figure 1

- **Scissors –** Scissors are used to cut and dissect tissue. There are many types of scissors found in the CS/SP instrument area. Figure 2 shows a few of the most commonly-used scissors. Scissors should be manually cleaned before mechanical cleaning. Instrument technicians should ensure scissors are placed in the washer with their blades and tips protected to keep them from falling out of the mesh basket. All scissors should be carefully checked for cleanliness, especially in the blade and hinge areas. Technicians should ensure there are no cracks in the hinge area. Scissors should also be tested for sharpness using the correct testing material and by following the instrument's IFU.
- **Forceps –** Forceps, also called clamps, are used to grasp and hold. There are many design patterns, including thumb-activated, locking and non-locking forceps. Forceps must be carefully manually prepped prior to mechanical cleaning, especially in the jaw and boxlock (hinge) areas. These instruments must be carefully

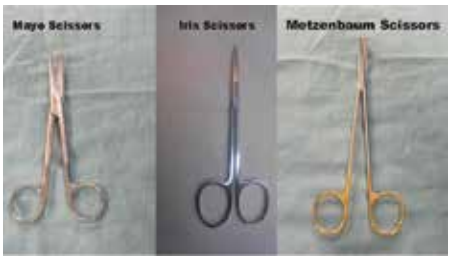

Figure 2

Figure 3

Figure 4

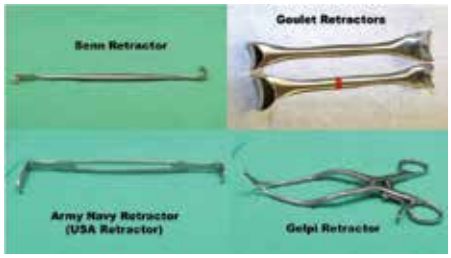

Figure 5

Figure 6

inspected for cleanliness and function. If the instrument has a ratchet or locking mechanism, those areas should be checked in accordance with the IFU to ensure they work properly. Toothed instruments should be inspected to ensure the teeth are clean, intact and aligned. The jaws should meet at the distal tip when the instrument is in the closed position and there should be no cracks in the boxlock area. Most general forceps can be steam sterilized. Figure 3 shows some common forceps.

- **Retractors –** Retractors are used to move (retract) and hold tissue and organs. They may be handheld or self-retaining. Some retractors may be table-mounted to allow the surgical team freedom from holding the retractor during the procedure. Careful cleaning is required for manual and mechanical processes. During inspection, instrument technicians should carefully check for cleanliness and inspect working areas for stress fractures. If the instrument has removable screws or parts, technicians should ensure all parts are accounted for and fit the retractor properly. Most general retractors can be steam sterilized. Figure 4 shows some common retractors.

- **Needle holders –** Needle holders, sometimes called needle drivers, are used to hold suture needles and "drive" the suture through the tissue so the physician can close an open wound. Some needle holders are one-piece instruments, while others may have a tungsten carbide insert in the jaw. The tungsten carbide insert prolongs the life of the instrument by slowing the wear process. When manually cleaning, it is important to pay close attention to the jaw and boxlock areas. Most needle holders can be mechanically processed in a washer-disinfector. Before processing in an ultrasonic cleaner, technicians should check the IFU to ensure this process is approved as some needle holder inserts may loosen during the ultrasonic cleaner's cavitation process. When inspecting needle holders, the jaw area should be inspected for wear and the boxlock area should be inspected for cleanliness and cracks. Most needle holders can be steam sterilized. Figure 5 shows several types of needle holders.

- **Suctions/aspirators –** Suctions and aspirators are used to remove or aspirate liquids, such as blood and irrigating solution, from the procedure area. Suctions are difficult to clean because dried blood is frequently found in the lumen area. Instrument technicians should always follow the IFU and use the proper size brush and brushing technique. During inspection, it is essential to pay special attention to the lumen; the use of a borescope may be helpful, especially when inspecting long- or small-lumened instruments. Multi-part suctions should be assembled to check for proper fit, and then disassembled for sterilization. The IFU must always be followed to ensure the proper sterilization cycle is used. Figure 6 shows some examples of suction instruments.

Learning general instruments is the first step in learning to assemble instrument sets. Sound knowledge of general instruments helps make assembling instrument sets an easier task.

OBJECTIVE 3: REVIEW THE DECONTAMINATION AND ASSEMBLY PROCESSES FOR GENERAL INSTRUMENTS

After use, instruments must be properly cleaned in the decontamination area. If instruments are not properly cleaned, they cannot be successfully disinfected or sterilized. It is important to remember that all instruments should be carefully cleaned, even if they do not appear to have been used. The IFU for cleaning agents and instruments must be carefully followed to help ensure a successfully cleaned device. All items should be disassembled for cleaning, in accordance with the manufacturer's IFU.

Each instrument should be manually cleaned before any mechanical cleaning occurs. Hinged instruments should be opened as wide as possible for proper cleaning. The use of decontamination stringers may be helpful in keeping hinged instruments open throughout the cleaning process. Instruments should not crowd the tray; too many instruments in a tray will impede the cleaning process. When placing items in a mechanical cleaner, it is essential to follow the equipment manufacturer's IFU for proper loading instructions. Instruments should be completely rinsed after manual, ultrasonic and washer-disinfector cleaning. Failure to properly rinse instruments between each cleaning process can lead to instrument damage.

When assembling instruments, technicians should carefully check each instrument for cleanliness and damage; the use of lighted magnification is recommended during this process. If soil remains in an instrument, it should not be cleaned in the assembly work area; the instrument (and the tray where it was located) should be sent back to the decontamination area for reprocessing. The work area should then be thoroughly cleaned before continuing with instrument assembly tasks. Damaged instruments should be removed from service and replaced with a back-up instrument.

Hinged instruments should be kept open throughout the preparation and sterilization processes. Again, the use of instrument stringers is helpful in keeping the instruments open and in order.

Non-hinged instruments should be placed in the tray or packaging, with enough room left between instruments to allow for sterilant penetration. Multi-part instruments should be assembled at the work station, checked for function and disassembled for sterilization. All instrument parts should be kept together. The instrument should be disassembled to allow the sterilant to reach all areas of the instrument.

To protect sharp and delicate instruments, approved instrument protectors should be used. Heavy items should be placed below lighter, more delicate items. Every effort should be made to evenly distribute the weight within the tray to facilitate sterilant contact, as well as even heating and drying in steam sterilization processes.

Carefully following an instrument count sheet will allow instruments to be placed in the same tray location each time the tray is assembled; this process makes it easier to access needed instruments during an emergent situation.

When peel packaging items for sterilization, care should be taken to keep hinged instruments opened and ensure there is adequate space in the package for the sterilant to contact all parts of the instrumentation. Care should also be taken to help ensure excess stress is not placed on the sides or seals of the peel pack.

CONCLUSION

General instruments provide the foundation for most instrument sets found in CS/SP departments. These instruments can be manufactured from different metals and should be handled as stated in the IFU. CS/SP instrument technicians should stay up to date on proper processes for cleaning, sterilizing and protecting these instruments.

RESOURCES

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Lind, N. Instrumentation Resource Course: 2005. *Identification, Handling and Processing of Surgical Instruments.*

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