Accountability for Surgical Instrument Processing From the OR to SPD and Back to the OR

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****This in-service has been Approved by the CBSPD, Inc. for 1.25 CEUs.**

Objectives

- To understand the protocols for handling and accounting for surgical instruments in the OR after surgery
- To identify the best practices for handling instruments in the Decontam area to prevent loss and enhance cleaning
- To know the best practices for instrument inspection, testing and quality testing

Background-Surgical Instruments

The quality of steel determines the quality of the instrument. US and German steel are considered the best. The base steel is critical to the quality of instrument. Therefore, you need to know the origin of the base steel. It is also important to understand that not all instruments labeled "surgical grade" are created equal.

Grades/Finishes

There are two grades of surgical instruments; surgical grade and floor grade (usually referred to as Pakistani). The floor grade instruments lack fine detail and precision; they break and corrode quickly and are not suitable for the OR.

There are several types of finishes; shiny - reflects light (e.g. chrome); dull/satin - does not reflect light and ebonized/black (used for laser surgery).

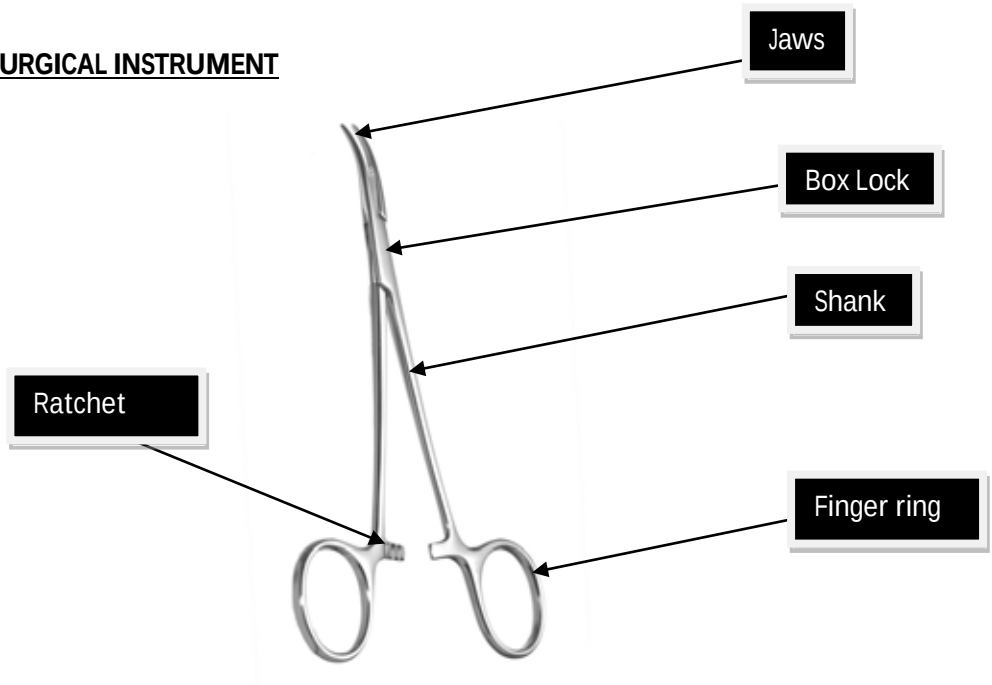
Anatomy of an Instrument

The parts of a basic surgical instrument include:

- **Jaws –** the working end of the instrument. The jaws make contact with the patient. The configuration of the jaw determines its function and helps identify its name.

- **Box Lock** – (also known as the hinge). There are three parts; male part, female part and the pin which secures the male and female parts together. The box lock is the weakest part of the instrument and the most difficult to clean.
- **Shanks** – run from the box lock to the finger rings. They provide the closing force for the instrument. The longer the shanks the greater the closing force of the jaws.
- **Ratchets** – located above finger rings on the shanks. The ratchet locks the instrument.
- **Finger rings** – Are located at the opposite end of the instrument from the jaws. Fingers are placed here for control.

ANATOMY OF A SURGICAL INSTRUMENT



Types of Instruments – There are many types of surgical instruments including (but not limited to):

- General surgical instruments
- Specialty instruments
- Laparoscopic instruments
- Robotic instruments
- Endoscopic Equipment

Instrument Manufacture

There are over 17 steps in the manufacturing of instruments. There are only 25 artisans remaining who perform the fine craftsmanship needed to manufacture surgical instruments. Most of the work is performed manually! Remember….no matter how talented the surgeon, surgery **cannot be performed without properly cleaned, assembled, tested and functional instruments!**

How to Protect Instruments

- At end of each case, place all instruments in their respective container (basket or tray) and spray with enzyme foam or gel.
- If the set has a protective container, place all instruments in their designated location to protect them from damage in transport.
- Do not stack instruments unless in they are in a rigid container; otherwise damage can occur to the instruments.
- Avoid exposure to saline and bleach; both of which are corrosive to surgical instruments. **If** saline must be used during case, immediately rinse the instrument(s) with sterile water.
- Protect delicate items and items with fine/sharp tips by keeping them separated from regular instruments.
- Place heavier items on bottom and lighter items on top to protect from damage.
- Separate scopes from instruments; the instruments can damage the lenses of the scopes.
- Clean instruments as soon as possible after use.
- Surgical instruments should always be used as intended. For example, only use dissecting scissors on tissue; only use suture scissors to cut suture and use tubing clamps to clamp tubings.

See next page

Would You Expect Damage?

The Association for the Advancement of Medical Instrumentation's Comprehensive Guide to Steam Sterilization and Sterility Assurance in Health Care Facilities (ANSI/AAMI ST-79) states:

"6.3 Care and handling of contaminated reusable items at point of use

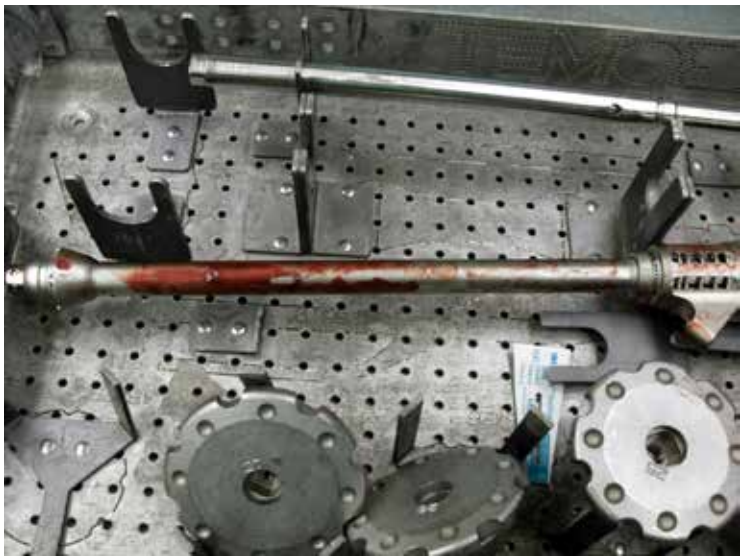
Contaminated reusable items should be handled as little as possible at the point of use. Soiled items should be immediately contained and transported to the decontamination area or soiled utility area, where cleaning procedures can be accomplished away from patient care. In many health care facilities, however, immediate containment, transportation, and cleaning might not be feasible, so gross soil should be removed at the point of use. Soil should be removed by a method that does not promote cross-contamination; a disposable sponge moistened with water (not saline) should be used to wipe gross soil from instruments. Gauze sponges and similar items used in the cleaning process are contaminated and should be handled, contained, and discarded according to the health care facility's policy for infectious wastes.

Gross soil is removed as soon as possible in order to

- (a) reduce the number of microorganisms on the item,
- (b) reduce the nutrient material that might support microbial growth,
- (c) reduce the potential for environmental contamination by aerosolization or spillage, and

- (d) minimize damage to devices from such substances as blood, saline, iodine, and radiological dyes or from the subsequent vigorous cleaning processes needed to remove encrusted material.

Not Acceptable



Accountability

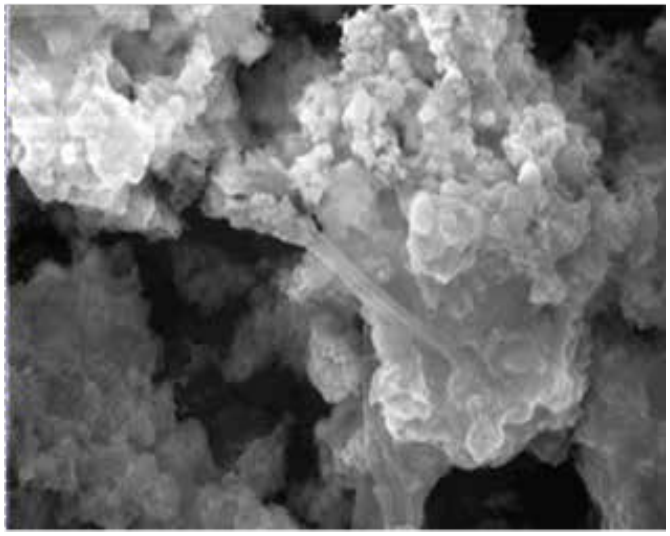
There needs to be a system of traceability for all individuals who handled the instruments

- OR (for damage/loss issues)

- SPD – for quality issues
    - Decontamination
    - Prep and Packaging
    - Sterilization
    - Distribution

Biofilm formation

Prompt cleaning reduces or eliminates the population of biofilm-forming microorganisms and thus prevents the formation of biofilm. Biofilm consists of an accumulated biomass of bacteria and extracellular material that is tightly adhered to a surface and cannot be removed easily. Biofilm has the effect of protecting microorganisms from attempts to remove them by ordinary cleaning methods used in the sterile processing department. Biofilm can form on many surfaces but is particularly problematic in devices with lumens. Once biofilm forms, direct friction and/or oxidizing chemicals are needed to remove it.



AORN: Recommended Practices: Care of Instruments

Instruments should be kept free of gross soil during surgical procedures.

Blood and body fluids can cause pitting of instruments. If blood is left to dry it can be difficult to remove. Preparation for decontamination should begin at the point of use. Removing gross soil and moistening soil at the point of use improves the efficiency and effectiveness of decontamination.

When instruments are comprised of more than one piece, they should be opened, disassembled and arranged in an orderly fashion within the original set configuration. Microsurgical instruments should be segregated into specialty containers (to prevent damage). Instruments should be treated with an instrument cleaner (e.g. enzyme detergent) before transport. All instruments used in the case should be accounted for at the end of the procedure (for inventory control).

CDC Guidelines

If soiled materials dry ….the removal process becomes more difficult and the disinfection or sterilization process less effective or ineffective. Surgical instruments should be presoaked or rinsed to prevent drying of blood and to soften or remove blood from the instruments. The more soils left on instruments – the longer it will take to process them.

Cleaning

Exposure of metals to incompatible solutions can cause a chemical and electrochemical attack called corrosion. Liquids, especially chlorides (e.g. bleach, saline) are of concern for stainless steel; they can cause corrosion which can lead to pitting resulting in irreversible damage.

INSTRUMENTS LOADED INCORRECTLY CAUSING DAMAGE

Instrument Loss

All instruments must be accounted for during all phases of use in the OR and SPD. All instruments should be counted at end of ALL cases for inventory control (AORN).

Instruments in Syringe Container!

Cleaning of Instruments

Always obtain and follow the instrument/device manufacturer's written instructions for cleaning, packaging and sterilization. This information should be verified each time a new device is received. Without this information, the device/instrument can be damaged or not properly cleaned.

Exposure of metals to incompatible solutions can cause a chemical and electrochemical attack called corrosion. Liquids, especially chlorides (e.g. bleach) are of concern for stainless steel.

Cleaning Issues

- Failure to comply with the instrument/device manufacturer's instructions for use (IFU) – can result in an improperly cleaned device.
- Failure to comply with the device manufacturer's instructions for soaking. Some devices require extended soak times in the enzymatic cleaner. In this case, the device manufacturer's recommendation must be followed.
- Incorrect loading of washers – can result in improperly cleaned devices.
- Improper cleaning implements – may interfere with proper removal of soils. Also, cleaning implements need to be cleaned and disinfected each shift to keep bioburden at a minimum.
- Improper cleaning agents – can damage the surgical instrument/device.

- Chemicals not measured correctly (sink?) – Too much of the chemical (e.g. detergent) is sometimes more of a problem than too little. It is essential that the volume of water in the sink be marked and that the detergent is measured with a measuring cup each time. If an automated pumping station is used, the pump's accuracy should be monitored by the company providing the pump to ensure it is delivering the correct amount of detergent.
- Short cuts – e.g. "utensil" cycle for heavy soils. Never take short cuts with cleaning. Always follow the device manufacturer's instructions exactly as stated.
- Bypass of sonic process. If the device manufacturer recommends sonic cleaning, it must be performed. Many specialty instruments (e.g. Orthopedic) require extended sonic cycles.
- Not washing each level of multi-level sets separately.
- Placing lids beneath trays (so they do not get lost). This impedes the cleaning action of the washer. (See photo)

Damage to Instruments

The expected life of an instrument is 20+ years if cared for properly. However, there are many causes of damage:

- Misuse - not used as intended by design
- Abuse -dumping, stacking
- Improper cleaning, sterilization
- Chemicals/detergents (e.g. saline - chlorine bleach, blood, even water!)

Corrosion

Stainless steel corrosion usually appears as surface blemishes (roughness/rust). This creates difficulties for cleaning, disinfection and sterilization. Corrosion can indicate locations where future device failure

can occur. Stainless steel can corrode by pitting; crevice corrosion or stress corrosion cracking (SCC) also known as hydrogen cracking.

Crevice Corrosion - Is found in box locks and other "tight" spaces. It appears as a red rust. It is caused by blood and other soils in box locks and other locations. In the early stages, the effects are just cosmetic. However, if allowed to continue, device failure can occur. Corrosion also interferes with proper cleaning and can inhibit the disinfection/sterilization process. Improper cleaning can cause corrosion as well.

Pitting - Is caused by exposure to blood, chloride or bromide containing solutions. It is a highly localized corrosion of stainless steel which results in shallow to deep localized defects. These defects look like black holes (pits) on the surface of the instrument. Pitting cannot be repaired, the instrument should be replaced.

Staining of Instruments – There are several types of stains. Blue stains - are usually caused by liquid chemicals (e.g. acid glutaraldehyde). Purple-black stains are usually due to exposure to ammonia. There are many cleaning and disinfecting chemicals which contain ammonia. Staining can also be caused by improper rinsing of chemicals or residual boiler ammine residue.

Rusting of Instruments - If the instrument is a good quality stainless steel instrument, the "rusting" is probably is baked on blood. It is not recommended to sterilize plated instruments (e.g. Pakistani) with stainless instruments; the lesser quality floor instruments can cause rusting of the OR grade instruments. Rust can also be caused by high iron content in your water.

Water Quality

The quality of water can have a great impact on instrument life. Water quality should be analyzed at least twice a year. Sodium, magnesium, iron are all present in water. These chemicals/impurities can adversely affect cleaning, detergent action (improper cleaning) and the life of instrument.

Enzyme Detergents

Most enzyme manufacturers recommend 140^{o}F (60^{o}C) maximum water temperature. It is important to read the enzyme manufacturer's instructions for use and if a maximum water temperature is recommended, install a thermometer to monitor the temperature. Too high a temperature can kill enzymes; too low a temperature can make them "sluggish". Neither is acceptable.

Thermometer for sink/container to monitor water temperature

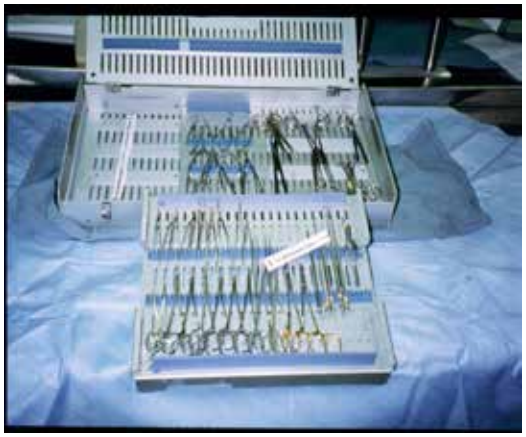
Preparation/Packaging

Accurate count sheets are needed to avoid assembly errors. Always follow the instrument/device manufacturer's instructions for sterilization; i.e. should the device be disassembled? Assembled? Use tip protectors to protect delicate/sharp items. Make sure the tip protectors have been validated for use in steam (or whichever sterilization method is being used).

Protection of Instruments

Specialty instruments should be placed in specialty container/tray to protect them from damage. The cost of the container will be covered by minimal damage/repair instrument costs.

SPECIALTY PROTECTIVE CONTAINER



Competencies

All individuals handling surgical instruments and devices need to be knowledgeable in the care, handling and processing of surgical instruments. Surgical instruments are the extension of the surgeon's hands therefore; they must work as intended when needed. The testing is based on the design and use of the instrument.

Inspect instruments using a lighted magnifying lamp to identify defects. Verify cleanliness first then inspect for

- Stiffness in jaws
- Jaw alignment
- Ratchets hold and are clean
- Box lox – no cracks; no loose screws. Remove immediately if cracked. The instrument can fail during use and a cracked box lock can permit blood and body fluids to enter the crack which may not be able to be removed.
- Teeth alignment
- Check for dull spots or chips on the cutting edge of scissors
- Dents
- Sharpness – there are latex and latex free products which simulate tissue that should be used to test surgical scissors for sharpness. The thickness of the product is based on the scissors' blades length.
- Plated Instruments - check for chips in metal, sharp edges, worn spots, plating flaking off. None of these scenarios is acceptable. Once the plating is removed, there is no longer a solid surface therefore blood and body fluids can enter the metal and may not be able to be removed.

Knife handle without chrome plating

Needleholders - Checks the jaws for burs, worn edges, cracked or missing tungsten carbide inserts (identified by gold plated handles). Check the box lock for cracks. Close the jaws, you should not be

able to see light through the tip of the jaws. You can also place a suture needle in the jaws and try to pull through when closed on second ratchet however the correct size suture needle is needed.

Retractors - If they are self-retaining, does the retention mechanism work? If it is a pair, do they match exactly? Sharp? Blunt? # prongs?

Forceps - Make sure the tips approximate (meet); that the teeth are present (if applicable). Check for rough edges and cracks. (Finger forceps are joined at the distal end where cracks usually appear). Are the serrations clean?

Marked Instruments - If instrument tape or dipping was used; make obtain the manufacturer's technical data verifying the sterilant can penetrate (written technical data from manufacturer). Verify that the tape is not coming off or flaking. Verify the integrity of dipped surfaces. Any marking methods must be maintained properly.

Tape in Poor Condition

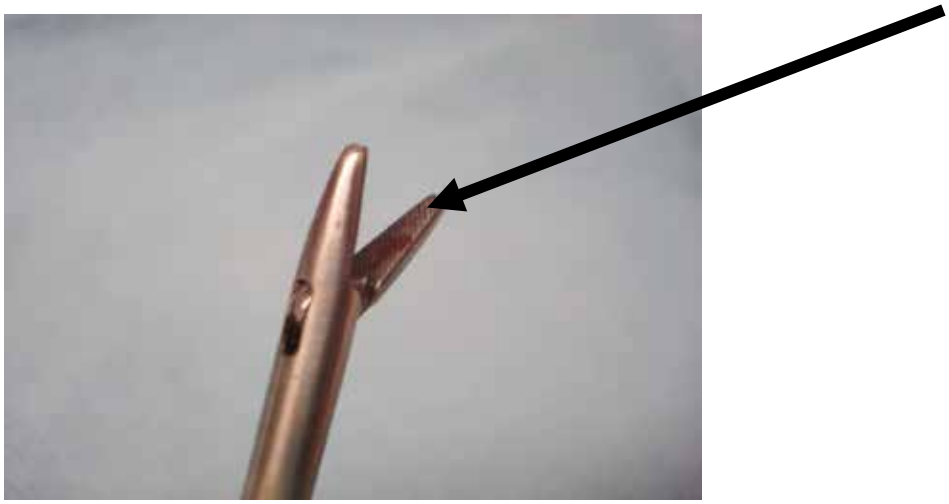
Lubrication of Instruments - Only use water soluble lubricants. It is recommended to lubricate instruments after each cleaning (unless otherwise specified by the instrument manufacturer). Sonication removes the protective chromium oxide layer from surgical instruments; the lubricant will help to re-apply this layer during steam sterilization thereby protecting the instrument. Always allow the lubricant to air dry; do not rinse off or dry with a towel. Check for the use life (when the solution has to be replaced) and the recommended water quality (i.e. if distilled water is needed for dilution).

Quality Inspection -

- Is the instrument clean?
- Are all the parts present?
- Does the instrument work as intended?
- Is there damage to the instrument?
- Is the plating missing?

Laparoscopic Instruments - Are difficult to clean due to their long shaft and jaw assembly; both can trap debris. During laparoscopic surgery, the positive pressure of the insufflated abdomen can cause blood and body fluids to flow under the insulation and into channels making cleaning difficult/impossible. Unless otherwise directed by the manufacturer, multi-part laparoscopic instruments should be disassembled for cleaning. Always follow the instrument manufacturer's instructions carefully. Use an enzymatic cleaner as soon as possible after use. Use ultrasonic cleaning unless contraindicated by the instrument manufacturer. Pay special attention to jaws and channels. Jaws should be cleaned using a small brush; scrub all surfaces.

See photo below with blood remaining on tip of laparoscopic needle holder.



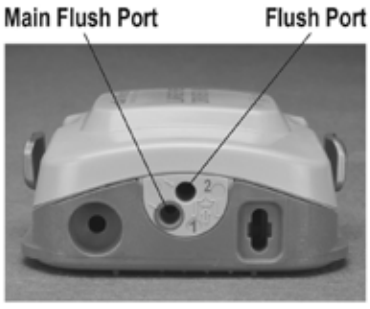
Insulated Instruments - Need to be inspected for integrity of the insulation after each use. Repeated use/sterilization can cause the layer of insulation covering the shaft to break down. Minute tears can go unnoticed during cleaning/inspection. During surgery, defective insulation could allow 100% of the electrical current (700°F) to flow from the defect to organs, tissue. The smaller the crack the more dangerous because more current escapes from small hole because it is more concentrated. Approximately 90% of the active electrode is outside the surgeon's field. Therefore, the problem could go unnoticed by the surgeon. (If the defect is not visible on the monitor, the surgeon has no knowledge that there is a defect in the insulation.) If the patient gets burned, the patient complains of severe abdominal pain after several days which can result in peritonitis and sepsis and can lead to death. Insulation failures occur due to normal wear and tear, high voltages, the cleaning and sterilization process (flash increases damage) and contact with sharp instruments (e.g. trocars). Therefore, a comprehensive system for inspection of insulation is required. Insulation can get damaged from dropping the instrument, repeated sterilizations and/or placing instruments on top of other instruments, or when instruments are "dumped" into a table.

There are three ways to monitor for insulation breaches; one type is monitored in OR, another type is used in the OR just prior to the case (single use, sterile insulation tester) or a reusable insulation tester which is used in SPD.

PHOTO OF REUSABLE INSULATION TESTER

Develop a policy and procedure to visually inspect insulation each time with a lighted magnifying lamp. Look for cracks, holes, or flaking in insulation. Then follow with insulation testing equipment. All such testing should be documented on a log form. These records should be retained with the sterilization records.

Robotic Instruments – are similar in design to laparoscopic instruments. These require special cleaning protocols; follow the instrument manufacturer's instructions for use carefully. A special high pressure hose is needed for effective flushing of the instruments.



High Pressure Hose for Flushing

SUMMARY: Surgical instruments represent a large financial investment for the healthcare facility. There must be accountability for surgical instruments for all personnel handling surgical instruments.

QUIZ: Accountability for Surgical Instruments

Please click on the link below to take the quiz.

https://www.spdceus.com/ceus/accountability_for_surgical_instruments_quiz.htm

Good Luck!