Effective Management of Surgical Instruments

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Developed with an unrestricted educational grant from

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Disclosures

Requirements for Successful Completion

View the activity in its entirety
Complete the Evaluation Form
Achieve at least the minimum score on the Post-Test

Conflict of Interest

The authors have no conflict of interest to declare. The activity has been reviewed to ensure that content meets the requirement for continuing nursing education. One author is the owner of Terri Goodman & Associates, the approved provider of continuing nursing education.

Commercial Support

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Disclosures (cont.)

This Continuing Education program has been granted 2.0 contact hours for nurses with a minimum score of 80 on the post test. Contact hours expire on December 31, 2016.
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Objectives

- Discuss the roles of personnel in both the operating room and sterile processing department (SPD) in the effective management of surgical instruments.
- Describe activities that impact the process of managing surgical instrumentation effectively.
- Explain the steps in preparing and sterilizing surgical instruments.

Managing Surgical Instruments is A Team Effort

Perioperative personnel and processing personnel must WORK TOGETHER to ensure the effective management of surgical instruments.

Purpose Statement

The purpose of this educational activity is to demonstrate proper management of surgical instruments and to emphasize that effective communication between perioperative and instrument processing personnel is essential to ensure that instruments used in surgical and other invasive procedures facilitate safe and effective patient outcomes.

Patient Safety

- Optimal surgical outcome.
- Reduced complications related to tissue damage.
- Reduced incidence of infection.
- Reduced recuperation time.

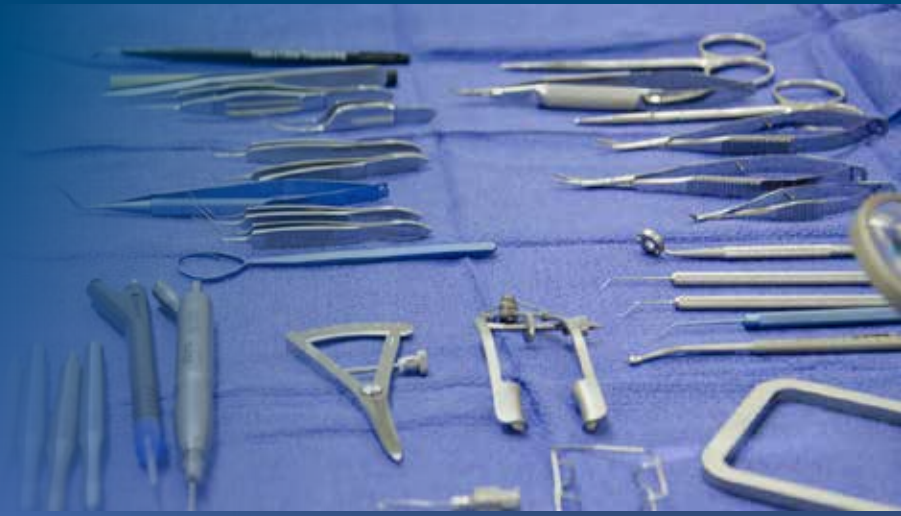
Reduced Expenses

- Reduce patient length of stay.
- Reduce expenses related to hospital-associated infection.
- Reduce expenses related to complications.
- Extend instrument life.
- Reduce replacement costs.
  - A major cause of instrument damage is mishandling and abuse.

Instrument management

BEGINS in the OPERATING ROOM

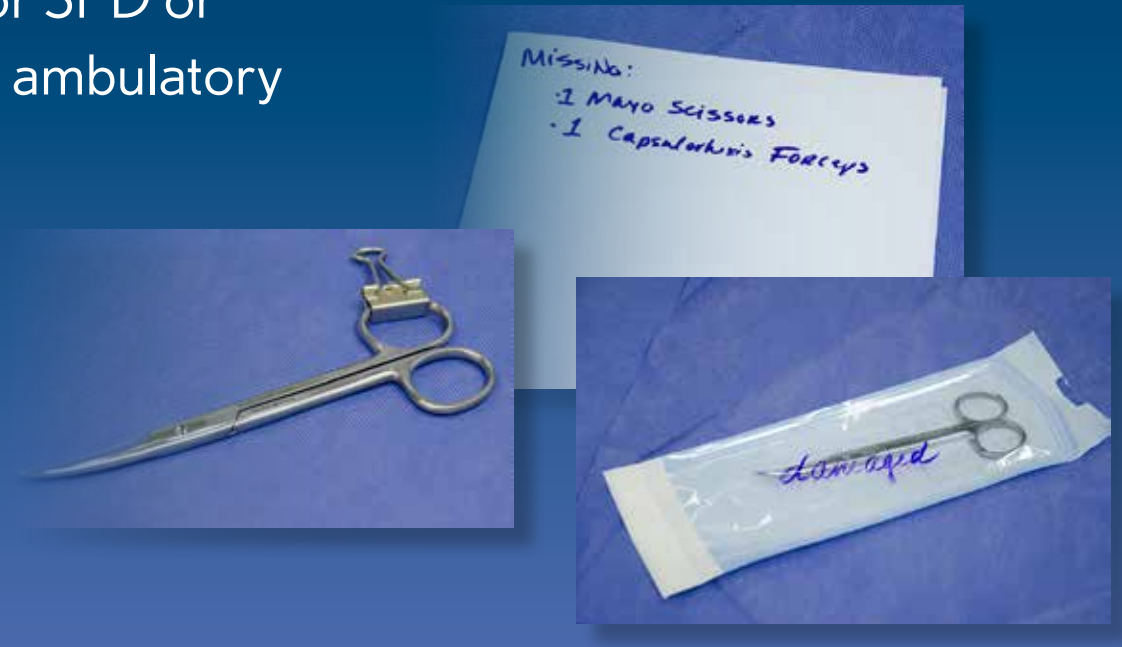
at the point of instrument use.



During the Procedure

Instruments must be
INSPECTED BEFORE use
on the field.

Any DEFECTIVE OR MISSING INSTRUMENTS must be CLEARLY IDENTIFIED for SPD or the instrument technician in ambulatory surgery.

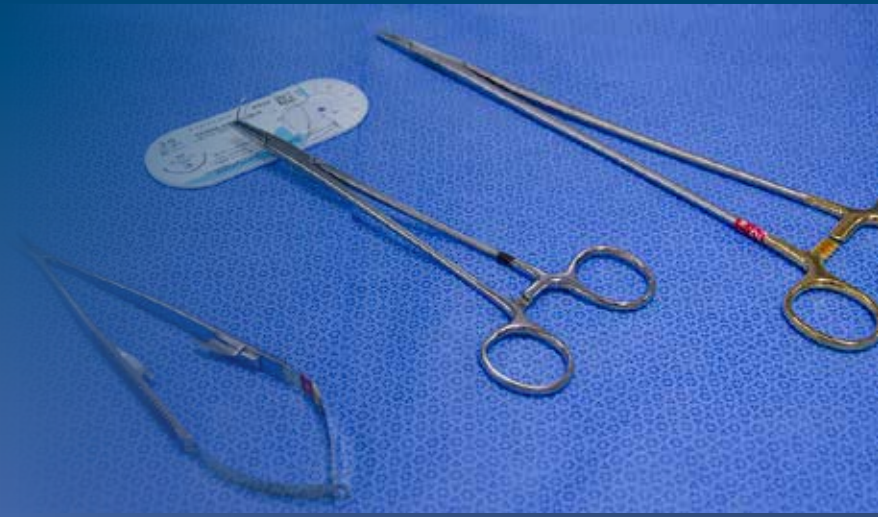


Handling

- Handle instruments carefully and ONE AT A TIME or in SMALL NUMBERS.
- Use instruments ONLY for the purpose for which they were intended.

- Use scissors only for the MATERIAL FOR WHICH THEY WERE DESIGNED.
  - Cutting other materials can cause misalignment, loss of sharpness, damage (e.g. Use Mayo scissors, not Metzenbaums or more delicate scissors to cut drapes and material other than tissue).
- Use sharp instruments (diamond knives, cystotomes, dissectors, knives) ONLY FOR THEIR INTENDED USE.
  - Misuse can cause blades and edges to dull and impair surgical performance.

- Use forceps APPROPRIATE TO THE TASK at hand
  - Improper alignment can create serious problems with function and harm to the patient
- MATCH NEEDLE HOLDERS TO THE SIZE OF NEEDLE for which it is intended
  - Large needles will spring the jaws of delicate needle holders and reduce holding power



- During the procedure, wipe blood and tissue from instruments IMMEDIATELY AFTER USE.
  - Debris that is allowed to dry on instruments causes deterioration, corrosion, and pitting.
  - Saline solution may be be used to wipe instruments that will be used again during the procedure.

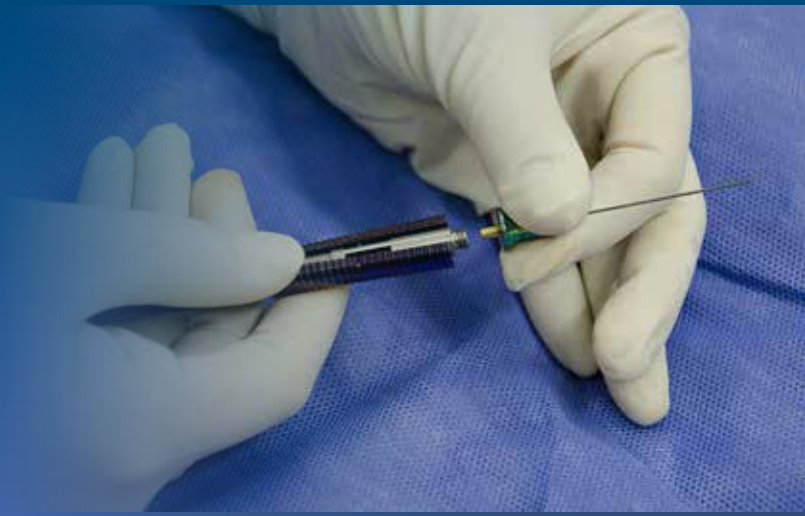
- PROTECT TIPS of instruments with tip protectors.
  - Prevent tips of instruments from contacting other instruments and snagging on towels and sponges.

Following the Procedure

- Remove disposable sharps; manage sharps appropriately.

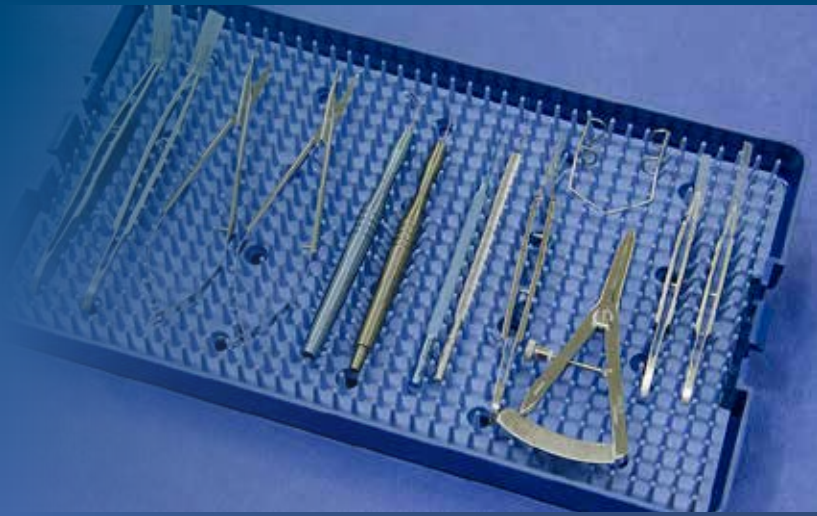
Prepare the Instruments

- Open box locks.
- Insure that all multipart instruments are DISASSEMBLED.
  - KEEP PARTS TOGETHER for easy reassembly after processing
- EXPOSE all surfaces
  - Cleaning, disinfectants, and sterilants must CONTACT ALL SURFACES of an instrument for the process to be effective

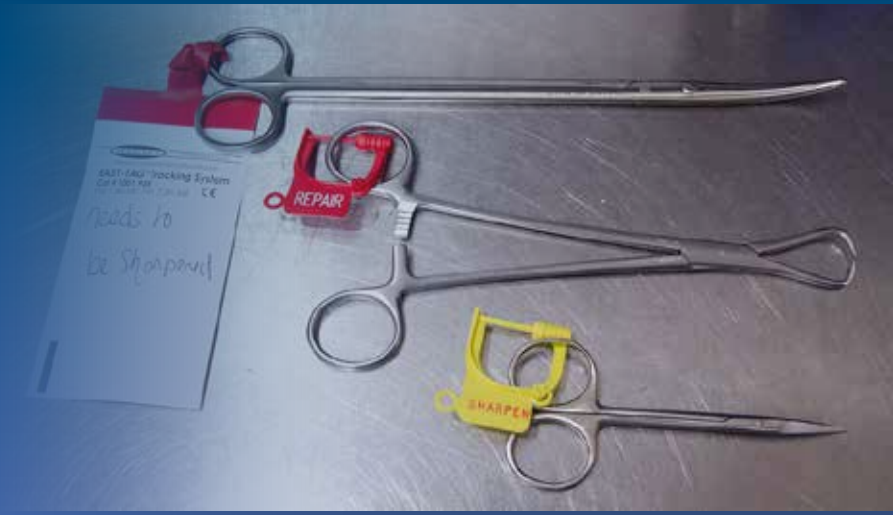


- All cannulated equipment and handpieces should be FLUSHED.

- Organize instruments into sets.
  - All instruments, used and unused, go back into the set.
  - Once opened onto the sterile field, the entire set is considered contaminated.
- Place HEAVY INSTRUMENTS ON THE BOTTOM; lighter instruments on top.



- Clearly identify deficient/missing instruments.



- CONTAIN CONTAMINATED instruments to protect personnel.
- DO NOT ALLOW BLOOD AND DEBRIS TO DRY on instruments.
  - Soak in demineralized water to prevent drying of bioburden.
  - Saline, disinfectants, and chlorinated solutions can cause pitting and corrosion and should never be used for soaking instruments.
- Transport instruments to SPD as quickly as possible.
  - Instruments should not remain in water for lengthy periods of time.
  - Biofilms may form, particularly within lumens.

Biofilm

- An aggregate of organisms encased within a gelatinous matrix.
  - Biofilm is the SLIMY FEELING on the inside of a container that has held water for a period of time.
  - Once formed, a biofilm CANNOT BE RINSED AWAY; it can only be removed by mechanical means.
- The presence of a biofilm makes cleaning more difficult.
  - Biofilm can pose a SERIOUS THREAT TO HEALTH.
  - Biofilm CAN COMPROMISE THE DISINFECTION AND STERILIZATION PROCESSES.

A biofilm CAN BREAK FREE from the surface of a device resulting in a MASSIVE INFUSION OF BACTERIA that can cause an infection that is difficult to treat.

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- Cleaning is the FIRST AND MOST IMPORTANT STEP in instrument processing.
- An instrument must be clean before it can be sterilized.
  - Debris prevents sterilant from contacting all surfaces of an instrument.
  - Improper cleaning of instruments can cause harm to patients.

AN INSTRUMENT CAN BE CLEAN BUT NOT STERILE;
NO INSTRUMENT CAN BE STERILE BUT NOT CLEAN.

Sterile Processing Responsibilities

- Cleaning/ Decontamination
  - Wash
  - Rinse
- Lubrication
- Inspection and Testing
  - Continue Reprocessing
  - Send for Repair/Discard
- Prepare for sterilization
- Sterilization
- Storage

TOXIC ANTERIOR SEGMENT SYNDROME (TASS)

- An ACUTE INFLAMMATION of the anterior chamber, or segment, of the eye following cataract surgery.
- Can be caused by INADEQUATE OR INAPPROPRIATE CLEANING of instruments leaving irritants on the surface of intraocular surgical instruments.

TOXIC ANTERIOR SEGMENT SYNDROME (TASS) (CONT.)

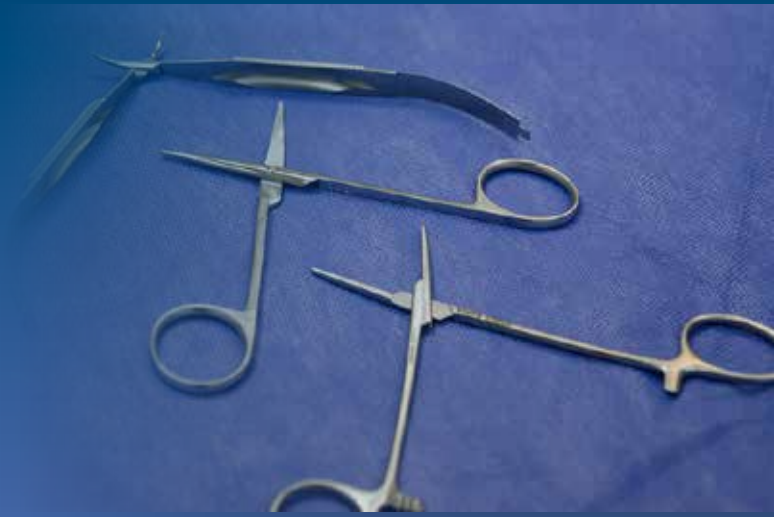
- Risks may be associated with the use of enzymatic cleaners.
  - INCOMPLETE RINSING, especially of cannulated instruments, has been identified with TASS.
- Chemical sterilization methods such as EtO and peracetic acid may leave CHEMICAL RESIDUES on the instruments that promote TASS.

Manual Cleaning

- Hand wash microsurgical instruments and trays.
- Remove mats from trays and clean each separately.
- Do not put delicate microsurgical instruments in mechanical washer unless it has a delicate cycle.

Manual Cleaning (cont.)

- Open all hinged microsurgical instruments for maximum exposure of hinges.
- Debris left in box locks or crevices can be baked on in sterilization, causing future breakage under stress.
- Disassemble instruments with removable parts.



Manual Cleaning (cont.)

- Wash each instrument individually to ensure proper cleaning and to prevent injury.

Manual Cleaning (cont.)

- Do not use abrasive cleaners when cleaning microsurgical instruments; they can damage or scar finishes.
- Use soft brush and instruments wipes.
  - Brush all serrations, crevices, tips, handles, and hinges.
  - Brushing should be done under the surface of the water to prevent aerosolization of contaminants.

Cannulated Instruments

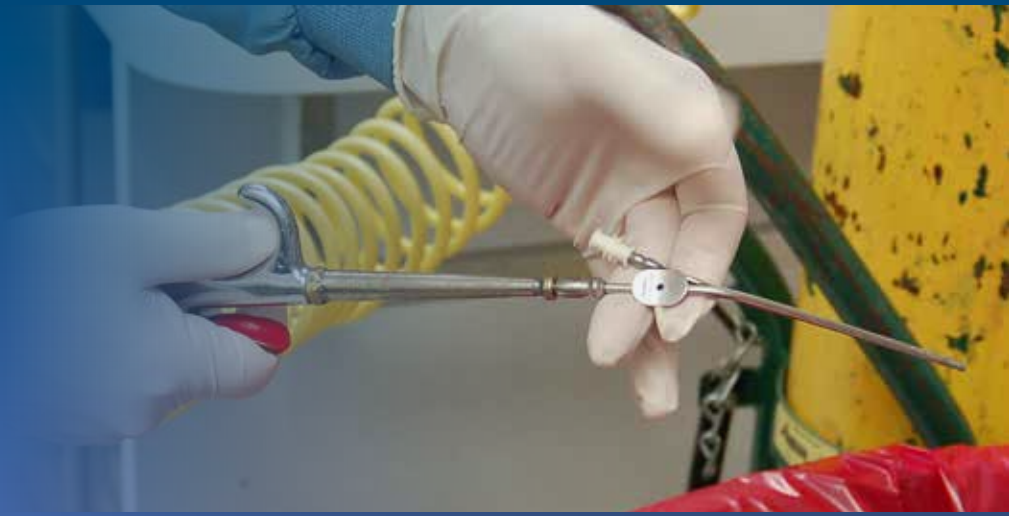
- Cannulas, irrigation cannulas, irrigation/aspiration (I/A) handpieces, suction tips, cystotomes.
- Use a brush of the appropriate size to clean the lumen; hold instrument and brush below the water surface.
  - Clean and sterilize the brush DAILY or according to the manufacturer's directions.

Cannulated Instruments (cont.)

- Flush lumens using a syringe filled with warm distilled or deionized water according to the manufacturer's directions.
- Flush below the surface of the water to avoid aerosolizing contaminants.

Cannulated Instruments (cont.)

- Follow rinse with air dry.
  - 50cc syringe filled with air.
  - Compressed air



Automated Cleaning / Mechanical washing

- A washer-decontaminator can be used to mechanically wash sturdier instruments in an agitated detergent bath.
- Use detergent with NEUTRAL pH.
  - Follow the recommendations of both the manufacturer of the detergent and the manufacturer of the instrument.

Automated Cleaning / Mechanical washing (cont.)

- Place heavy instruments in the bottom of the tray or basket.
- Load small or light instruments in separate trays.

Automated Cleaning / Mechanical washing (cont.)

- Do not put microsurgical instruments into a washer decontaminator unless it has a DELICATE CYCLE.
- Do not put powered or lensed instruments into a washer decontaminator unless recommended by the instrument manufacturer.
- Do not use a washer decontaminator for heat, moisture, or pressure-sensitive instruments.

Mechanical Cleaning with Hard Water

- Mineral deposits will accumulate on the walls of equipment after repeated use.
- Clean equipment regularly to remove impurities and scale.
- Water purifying system or softening agent added before each use minimizes formation of scum, scale, and discoloration.

Prepare the Instruments

- Just as in the OR, SPD personnel must insure that
  - Box locks are open
  - All multipart instruments are disassembled
  - All instruments in a set are together
  - All surfaces are exposed so that disinfectants and sterilants can reach ALL surfaces

Prepare the Instruments (cont.)

- Protect sharp instruments
  - Sharp tips and sharp edges are easily dulled or broken.
- Protect personnel from injury from sharp instruments.
  - Don't bury sharp instruments among other instruments.
  - They should be readily visible to avoid injury when handling.

Ultrasonic Cleaning

- Ultrasonic cleaners use high frequency sound waves to create mechanical vibration.
- Cavitation: microscopic bubbles form on every surface, then implode, creating a vacuum which pulls particles from every crevice of the instrument.
- Ultrasound penetrates areas that a brush or mechanical washer cannot reach.

Ultrasonic Cleaning (cont.)

- Use detergent at the proper concentration and temperature, recommended by the manufacturer.
- Ultrasound for 5 minutes or according to the manufacturer's directions.
- The ultrasound machine should be drained and cleaned/disinfected frequently.
  - Frequency of cleaning is based on the amount of use.
  - Frequency can be as often as every 1-2 hours or after every use.

Ultrasonic Cleaning (cont.)

- Sort instruments into batches, separated by metal composition.
- Never place different metals in ultrasonic cleaner at the same time.
- Stainless steel and titanium instruments must be cleaned separately.
- Mixing incompatible metals can CAUSE PITTING, ETCHING, AND DEGRADATION of surface treatments.

Ultrasonic Cleaning (cont.)

- Powered instruments should be not cleaned in an ultrasonic washer.
- A NEUTRAL pH ultrasound solution is also vital to protect the passivation layer on instruments and prevent corrosion.

Ultrasonic Cleaning (cont.)

- Protect tips, cutting edges and box lock from other instruments.
  - Ultrasonic vibration can cause premature wear when instruments contact adjacent instruments.
- Rinse instruments thoroughly with distilled water after the cycle to remove residue and particles from surfaces and to prevent staining.

Ultrasonic Cleaning (cont.)

- Check screws on instruments, as vibration may loosen screws.
- Instruments should be air dried with filtered, compressed air.
- Use hot air dryer.
- Avoid canned, compressed air due to particulates.
  - Protect fine tips and edges which can be damaged when snagged on gauze or towel.
- If drying with a towel, the towel should be lint-free

- Lubrication helps prevent staining, rusting and corrosion (if specified by the instrument manufacturer).
- Lubrication promotes smooth action of hinged instruments
- Proper lubrication helps to keep instruments clean by preventing mineral and protein build up.

LUBRICATION (CONT.)

- Lubricate only instruments with mechanical parts.
- Use a water-soluble, anti-microbial lubricant after each cleaning, or a minimum of once each day.
- Water soluble lubricant penetrates the box locks, hinges and crevices, preventing binding and excessive wear.
- Do not lubricate cannulated instruments.

LUBRICATION (CONT.)

- Follow the manufacturer's instructions for lubrication.
  - Place instruments individually in a perforated tray; do not allow instruments to touch one another. Immerse the open perforated tray in the lubricant.
  - 30-40 seconds is the usual immersion time.
- Replace the lubricant at least daily to keep it clean.
- DO NOT USE SILICONE SPRAYS or other oils which can build up in hinges and crevices and inhibit sterilization.

LUBRICATION (CONT.)

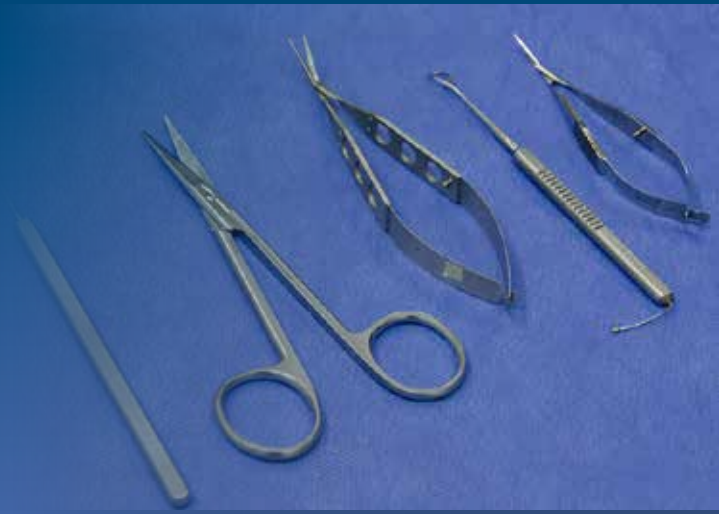
- Let the instruments drain.
- Do not rinse or wipe the instruments.
- Some lubricant will be removed during ultrasonic cleaning.

Lubrication (cont.)

- Lubricant film should remain on instruments through the sterilization process.
  - Though much of the lubricant is removed during preparation and sterilization, the lubricant that remains provides surface protection.

Inspecting and Testing

- Magnified visual and mechanical inspection is a CRUCIAL STEP in the processing of instruments.
- Each instrument is inspected following the lubricant bath.
  - Misalignment, malfunction, dull edges or points on sharp instruments, bent tips, loose screws, pits, nicks, cracks, corrosion, etc.



Inspecting and Testing (cont.)

- Damaged instruments are SET ASIDE for further evaluation, repair, or replacement.
  - Damaged instruments must never be put into sets.
  - A set should not be processed until the damaged instrument has been replaced; INCOMPLETE SETS CAN CAUSE DELAYS IN SURGERY.

Inspecting and Testing (cont.)

- The instrument finish should have no dull spots, dents, nicks, or cracks.
- Incompletely cleaned instruments must be reprocessed.

Inspecting and Testing (cont.)

- Sharp instruments (scissors, rongeurs, osteotomes, curettes, knives, etc.) should be tested for sharpness and smooth cutting under magnification.
- Hinged instruments should work smoothly without stiffness.

Forceps

- Jaws that overlap when tightly closed are out of alignment.
- Teeth of forceps must mesh properly.
- Tying platforms must meet evenly over the full length to eliminate damage to fine sutures.

Box Lock

- Hold the ring handles in both hands, open the instrument, wiggle the instrument to identify excessive play in the box lock.
  - Excessive play indicates alignment problems or wear.
  - Instrument may not hold securely.

Ratchet

- Test tension by closing the instrument gently; when jaws touch, a space of 1/16" or 1/8" should occur between the ratchet teeth of each shank.
- Close ratchet to first tooth.
- Hold instrument by jaws and tap against your hand.
- If instrument springs open, it is an indication of defective ratchet teeth or poor shank tension.
  - The instrument will not hold tissue, sponges, or needles securely.

Scissors

- When closed, scissor should meet only at tips.
- All scissors should operate smoothly.
  - Rough operation implies wear, damage, or failure.
- Look for burrs on blade tips.
- Scissors with nicks in the blades should be identified and tagged for repair.
- Shanks should be in good alignment; if not, the blades may not close smoothly.

Scissors (cont.)

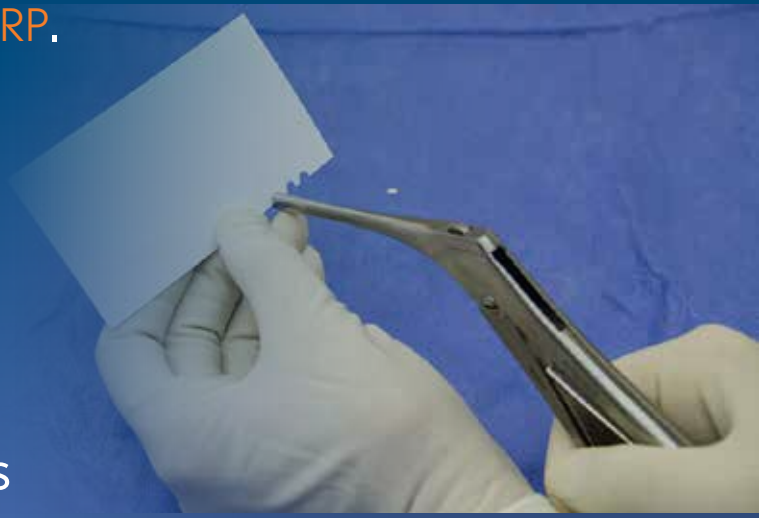
- Many facilities use *Theraband* (the same latex product that is used for exercise bands) to test the sharpness of Mayo and Metzenbaum scissors.
  - There are two thicknesses; one for scissors with blades longer than 5 inches and one for scissors with blades less than 5 inches.

Needle Holders

- A needle should be held firmly in place when the needle holder is closed to the lock or stop.
- If the needle can be twisted or rotated, the needle holder needs repair.
- If light can be observed between jaws that are closed and/or locked, the jaws are sprung or damaged and will require repair

Rongeurs

- The cutting edges of a rongeur must be SHARP.
- A sharp Kerrison rongeur should take a clean bite out of a 3x5 index card.
- Bone-cutting rongeurs should bite through a tongue depressor.
- There are commercially available sharpness test kits and standards for surgical instruments.



PREPARATION FOR STERILIZATION

- Instruments are assembled and placed into containers for sterilization.
- All surfaces of each instrument must be exposed to sterilant.

Preparation for Sterilization

- Arrangement of instruments in a set should:
  - Maximize exposure to sterilant.
  - Protect the instruments from damage.
  - Facilitate setting up for the surgical procedure.
- Stringers or posts keep ringed instruments open.
  - String instruments from large to small with jaws and tips pointing in same direction.
- Position cupped or concave instruments so they will not collect water.
- Delicate instruments must not touch one another in trays.

Preparation for Sterilization (cont.)

- Heavier instruments should be loaded first, and kept separate from lighter instruments.
- Tray weight should not exceed 25 lbs.
- Delicate instruments are often packaged in cases specially designed to protect them.
- Protect tips and sharp edges with tip protectors that have been validated for sterilization cycles.

Monitoring

- Every package must be monitored to insure that the sterilization process was successful.
- Chemical monitors demonstrate that the parameters of sterilization have been met.
- Biological monitors demonstrate that all microorganisms, including spores, have been killed.

Monitoring (cont.)

- Sterility Assurance Level (SAL) – 10^{-6}
  - There is a probability of only one in one million organisms surviving the sterilization process.

Chemical Monitors

- Will change color when conditions that are measured have been met.

Classes of monitors:

- Class I: process indicator
  - When exposed to heat the indicator changes color.
  - distinguishes between processed and unprocessed items.

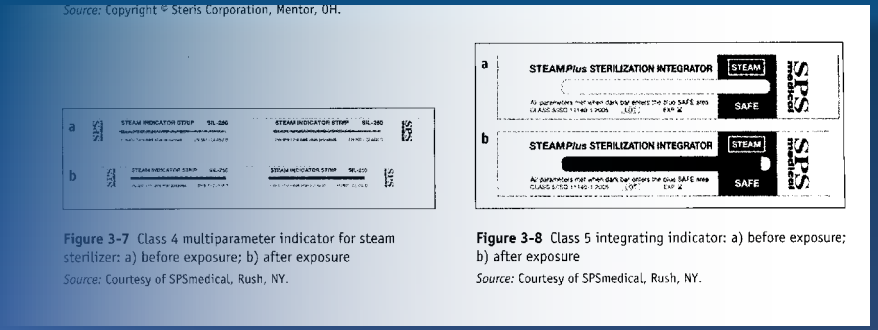


Figure 3-7 Class 4 multiparameter indicator for steam sterilizer: a) before exposure; b) after exposure
Source: Courtesy of SPSmedical, Rush, NY.

Figure 3-8 Class 5 integrating indicator: a) before exposure; b) after exposure
Source: Courtesy of SPSmedical, Rush, NY.

**Note: Class II indicator (Bowie Dick) is used to verify air evacuation in a dynamic air removal sterilizer.

Chemical Monitors (cont.)

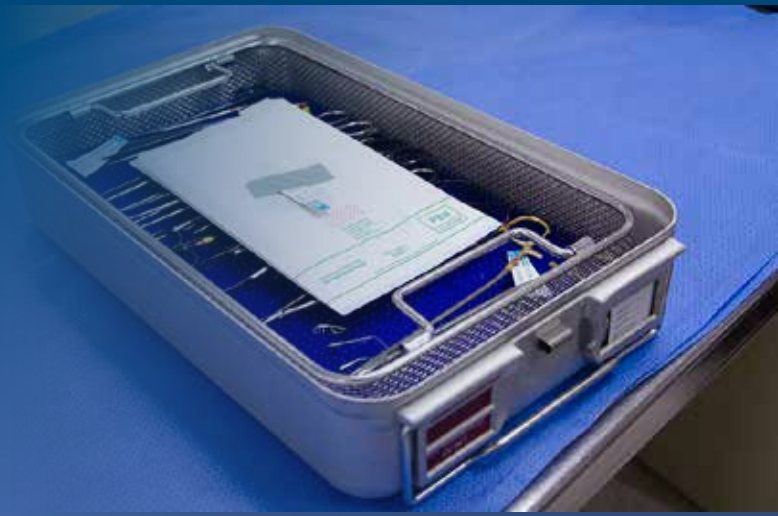
- Class III: single variable indicator
  - Measure one of the parameters
- Class IV: multi-variable indicator
  - Measures more than one parameter
- Class V: integrators
  - Measures all parameters
- Class VI: Cycle specific indicators

Chemical Monitors (cont.)

- There should be a process indicator on the outside of the package or set to distinguish processed items from unprocessed items.

Chemical Monitors (cont.)

- An indicator should be placed in each package in the site most challenging for the sterilant to reach.
  - Near the center of the set or package.
  - Must be visible to the scrub person and circulator when the package is opened.

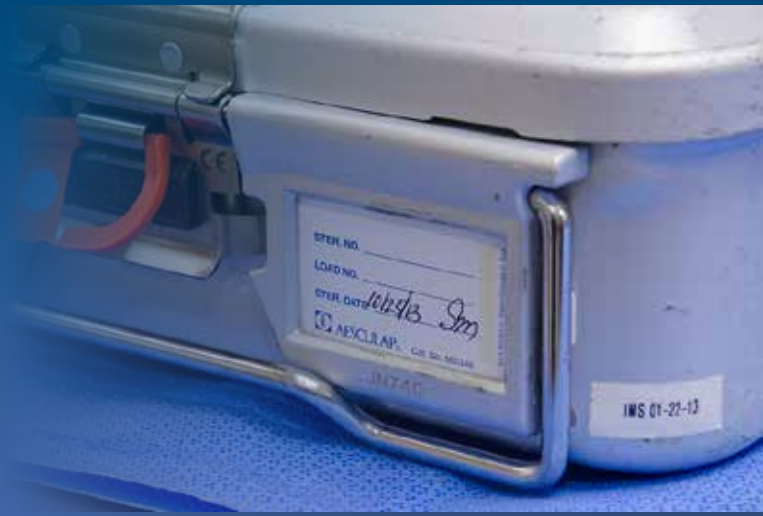


Chemical Monitors (cont.)

- Label items packaged for sterilization clearly.
  - Contents.
  - Initials of the package assembler.
  - Lot control number.
- Lot control number indicates:
  - sterilization date; sterilizer used; cycle or load number.
  - In conjunction with computerized instrument tracking systems, lot control numbers facilitate inventory control, stock rotation, and retrieval of items in the event of sterilization or sterilizer failure.

Chemical Monitors (cont.)

- Individual facilities may have their own protocol for information to print on each package.
- Use indelible, non-bleeding, non-toxic markers.
- Write on the plastic side of pouches.



Event Related Sterility

- A package remains sterile until it is opened or an event occurs that contaminates the package.
  - Wrapping is torn or punctured.
  - Package exposed to moisture.
  - Package is dropped on floor.

Event Related Sterility (cont.)

- If an item is not contaminated during storage, it will remain sterile indefinitely.
- The longer a package is stored, the greater the possibility for contamination to occur.

- Use the sterilization method(s) recommended by the instrument manufacturer.

Sterilization (cont.)

- High temperature: Steam
  - Most common.
  - Least expensive.
- Low temperature
  - Ethylene oxide (EtO).
  - Hydrogen peroxide plasma.
  - Hydrogen peroxide vapor.

Dynamic Air Removal Steam Sterilizer (PreVac)

- Most common steam sterilizer.
- Has a variety of settings to accommodate different instrument requirements.
- Fast and efficient.
- Evacuates all of the air prior to introduction of steam.

Dynamic Air Removal Steam Sterilizer (PreVac) (cont.)

- Injected steam instantaneously and uniformly contacts load surfaces.
- Sterilization is rapid by comparison to gravity sterilizers.
- Multiple prevacuum/steam pulses provide for efficient heating and removal of air from the load prior to exposure.
- Following the preconditioning phase, the load is then heated to the desired temperature and pressure for the pre-selected exposure time.
- Requires Bowie Dick (Class II) monitor to validate air evacuation.

Gravity Displacement Steam Sterilizer

- Older technology.
- Longer cycle times; fewer settings.

Table Top Sterilizers

- Usually found in facilities where there is a limited number of medical devices to be sterilized such as ambulatory surgery, physician offices, dental offices, clinics and laboratories.
- It is important to follow the sterilizer manufacturer's instructions for installation, load configurations and biological testing.
- Usually have pre-set cycles which cannot be adjusted (e.g. wrapped, unwrapped, liquids). Make sure these cycles are compatible with the items to be sterilized.

Table Top Sterilizers (cont.)

- Generates its own steam when distilled or deionized water is added by the operator.
- Follow the sterilizer manufacturer's instructions for water quality (usually distilled water) and care, maintenance and cleaning of the water reservoir.
- Drying usually takes place with the door open, follow instructions to prevent contamination of packs during the drying phase.

Loading the Sterilizer

- Sterilant best penetrates packs when the sterilizer is loosely loaded. Do not overload the sterilizer.
- Position wrapped instruments to allow for adequate circulation, penetration of steam, air removal and condensate drainage.

Loading the Sterilizer (cont.)

- Arrange pouches in the vertical position, all facing in the same direction.
- Place basins upright on edge so that water runs out and does not accumulate.

Minimum Cycle Times for Dynamic-air-removal steam sterilization cycles

ITEM	EXPOSURE TIME AT 132°C (270°F)	EXPOSURE TIME AT 135°C (275°F)	DRYING TIMES
Wrapped Instruments	4 Minutes		20 to 30 Minutes
		3 Minutes	16 Minutes
Textile Packs	4 Minutes		5 TO 20 Minutes
		3 Minutes	3 Minutes
Wrapped Utensils	4 Minutes		20 Minutes
		3 Minutes	16 Minutes
Unwrapped Non-Porous Items (e.g Instruments)	3 Minutes	3 Minutes	NA
Unwrapped Non-Porous and Porous Items in Mixed Load	4 Minutes	3 Minutes	NA

NOTE-- This table represents the variation in sterilizer manufacturers' recommendations for exposure at different temperatures. For a specific sterilizer, consult only that manufacturer's recommendations.

Minimum Cycle Times for Gravity-Displacement Steam Sterilization Cycles

ITEM	EXPOSURE TIME AT 121°C (250°F)	EXPOSURE TIME AT 132°C (270°F)	EXPOSURE TIME AT 135°C (275°F)	DRYING TIMES
Wrapped Instruments	30 Minutes	15 Minutes		15-30 Minutes
			10 Minutes	30 Minutes
Textile Packs	30 Minutes	25 Minutes		15 Minutes
			10 Minutes	30 Minutes
Wrapped Utensils	30 Minutes	15 Minutes		15-30 Minutes
			10 Minutes	30 Minutes
Unwrapped Non-Porous Items (e.g Instruments)		3 Minutes	3 Minutes	0-1 Minute
Unwrapped Non-Porous and Porous Items in Mixed Load		10 Minutes	10 Minutes	0-1 Minute

NOTE-- This table represents the variation in sterilizer manufacturers' recommendations for exposure at different temperatures. For a specific sterilizer, consult only that manufacturer's recommendations.

Following Sterilization

- Items will be hot and must be allowed to cool.
- Leave items on the autoclave cart until they are COOL and DRY (30 minutes to two hours).
- If autoclave cart must be emptied, place items on wire, not solid, shelving to cool.

Following Sterilization (cont.)

- Cool items in a low traffic area.
- Place cooling items away from air conditioning and cold-air vents to prevent condensation.

Immediate Use Steam Sterilization (IUSS)

- IUSS to be used ***ONLY IN URGENT SITUATIONS*** (e.g. required item contaminated during a procedure with no replacement available).
  - Should NOT be used in place of the preferred method in order to save time.
  - Is NOT designed for complete instruments sets.
  - Is not an acceptable alternative to lack of inventory.
- Previously called "Flash Sterilization".
- Careful monitoring and documentation required.

Immediate Use Steam Sterilization (IUSS) (cont.)

- Items placed unwrapped into sterilizer.
  - Trays are available that are designed specifically for this process.
- Challenges include:
  - Proper cleaning and drying of items prior to sterilization.
  - Delivery of sterile item to surgical field without contamination of item or personnel.

Immediate-use sterilization should NOT be used on the following devices:

- Implants, except in a documented emergency situation when no other option is available.
- Post-procedure decontamination of instruments used on patients who may have Creutzfeldt–Jakob disease (CJD) or similar disorders.
- Devices or loads that have not been validated with the specific cycle employed.
- Devices that are sold sterile and intended for single-use only.

- Low temperature sterilization for heat and moisture sensitive items
  - Lensed instruments, delicate fiber optics, and some endoscopes may not withstand heat and pressure

Low Temperature Sterilization (cont.)

- Hydrogen Peroxide Sterilization

  Advantages of Hydrogen Peroxide Sterilization
  - No toxic residue; no aeration required
  - Shorter cycles than ethylene oxide
  - Compatible with most metals and plastics
  - Simple to operate; cycle times preset
  - No plumbing or drains; unit connects to electric outlet; easy to relocate

Low Temperature Sterilization (cont.)

- Hydrogen Peroxide Sterilization

  Disadvantages of Hydrogen Peroxide Sterilization
  - Not compatible with powders, liquids, or cellulose-containing items (linen, gauze, paper)
  - Packaging materials limited to non-woven polypropylene wraps, tyvek and Mylar pouches, specific container systems
  - Some sterilizer models have lumen restrictions

Low Temperature Sterilization

- Ethylene Oxide (EtO or EO)

  Advantages of EtO sterilization:
  - EtO is effective against all types of microorganisms.
  - EtO does not require high heat.
  - EtO is noncorrosive.
  - EtO effectively penetrates large bundles and permeates all porous items.

Low Temperature Sterilization (cont.)

Disadvantages of EtO

- EtO sterilization is more expensive than steam sterilization.
- The sterilization cycle time is lengthy.
- Ethylene oxide is a toxic gas, and the sterilization process can be complex and potentially hazardous.
- EtO is highly flammable, and EtO cylinders and cartridges must be carefully handled and stored.
- A variety of materials absorb EtO during the sterilization process; residual EtO must be aerated from 8-24 hours before sterilized items can be used.

Low Temperature Sterilization (cont.)

Disadvantages of EtO (cont.)

- EtO is regarded as a human carcinogen by the Occupational Safety and Health Administration (OSHA).
- Personnel working with EtO must wear personal protective equipment (PPE).
- OSHA also requires posting of a sign that reads:
  "Danger: ethylene oxide, cancer hazard and reproductive hazard. Authorized personnel only. Respirators and protective clothing may be required to be worn in this area".
- Exposure to EtO can cause eye irritation, nausea, dizziness, vomiting, nasal and throat irritation, shortness of breath, tissue burns, and hemolysis. Insufficiently aerated items may cause patient or personnel injury.

Low Temperature Sterilization (cont.)

- "Just-in-time" Sterilization (e.g. peracetic acid; high level disinfectants)
  - Items are processed unwrapped and cannot be stored; they must be removed from the sterilant, rinsed thoroughly, and used immediately.
  - Some high level disinfectants (e.g. glutaraldehyde, ortho-phthaldehyde (OPA)) will kill bacterial spores if items are submerged for the number of hours required by the manufacturer.

Low Temperature Sterilization (cont.)

- "Just-in-time" Sterilization (cont.)
  - Can be used when sterilizing.
    - » Lensed and mirrored instruments.
    - » Instruments with bonded parts.
    - » Delicate fiber optics.
    - » Some endoscopes which cannot stand heat or are permeable.
  - Must be rinsed thoroughly.
  - Residual chemicals have been linked to TASS.
  - Use only if recommended by the instrument manufacturer.

- Packages containing sterile surgical instruments should be stored so that their integrity is maintained.
- Storage arrangements should prevent:
  - Exposure to water and moisture.
  - Exposure to dust and dirt.
  - Potential for punctures and tears.
  - Extremes of heat and humidity.

Storage

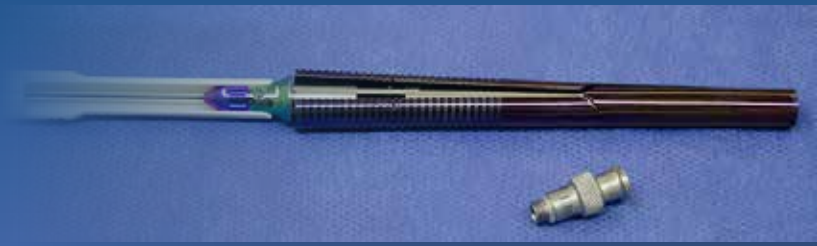
- Store sterile packages on wire racks
  - Solid shelving collects dust and promotes moisture retention
  - Shelving must be in good condition to prevent rips and punctures
  - Packages must be located at least
    - » 18 inches from the ceiling
    - » 8-10 inches above the floor
    - » 2 inches from outside walls

Special Handling

Throughout the process of managing surgical instruments, some instruments require special attention and handling to ensure they remain in adequate condition for surgical use.

Vitreoretinal Instruments

- Retinal instruments require special handling to ensure precise operation.
- The intraocular Instrument is designed for posterior segment ophthalmic surgery.

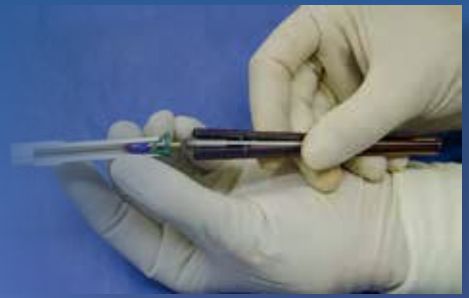


Vitreoretinal Instruments (cont.)

- The system consists of a handle, a selection of color coded tips, a plastic tip guard, and a cleaning adapter.
- The handle features a rotation knob which allows the tip to be conveniently adjusted into optimal alignment.
- The actuation mechanism locks the tip position as it actuates the tip.

Vitreoretinal Instruments (cont.)

- Preparation for Use:
  - With the plastic protective tip guard in place, hold the rotation knob firmly to stop rotation.
  - Attach the tip securely to the handle by threading the tip clockwise on to the handle.
  - Remove the plastic protective tip guard by grasping the guard at the tip end and pulling it downward from the tip toward the handle.



Vitreoretinal Instruments (cont.)

- Disassembly of Instrument:
  - Hold the rotation knob firmly to stop rotation of the handle, and unscrew the tip by turning counterclockwise being careful to protect the tip from damage.
  - Install tip guard to ensure tip is adequately protected.

Diamond Knives

- Diamond is a hard and brittle material.
- A diamond blade never loses its edge; however
  - The accumulation of biological material interferes with the sharp cutting edge.
  - They are easily chipped by contact with other objects (countertops, other instruments).

Diamond Knives (Cont.)

- Protect the blade by:
  - Keeping it clean.
  - Retracting the blade back into the handle prior to place the knife on the Mayo or into the instrument tray.

Demagnetizing Instruments

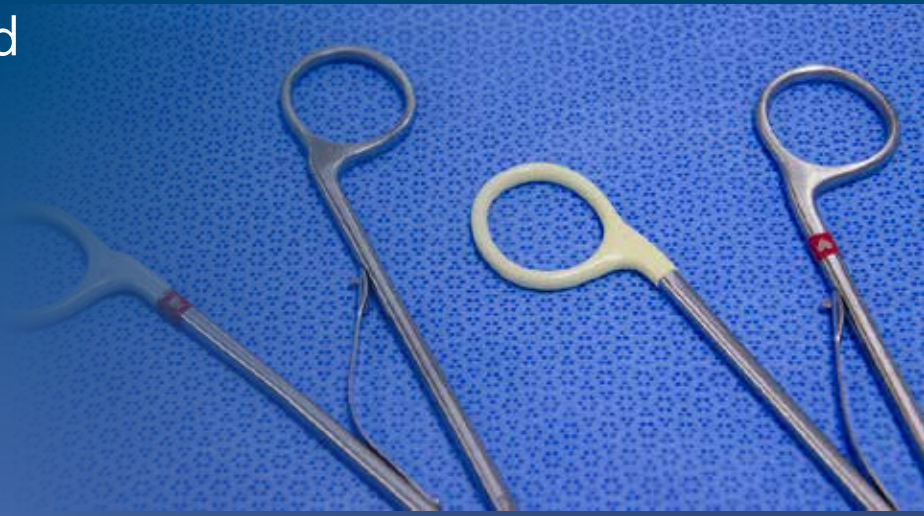
- Some delicate microsurgical and ophthalmic instruments become magnetized over a period of time.
- A magnetized instrument can interfere with effective use.
  - For example, a magnetized needle-holder can repel a surgical needle.

Demagnetizing Instruments (cont.)

- Magnetization can occur with consistent contact with instruments of dissimilar metals.
  - Segregate instruments of dissimilar metals.
  - Process and wrap instruments of dissimilar metals separately.
  - Use inserts to separate instruments of dissimilar metals in trays.
- Check with manufacturer about demagnetizing instruments.
  - Commercial demagnetizers are available.

Color Coding

- Used to differentiate instruments and sets by procedure, department, or surgeon.
- Preferred method: Color coating fused permanently onto instrument handles or rings.



Color Coding (cont.)

- Laser engraving is safe for both new and old instruments.
- Vibration or impact etching is not recommended as it can damage the instrument.
- Using colored marking tape requires careful monitoring.
  - Marking tape manufacturer must validate tape for sterilant penetration.
  - Cracked and peeling tape can harbor microorganisms that cause infection.
  - Tape can crack, peel, or flake off into wounds.
  - Tape must be inspected for defects and replaced regularly.

Wear / Breakage

- Worn, broken instruments can cause significant problems if not identified during inspection and testing.
  - Harm to patient: non-performance during surgery or tissue damage.
  - Damage to other instruments.
- Proper maintenance and appropriate use will prolong the life of an instrument, but all instruments wear out eventually.

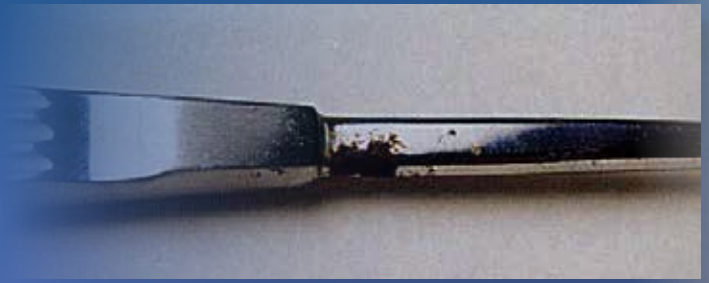
Wear / Breakage (cont.)

- Identify damaged instruments promptly.
  - In the operating room, identify damaged instruments for return to SPD.
  - In SPD, separate unacceptable instruments from other instruments and tag them for replacement or repair.
- Instrument repair, when possible, represents a significant cost savings over replacement.
  - Credible repair source is essential.
  - Instrument suppliers may offer special instrument maintenance programs.

Wear / Breakage (cont.)

- Problems with surgical instruments are generally the result of:
  - Improper handling or mis-use.
  - Inadequate cleaning during the surgical procedure and/or during the decontamination process.
  - Use of saline or tap water rather than demineralized distilled water.
  - Detergents with a pH that is too high or too low.
  - Poor lubrication.
  - Poor water quality.
  - Faulty autoclave, improperly maintained equipment, or mechanical changes in hospital piping or supply.
  - Highly acidic stain removers.

Pitting, Etching, Spotting & Rusting



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Post-Test

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