LEARNING OBJECTIVES
1. Review steps to pre-clean complex instrumentation
2. Discuss manual preparation and cleaning processes for complex instruments
3. Describe mechanical cleaning processes for complex instruments
4. Review basic cleaning procedures for flexible endoscopes
5. Explain the importance of a quality control process to monitor the effectiveness of cleaning complex instruments

M ANY OF TODAY’S SURGERIES USE MINIMALLY INVASIVE procedures. Instrumentation used for laparoscopic, robotic, spine and total joint, and many other surgeries is much more complex and difficult to clean than in the past. Examples of these instruments include power instrumentation and items with lumens, crevices and articulating arms. Many of these instruments have special handling requirements that make the Central Service (CS) technician’s job much more challenging.

The basic requirements for processing complex instruments are the same as for less complex items: thorough cleaning, meticulous inspection, use of correct packaging, and the appropriate disinfection or sterilization process. Complex instruments require multiple cleaning and decontaminating steps, and this lesson reviews these steps.

OBJECTIVE 1: REVIEW STEPS TO PRE-CLEAN COMPLEX INSTRUMENTATION
The primary goal of every CS department is to accurately clean and decontaminate instruments and other medical devices on a timely basis to help ensure patient safety and customer satisfaction. Surgical instrumentation that is not properly cleaned may create post-operative complications, infections for patients and instrument damage.

It is always important to follow the detailed handling and cleaning instructions provided in the manufacturer’s Instructions for Use (IFU) for each specific instrument; therefore, while the pre-cleaning process begins during the procedure when instruments should be kept free of gross soil, the pre-cleaning procedures may differ for each instrument.

Complex instruments should be disassembled immediately after the procedure to allow moisture to penetrate deep into them and to keep gross soil from drying on their inner parts. Failure to do so can cause damage and instrument failure, and make the cleaning process much more difficult.

Mail: For written grading of individual lessons, send the completed 20-question quiz and $15 to: PEC Business Office, Purdue University, Stewart Center Room 110, 128 Memorial Mall, West Lafayette, IN 47907-2034. Each 20 question quiz with a passing score of 70% or higher is worth two points (2 contact hours) toward your CRCST re-certification of 12 CE.

Subscription Series: From January 1 to June 30 each year, Purdue Extended Campus offers an annual mail-in or online self-study lesson subscription for $75 (six specific lessons worth 2 points each toward your CRCST re-certification of 12 CE). Call 800.830.0269 for details.
process in the decontamination area much more difficult.

Photos 1 and 2 show, respectively, a trocar and a drill guide that have been properly disassembled at the point of use. Lumens should be flushed, and immersible complex devices should be disassembled and wiped with sterile water.

Sterile water should be used to wipe blood from the outer surfaces of non-immersible items after they are disassembled. These instruments should never be soaked in a solution as fluid will cause major damage to their inner parts. Note: point-of-use instrument wiping does not replace any aspect of the cleaning process in the decontamination area. Each item must still be handled, inspected and properly cleaned in the CS department.

After gross soil is removed, the instruments should be carefully packaged for transport to the decontamination area. All instruments should be placed in the proper containment device and secured for transport. Care should be taken to protect lighter and more delicate instruments from damage to keep all instrument parts safe and secured, and to prevent loss of small parts. Note: even heavier instruments can become damaged if they are piled or dumped into the containment device.

Sharp items should be placed in a separate container for the safety of those who will handle the instruments when received in the decontamination area. Devices should not remain in solutions for transport unless required by the manufacturer. Instead, they should be kept moist during transport with a moist towel or a commercially-prepared product designed for this purpose.

OBJECTIVE 2: DISCUSS THE MANUAL PREPARATION AND CLEANING PROCESSES FOR COMPLEX INSTRUMENTS

Cleaning is the removal, usually with a detergent and water, of visible and non-visible soil from the surfaces, crevices, serrations, joints, and lumens of instruments, devices and equipment. It is the first and most important step in the sterilization process. One can clean without disinfecting or sterilizing, but one cannot disinfect or sterilize without thorough cleaning. The sterilization process cannot produce a sterile device if that device was not first properly cleaned.

Once received in the decontamination area, each complex instrument must be inspected for cracks, defects, missing or broken parts, chips, holes in air hoses, exposed wires, and leakage of bearing oils, among other concerns. Damaged instruments should be properly tagged, cleaned and removed from service until they are properly repaired.

Water hardness and temperature impact detergent effectiveness. Be sure to mix the chemicals as specified by the chemical manufacturer because improperly mixed solutions make them less effective.

The manufacturer’s IFU should be followed as immersible instruments are completely disassembled, if not done so at point-of-use. Then the instruments should be placed in the manufacturer’s recommended solution to soak for the specified time.

After the soil is loosened, each instrument should be carefully cleaned before mechanical cleaning. Use a soft, lint-free cloth to wipe all surfaces of the instrument. A soft-bristled brush can assist with cleaning box locks, serrations and other crevices. Lumens should be cleaned using a brush that fits the length of the lumen, and technicians should ensure the brush’s diameter is large enough to clean the lumen’s inner walls.

A water/air pistol may be used to flush lumens, but be sure the appropriate-sized pistol tip is used so water can reach the lumen’s inner walls. Water pistols are also effective in flushing small crevices and joint areas.

Keep instruments under the surface of the solution while cleaning to avoid creating aerosols. Care should be taken to ensure all surfaces of the instruments are clean and all parts of the instrument are accounted for.

Rinse each instrument as specified by the manufacturer, and ensure that all cleaning solution and debris are removed. Carefully inspect the instrument to ensure it is clean. Note: use of a magnifying device will help ensure all instrument areas are clean.

Clean all surfaces of instruments that cannot be immersed using the type of solution recommended by the instrument’s manufacturer. Do not immerse these instruments as water will enter the inner casing and damage them. Photo 3 (top of next page) shows the damage that can be caused when a non-immersible instrument is placed in a cleaning solution.
The use of the proper-sized brushes and water pistols (if allowed by the manufacturer) with the correct-sized tip will help clean hard-to-reach areas of non-immersible instruments. Completely rinse all cleaning solutions and debris following the manufacturer’s IFU. Carefully inspect the instrument for cleanliness, paying close attention to dark cords (where soil is difficult to see), all moving parts, and crevices. Note: IFU for some handwash items specify that they be disinfected before they are sent to the assembly area.

OBJECTIVE 3: DESCRIBE MECHANICAL CLEANING PROCESSES FOR COMPLEX INSTRUMENTS

Cleaning complex instruments is very time-consuming and requires meticulous attention to detail. The manufacturer’s IFU must be carefully read and followed. Many complex instruments have specific cleaning instructions requiring more steps and time than general instrumentation.

Many complex instruments should be processed in an ultrasonic cleaner, which uses the cavitation process to clean small hard-to-reach areas. Fill the ultrasonic cleaner with the recommended solution and degas (if required) before adding the instruments to be processed. All instruments should be disassembled and pre-cleaned before processing, hinged instruments should be opened, and all surfaces of each instrument should be exposed.

Irrigating ultrasonic cleaners are highly effective for cleaning lumened items, such as laparoscopic and robotic instruments. When connecting items to an irrigating ultrasonic instrument, be sure the proper connections are used, and that they are connected to the proper instrument port. Run the ultrasonic cycle per the instrument manufacturer’s IFU. Note: some instruments require an extended cleaning cycle. When the cleaning process is complete, ensure the instruments are completely rinsed so no chemical residues or debris remain on them. Carefully check instruments for cleanliness before further processing.

OBJECTIVE 4: REVIEW BASIC CLEANING PROCEDURES FOR FLEXIBLE ENDOSCOPIES

Flexible endoscopes are exceptionally difficult-to-clean devices that require meticulous attention to detail and careful handling. Each type of flexible scope usually has different cleaning requirements, and it is important to have the manufacturer’s IFU available in the decontamination area for each model of scope.

As with other instrumentation, the cleaning process for flexible scopes starts at the point of use. The outer shaft should be wiped to remove all gross soil. It is usually recommended that an enzymatic solution be drawn into the scope at the point of use to help facilitate cleaning.

Once received in the decontamination area, scopes should be checked for damage before processing. Damaged scopes may have special cleaning instructions.
from the manufacturer to avoid causing more damage to the scope before its repair.

Flexible scopes should be leak-tested using the appropriate tester and following the manufacturer’s IFU for wet or dry testing. The most common areas for leaks are in the bending rubber at the distal tip of the insertion tube or at the control knobs. Leak testing verifies that the scope’s inner channel(s) and seals are intact.

If the scope does not pass the leak test, the processing instructions for damaged scopes should be followed. Never process a damaged scope following routine cleaning instructions, as more damage can occur. Damaged scopes should be removed from service and sent for repair.

If the scope passes the leak test, remove all removable parts and immerse the scope and its parts in an approved solution. Note: if the scope has a water cap be sure it is in place before immersion. Inner channels of the scope should be cleaned by drawing an approved solution into the channel(s) with a syringe and the appropriate irrigation tubes. Use specially-designed brushes that fit the channel’s diameter and that extend through the entire scope and out its distal tip.

The scope’s external surfaces should be cleaned with the recommended solution and a soft lint-free cloth. Follow the IFU for the correct immersion time. When the scope is cleaned, rinse all channels and exterior surfaces with copious amounts of pure water.

Repeat the rinse process for a total of three complete rinses. If recommended by the manufacturer, flush the instrument channel with 70% alcohol. Dry the scope’s exterior with a soft, lint-free cloth. Flush the scope’s inner channels with compressed air (if approved by the manufacturer) to help facilitate the drying process.

If an automated endoscope reprocessing (AER) unit with a scope cleaning cycle is used, the scope should still be manually cleaned and completely rinsed before placing it in the AER.

**OBJECTIVE 5: DISCUSS THE IMPORTANCE OF A QUALITY CONTROL PROCESS TO MONITOR THE EFFECTIVENESS OF CLEANING COMPLEX INSTRUMENTATION**

Every facility should develop a quality control process to verify the effectiveness of the cleaning protocols used for complex instruments. While visual inspection is the most common way to verify cleanliness, it is not necessarily the most effective method.

Several different types of commercially-prepared systems are available to check cleaning effectiveness. The products used should be appropriate for the instrument being inspected. Failure to perform quality checks or to monitor the cleaning process may lead to disinfection and sterilization failures.

**IN CONCLUSION**

Cleaning complex instrumentation is a time-consuming and meticulous process in which careful attention to details is required. CS technicians should never attempt to clean instruments unless they have been properly trained. They must also carefully follow the instrument manufacturer’s IFU to consistently provide clean and undamaged instruments for patient use.

**REFERENCES**


IAHCSMM acknowledges the assistance of the following two CS professionals who reviewed this quiz:

LISA HUBER, BA, CRCST, ACE, FCS; Sterile Processing Manager, Anderson Hospital, Maryville, IL

PAULA VANDIVER, CRCST, CIS; Orthopedic Specialist, Anderson Hospital, Maryville, IL

SCOTT DAVIS, CMRP, CRCST, CHMMC
Materials Manager, Surgical Services
Las Vegas, NV

SUSAN KLACIK, ACE, CHL, CRCST, FCS
CSS Manager, St. Elizabeth Health Center, Youngstown, OH

PATTI KONCUR, CRCST, CHMMC, ACE
Educational Specialist, IAHCSMM

NATALIE LIND, FCS, CRCST, CHL
Educational Director, IAHCSMM

CAROL PETRO, RN, BSN, CNOR, CRCST, CIS
OR Educator and Sterile Processing Educator, Indiana University Health North Hospital, Carmel, IN

TECHNICAL EDITOR
CARLA MCDERMOTT, RN, CRCST, CHL
Clinical Nurse III, South Florida Baptist Hospital, Plant City, FL

SERIES WRITER EDITOR
JACK D. NINEMEIER, PH.D.
Michigan State University
East Lansing, MI

**ADVISORY COMMITTEE FOR SELF-STUDY LESSONS**
OBJECTIVE 1
1. The goal of CS is to clean and decontaminate instruments and other medical devices.
   a. On a timely basis
   b. Accurately
   c. In accordance with APIC standards
   d. A and B above
   e. All the above

2. The instrument cleaning process starts
   a. In the CS decontamination area
   b. At the point of use
   c. When sterile packaging is opened
   d. When instruments are inspected

3. Which is true about the disassembly and removal of gross soil on complex instruments?
   a. They should be disassembled and gross soil should be wiped off as soon as they arrive in the decontamination area
   b. They should be disassembled during the procedure and gross soil should be wiped off after the procedure
   c. They should be disassembled in the CS area and gross soil should be wiped off in the decontamination area
   d. They should be disassembled and gross soil should be wiped off at the end of the procedure at the point of use

4. The process to pre-clean instruments at the point of use is the same for all instruments.
   a. True
   b. False

5. Complex instruments should be transported from the point of use to the decontamination area in a containment system that allows the instruments to remain in sterile water.
   a. True
   b. False

6. When done properly, point of use pre-cleaning replaces the need for manual cleaning in the decontamination area.
   a. True
   b. False

OBJECTIVE 2
7. When should complex instruments be checked for damage?
   a. As soon as they are received in the decontamination area
   b. After the instruments are properly cleaned
   c. If they are being packaged for transport to the decontamination area
   d. Immediately after the procedure at the point of use

8. How should complex instruments be soaked before cleaning?
   a. In a neutral pH detergent
   b. In a highly acidic solution, according to the manufacturer’s IFU
   c. According to the manufacturer’s IFU
   d. All the above

9. Water/air pistols must always be used to clean all lumened instruments.
   a. True
   b. False

10. Which is true about rinsing complex instruments?
    a. Immiscibles should be rinsed three separate times
    b. Non-immiscible instruments should be quickly rinsed under running water
    c. A and B are true
    d. None of the above are true

OBJECTIVE 3
11. Which is true about the use of ultrasonic cleaners for complex instruments?
    a. They use the process of impingement to clean instruments
    b. They should not be used to clean complex instruments
    c. They use the process of cavitation to clean instruments
    d. They are used before manual cleaning

12. When using a washer-decontaminator to clean complex instruments
    a. Instruments can be assembled after manual cleaning, before placing them in the washer-decontaminator
    b. Instruments should be disassembled and disinfected before using the washer-decontaminator
    c. Instruments should be disassembled and pre-cleaned before using a washer-decontaminator
    d. Instruments do not need to be manually cleaned when using a washer-decontaminator

13. Which is true when cleaning multiple-layered instrument sets in a washer-decontaminator?
    a. Remove each tray from the case and place each tray in the machine, separate from the other trays
    b. They can effectively be cleaned in a washer as long as the lid is removed
    c. They should not be processed in a washer
    d. They should be processed in an ultrasonic cleaner before using the washer

14. Which is true when cleaning complex instruments?
    a. The process is time-consuming
    b. Meticulous attention to detail is required
    c. Technicians must carefully follow the manufacturer’s IFU
    d. All the above are true

OBJECTIVE 4
15. All flexible endoscopes have the same basic cleaning requirements.
    a. True
    b. False

16. What should occur if a damaged flexible endoscope is received in the decontamination area?
    a. It should be cleaned following the damaged scope cleaning process
    b. Damaged instruments should be cleaned the same way as undamaged instruments are cleaned
    c. The using department should be held responsible for the damage
    d. It should be cleaned with the leak tester attached

17. Flexible endoscopes only need leak testing when the scope appears damaged.
    a. True
    b. False

18. Flexible endoscopes should
    a. Be leak tested three times during the cleaning process
    b. Be rinsed three times after cleaning
    c. Be leak tested using both wet and dry leak test protocols before use
    d. All the above are true

19. When using an AER with a cleaning cycle
    a. Scopes must still be cleaned before using the AER
    b. Scopes do not need to be cleaned before using the AER
    c. The solution in the AER should be changed after each use
    d. The scopes must be cleaned, but not rinsed before placing them in an AER

OBJECTIVE 5
20. Monitoring the cleaning process for complex instruments
    a. Should be undertaken daily
    b. May be performed using only a magnification device
    c. Should be performed with products appropriate for the instruments being monitored
    d. All the above

REQUEST FOR ONLINE SCORING (payment and scoring made directly online at www.iahcsmm.org)
REQUEST FOR PAPER/PENCIL SCORING (please print or type information below)
☑ I have enclosed the scoring fee of $15. (Please make checks payable to Purdue University. We regret that no refunds can be given)
☑ Check here if you have a change of address
☑ Check here if you wish to have your results emailed to you

DETACH QUIZ, FOLD, AND RETURN TO:
Purdue University
PEC Business Office
Stewart Center, Room 110
128 Memorial Mall
West Lafayette, IN 47907-2034
800.830.0269

I have enclosed the scoring fee of $15. (Please make checks payable to Purdue University. We regret that no refunds can be given)

Name
Mailing Address (be sure to include apartment numbers or post office boxes)
City State Zip Code
Daytime telephone IAHCMM Membership Number
Email Address

If your name has changed in the last 12 months, please provide your former name

Purdue University is an equal access/equal opportunity institution

Sponsored by:
3M Health Care