The importance of cleaning in earnest

A regular column on sterilization and infection control issues.

When you sterilize an instrument set, you know what the standards are. Sterilizers must provide a sterility assurance level (SAL) of 10 to the minus 6 ($10^{-6}$). Biological indicators are used to test the efficacy of the sterilizer. Chemical indicators or chemical integrators are placed in instrument sets to allow an OR nurse to determine whether an instrument set has been exposed to the sterilization process.

But there is no standard for measuring cleanliness. There is no cleaning monitor you can place in an instrument set. You can only determine whether something is cleaned by visual inspection, which may vary depending on your eyesight, available light, and whether a lighted magnifying glass was used. Products are available to test the efficacy of automated washing systems. But many instruments cannot be cleaned in automated systems, and some facilities, particularly small ambulatory surgery centers, do not have automated washing systems.

Yet effective cleaning is a prerequisite to effective sterilization or disinfection. Ineffective cleaning can compromise sterilization or disinfection and has been associated with adverse patient outcomes. Because there is no objective measurement to define when a device is clean, the best guarantee is consistent and strict adherence to:

- the manufacturer’s instructions for cleaning
- the AORN Recommended Practices for Cleaning and Caring for Surgical Instruments and Powered Equipment
- the cleaning guidelines in AAMI ST79: Comprehensive Guide to Steam Sterilization and Sterility Assurance in Health Care Facilities from the Association for the Advancement of Medical Instrumentation.

Cleaning is defined by AAMI as the removal of contamination from an item to the extent necessary for further processing or for the intended use. AAMI notes that:

“...cleaning consists of the removal, usually with detergent and water, of adherent soil (e.g., blood, protein, and other debris) from the surfaces, crevices, serrations, joints and lumens of instruments, devices and equipment by a manual or mechanical process that prepares the items for safe handling and or further decontamination.”

Cleaning removes microbial contamination and organic and inorganic material, which if not removed, can interfere with sterilization or disinfection.

Here is advice to help ensure your organization is taking the steps needed for effective cleaning.

**In the operating room**

Cleaning should begin as soon as possible after a device is contaminated. Cleaning begins in the operating room, and steps to promote removal of contamination may begin during a procedure.

Some key points:

- Instruments that have been used should be kept moist to prevent adherence of debris. Blood, tissue, or mucus that is allowed to dry on surgical instruments is difficult to remove and will lengthen the time necessary to clean the instrument effectively. Cool water easily removes most blood. If blood dries and is not com-
pletely removed during the washing process, it can be baked onto a device when exposed to the high heat of sterilization, in a process called denaturing.

- Cleaning in the operating room starts by placing contaminated instruments in a basin of cool water or wiping them with a moist sponge during surgery. Unfortunately, many instruments, particularly those with long lumens used in endoscopic surgery, do not fit horizontally in a standard basin. While the handle may be fully immersed, the inside of the lumen may not make contact with water.

- Instruments should be kept free of gross soil. A moistened lap pad may be used for this purpose. Saline should not be used for removing debris because it can cause deterioration of instrument surfaces.

- Lumens should be irrigated with water using an appropriate-sized syringe. The intent is only to prevent adherence of debris, not to complete the cleaning process. Care must be taken not to create aerosols during this process. Irrigation should be gentle and the distal end of the lumen positioned below the surface of the water.

- Before transport to a decontamination area, arrange instruments with heavy instruments on the bottom of the tray and lighter or more delicate instruments placed on top or in a separate container. Open box locks and instrument jaws.

- Transport instruments immediately in a containment device labeled with a biohazard label to a designated decontamination area.

In the decontamination area

Instruments should be cleaned according to an established protocol by personnel who have demonstrated competency in instrument cleaning.

In an ideal world, soiled instruments would be immediately transported to the decontamination area, where they would be received by a certified instrument processing technician wearing personal protective equipment (PPE), who would immediately begin the decontamination process. The technician would determine which instruments must be manually cleaned and appropriately prepare and place all others in an automated system.

In reality, instruments may sit for a long time before they can be cleaned because of work loads, instrument turn-around priorities, and possible unavailability of automated washing systems. For this reason, instruments should be kept moist, either by adding a moistened towel to the transport container or applying a foam, spray, or gel intended for this purpose.

If the delay is prolonged, such as over a weekend, use a precleaning disinfectant to prevent biofilm formation. A biofilm is a mass of bacteria tightly adhered to a surface and not easily removed. Although biofilms may form on many surfaces, they are more common in lumened devices. If a biofilm breaks loose within a patient, the infection consequences can be severe and can lead to death.

Automated cleaning systems

Automated cleaning is preferable to manual cleaning. Automated cleaning systems are consistently effective and reduce the risk of exposing personnel to microbial contamination. Automated systems include washer-disinfectors, washer-decontaminators, washer-sterilizers, sonic irrigators for lumened devices, and ultrasonic cleaners. Phases in automated systems may include rinsing, enzymatic soak, detergent wash, ultrasonic cleaning, chemical germicide rinse, lubrication, and drying.

When automated systems are used, the manufacturer’s instructions are paramount. The instructions help in determining the device’s compatibility with the intended cleaning process, the correct type and concentration of detergent, necessary water quality, temperature, time, and care and maintenance of the equipment.

Whenever possible, monitor the process with products designed for automated processes. There are products for monitoring the cleaning efficiency of washer-disinfectors and ultrasonic cleaners and for monitoring cleaning efficacy within lumens.

Manual cleaning

Though automated cleaning is preferred, manual cleaning is needed in some sit-
uations, such as when the instrument inventory is inadequate, and there is need for quick turnaround. Although manual cleaning poses the greatest risk for inadequate cleaning, if performed correctly, it can be as effective as automated cleaning. The keys are:

- knowing the requirements of the process
- demonstrated competence
- consistency in practice.

Here are some reminders on effective manual cleaning:

- Instruments should be cleaned in a dedicated area away from patient care.
- Instruments should never be cleaned in the scrub sink or with scrub brushes intended for surgical hand antisepsis.
- Personnel performing cleaning should wear PPE, including general-purpose utility gloves (not examination gloves); a liquid-resistant covering with sleeves; and when there is risk of splash or aerosols, eye protection, such as goggles or a full face shield. PPE should be worn regardless of the number of instruments that will be cleaned. Having PPE available at the point of use encourages compliance.
- Instruments should be disassembled and in the open position prior to cleaning.

**Follow instructions precisely**

Cleaning instruments with detergent is not like washing dishes at home. The instructions for use and concentration must be followed precisely. Detergent that is too concentrated or diluted can compromise the sterilization or disinfection process. Here are a few tips:

- To encourage compliance with dilution instructions, mark the sink with a piece of tape or similar material to indicate the correct water level. Make sure to have available a measuring device or cup equivalent to the amount of detergent specified in the instructions. You may want to consult with the engineering department about tethering the measuring device to the sink so it will always be available.
- The sink should be deep enough to allow complete immersion of the devices, and cleaning should be done below the surface of the water.
- Water temperature should not exceed 140°F and should be within the range indicated on the instructions for use. A thermometer to test the temperature should be readily available.
- Devices should be cleaned below the surface of the water.
- Items that cannot tolerate immersion should be cleaned in a manner that prevents aerosolization. A lint-free soft cloth moistened with detergent solution should be used to wipe these instruments.
- Soak lumened devices vertically to prevent formation of air bubbles that can occur when these are placed horizontally. Lumens should be brushed with an appropriate-sized brush. Brush diameter should be large enough for the bristles to make contact with the wall of the lumen but not so large as to cause the bristles to collapse. A variety of different-sized brushes should be available and in good condition. Brushes that show signs of wear should be discarded. At a minimum, brushes should be decontaminated at least daily.
- Pay particular attention to difficult-to-clean areas and devices. These include box locks, serrations, hinges, crevices, lumens, and devices such as flexible reamers and biopsy forceps where debris can easily be trapped and go unnoticed.
- Change cleaning solutions frequently to maintain properties of the agent and to prevent the buildup of bioburden.
- Following cleaning, rinse instruments thoroughly. Tap water is acceptable for all but the final rinse. Treated water is recommended for the final rinse. Sterile water or water filtered through a 0.2 micron filter is preferred but may be prohibitively expensive.
- After cleaning, inspect instruments for cleanliness visually, preferably using a lighted magnifying glass. One method for verifying the cleaning process is to...
expose the device to a 2% hydrogen peroxide solution. If bubbles appear, it is an indication that cleaning was ineffective. This process should be done periodically as part of a continuous quality improvement process.

**Special cleaning challenges**

Contaminated gastrointestinal flexible endoscopes have been linked to infections. These devices should be cleaned according to the guidelines of the Society of Gastroenterology Nurses and Associates (www.sgna.org).

Instruments that have been in contact with prions should be cleaned according to a specific prion deactivation protocol, as recommended by AORN. In developing a protocol, consult recommendations of the World Health Organization and the Centers for Disease Control and Prevention.

**Conclusion**

Fortunately, the days are long gone when it was thought that anyone who knew how to wash dishes was competent to wash surgical instruments. All staff responsible for instrument cleaning should have demonstrated competence. One method for developing competencies is to group instruments into processing needs, such as lumened devices, devices with difficult-to-clean areas, lensed instruments, and powered instruments, and determine the necessary competencies for each.

Cleaning is an essential step in instrument reprocessing and must be done in accordance with accepted protocols. It is no longer acceptable to discover “sterile dirt” after an instrument set is opened.

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**Selecting a detergent**

Selecting a detergent is not a simple task and should always be done in conjunction with the detergent manufacturer, considering:

- the device materials
- anticipated bioburden
- water quality
- whether a manual or automated process will be used.

Because hard water may cause staining of instruments, a water-softening system may be necessary. The mineral content of the water must also be factored in.

**Automated washers**

For automated washers, detergents with a high pH are most effective. They can, however, be harsh on devices made from materials other than stainless steel. A milder detergent may be used on softer metals such as aluminum and on glass.

**Manual cleaning**

Manual cleaning formulations generally have a neutral pH of between 7 and 9. A detergent with a neutral pH will minimize damage to soft metals but will not dissolve water-insoluble proteins, making brushing and mechanical friction especially important.

**Enzymatic detergents**

Nonenzymatic detergents take longer to dissolve proteins. Because enzymes are effective for breaking down organic substances, most facilities use a detergent containing one or more enzymes. For facilities that specialize in orthopedics, a detergent with a lipase enzyme, which is effective on fats and organic materials, may be most appropriate. For facilities that specialize in vascular procedures, a detergent with a protease enzyme may be most appropriate. Protease enzymes are effective on blood, mucus, and proteins.
References

