Manual Cleaning

LEARNING OBJECTIVES
1. Discuss the need and importance of manual cleaning
2. Describe the appropriate cleaning solution and cleaning implements for the manual cleaning process
3. Describe manual cleaning techniques

MANUAL CLEANING IS A VERY IMPORTANT PART OF THE decontamination process, and it is often performed incorrectly. Device labeling specifies cleaning methods, which have been validated by the manufacturer and are regulated by the US Food and Drug Administration (FDA). The medical device manufacturer’s instructions for use (IFU) must be followed. All medical devices entering the healthcare facility must be cleaned before use, disinfection or sterilization. New and repaired devices may have manufacturing soils on them, and must be decontaminated upon receipt. Also, loaned instrumentation must be decontaminated and sterilized because it is not known how the instrumentation was processed at another facility, and also because the devices were transported in an uncontrolled environment. This lesson addresses these and other factors, as well as the steps that lead to successful manual cleaning.

OBJECTIVE 1: DISCUSS THE NEED AND IMPORTANCE OF MANUAL CLEANING
Because medical procedures require a wide range of reusable devices and instrumentation, each item presents unique challenges that must be considered before reprocessing can take place. Central Service (CS) technicians should possess technical and critical thinking skills and a comprehensive understanding of potential challenges; this includes being aware of proper cleaning procedures and the delicacy and complexity of medical devices and instruments. The IFU will provide pertinent information regarding instrument/equipment disassembly, precautions, inspection points, types of detergents to use if an item can be submerged, and more. For example, most power equipment cannot be submerged because it would result in equipment malfunction. It is the responsibility of each technician to protect the patient and community by consistently delivering safe medical devices. Instruments should be manually cleaned, per the IFU, prior to mechanical cleaning and whenever the manufacturer states that manual cleaning is the cleaning process of choice.

Even instrumentation perceived as clean may harbor gross soil and pathogens that could infect the technician...
or patient; therefore, it is only appropriate that each soiled instrument be targeted with proper cleaning methods and handled with the utmost care before further processing. The efficacy of the cleaning process is heavily reliant upon vigilant manual cleaning and inspection because a medical instrument cannot be successfully disinfected or sterilized without the removal of bioburden. The goal of manual cleaning is to remove residual soil after the pre-cleaning process by applying friction with the appropriate cleaning tools and solutions.

**OBJECTIVE 2: DESCRIBE THE APPROPRIATE CLEANING SOLUTION AND CLEANING IMPLEMENTS**

Manual cleaning is performed in the decontamination area and should be done as soon as possible to prevent debris from drying on the instrument and also to prevent the development of biofilm. Biofilm is an extracellular, slimy film produced by bacteria that adheres to instrument surfaces and can begin forming within minutes. If instruments were not pre-cleaned/soaked at the point of use, they may contain dried gross soil and biofilm, which will make the cleaning process more difficult.

Once instruments are received in the decontamination area, they should be sorted and the manual cleaning process should begin. A three-sink arrangement is needed; the first is a wash sink with water and detergent or enzymatic cleaner. The cleaning solution should be clean and changed when it appears soiled, which may be after one use. The middle sink is used to rinse the items. After an item is cleaned, it must be thoroughly rinsed to remove debris and detergent residue. Rinse water should be changed frequently to prevent the buildup of cleaning chemicals and debris that may reattach to the item being rinsed. The final sink is used for a treated (critical) rinse water to prevent instrument spotting and remove minerals, dissolved solids and some microorganisms that are present in untreated water.

Instruments should be rinsed with cold water to remove pre-soak chemicals (if used), prevent coagulation of blood and help remove gross debris. Instruments that can be submerged should be soaked in the appropriate cleaning solution. There are two basic types of cleaning chemicals: enzymatic products and detergents.

- **Enzymatic detergents** are commonly used since they are low-foaming and formulated to facilitate the breakdown of biomolecules (any molecule present in living organisms, including large macromolecules). Essentially, enzymes are proteins that act as catalysts to speed up chemical reactions. Protease is an enzyme responsible for the breakdown of blood, feces, mucous and albumin. Lipase breaks down fatty deposits such as bone marrow and adipose tissue. Amylase breaks down starch and lipase-dissolved fats. Multi-enzymatic cleaners contain several or all of these enzymes. These enzymes require the correct temperature and dilution to work optimally. Water temperature is usually between 90° and 140°F; it is important to follow the enzymatic cleaner’s IFU for its specific temperature range. If the water temperature is too cold, it will inactivate the enzyme. Too hot temperatures will cause the enzymes to break down.

- **Detergents** contain emulsifiers, surfactants and chelating agents. When used properly, they penetrate and remove soil from instruments and keep soil in suspension. Detergents are designed for specific tasks and should be selected based upon the specific cleaning need.

While using the correct enzyme or detergent is important, the correct detergent or enzyme dilution is also important. If too much is used, it can be difficult to rinse off and may leave a residue. If too little is used, the cleaning solution may not be effective. Again, prolonged cleaning delays should be avoided to prevent debris from drying and biofilm from forming. Cleaning solutions work best when gross soil has not dried. Pre-soak dampening agents are available and, when used, allow for much more efficient cleaning. Neutral-pH cleaning agents are the most suitable for cleaning instruments; however, it is important to check the chemical’s IFU to ensure the correct pH for the detergents is being used. If uncertainty arises regarding proper cleaning practices for a medical instrument or device, the manufacturer can provide additional detailed information to assist with cleaning. Technicians should always follow the manufacturer’s IFU.

Water quality is a very important part of the cleaning solution as it can impact the effectiveness of the detergent or enzymatic cleaner, or leave residue on the instrumentation. Using certain methods to treat water to clean instruments can help ensure that water impurities, mineral deposits, dissolved gases, particles and organic and non-organic chemicals are not present and do not compromise the cleaning process. If treated (critical) water is not used, the contaminants will affect the acidity/alkalinity and conductivity, create an imbalance of halogens and dissolved gases, and perhaps even contain algae, bacteria or parasites. Treated water can be derived from several processes: granular activated charcoal, filters, distillation, deionization and reverse osmosis.

- **Granular activated charcoal** is a form of carbon that is processed to have small, low-volume pores that increase the surface area; this allows purification via adsorption or chemical reactions.

- **Filters** are produced by manufacturers to reduce the presence of sediments, odor and contaminants.

- **Distillation** removes gases, distilled solids and organic materials. Organic materials consist of pyrogens (substance...
that produces a fever), bacteria and endotoxins (toxins in bacteria that are released when the cell disintegrates).

- Deionization removes total dissolved solids using ion exchange resins that control the electrical charge of ions in the water. It is important to note that this method of water purification does not remove organic particles.
- Reverse osmosis removes minerals and a large percentage of dissolved solids and organics, including salt, bacteria, pyrogens, endotoxins, halogens, and transitional and earth metals. Note: Dissolved gases will still be present.

Cleaning Tools

Industry guidelines stress the importance of choosing the correct size and type of cleaning tools for cleaning a medical device or instrument. The most common cleaning tools found in the decontamination area are brushes, cleaning cloths and sponges.

- Brushes are either disposable or reusable. Disposable brushes are discarded after one-time use. Reusable brushes are cleaned after each use and disinfected or sterilized at least once a day. When inspecting a brush, technicians should be critical of worn, frayed bristles, kinks and overall cleanliness. Kinks inhibit the cleaning process by preventing the brush bristles from making proper contact with the instrument's interior walls. Twisted stainless steel-style brushes are used to clean lumens. The twisted stainless steel-style handles come either looped or non-looped. A looped-end handle permits hanging and allows for faster drying. A non-looped end brush allows the technician to pull the entire brush through the lumen. Antibacterial bristles are available and are resistant to the growth of bacteria, yeasts and molds; however, they do not fully prevent them from forming.
- Cleaning cloths must be clean and low-linting or lint-free to prevent cross contamination and reduce the risk of fibers being left on instruments. These should be changed regularly or whenever they become visibly soiled or stained.
- Sponges can also be used, but because they are impossible to clean and sterilize, only single-use sponges should be used. Sponges should also be replaced at least daily or if visibly soiled. Some sponges are impregnated with detergents and must be used according to their manufacturer's IFU.

OBJECTIVES 3: DESCRIBE MANUAL CLEANING TECHNIQUES

Wearing the correct personal protective equipment (PPE) while working in the decontamination area is a basic requirement for any type of cleaning process. Properly-used PPE protects the technician from splashes and aerosols during the manual cleaning process.

Cannulated instruments (suctions, sleeves, sheaths, etc.) can appear to have a “clean” exterior, but may harbor residual gross soil from surgical procedures inside the lumened area. It is suggested for all cannulas to be soaked vertically to ensure that lumens have complete contact with the cleaning solution; however, if horizontal soaking is the only option, lumens should be submerged and the lumen should be filled with the soaking solution. To internally clean a cannula, the correct brush must be chosen to remove all gross soil. Brushes are provided in different configurations, materials, lengths and diameters to accommodate instrumentation, and choosing the proper brush depends upon the type of instrument being cleaned, the type of gross soil present and, above all, the manufacturer’s recommendations.

To properly remove gross soil, the brush must have the proper diameter to contact and exert friction within the internal walls. A brush that is too small will not contact all internal surfaces, rendering the instrument soiled. If a brush that is too large is used, it will either not fit into the lumen or will cause damage to the device or bristle breakage.

Twisted metal-tip brushes are the preferred choice for cleaning flat surfaces and instrument exteriors. Brushes with a protective cover on the tip are the appropriate choice for cleaning lumens so they do not scratch the interior of the lumen. Fan-tipped brushes contact surfaces of the very end of the lumen, which makes them effective for cleaning a closed-ended lumen. Brush length should be long enough to extend though the instrument, but short enough to maintain user control. To brush the internal cannula, the brush should extend through the cannula until it exits the other end (pushing through the lumen in a twisting motion multiple times to help reach all surfaces within the lumen walls and ensure the exit of gross soil).

Brush bristles should be inspected for cleanliness and any debris should be removed so it is not reintroduced into the instrument before being pulled back through the lumen. This process should be repeated until the bristles come out clean. If gross soil is present on the brush, it should be removed before pulling the brush back through the lumen. Broken bristles are an extremely hazardous fomite. If they go unnoticed during assembly, they may end up inside the patient during surgery. After the cannula is brushed, it should be flushed with the cleaning solution and followed by rinse water flushes.

The toothbrush-style brush is intended for more rigorous cleaning, such as for external surfaces and hinged instruments; a brush with nylon toothbrush bristles is softer and more flexible, and is the preferred choice for cleaning soft metal instruments. Hinged instruments have box locks, serrations, jaws and ratchets that must be thoroughly cleaned. Hinged instruments should always be placed in the sink in the fully opened position. This allows for more efficient cleaning, even in difficult-to-clean areas such as box locks and serrations.
Multi-part instrumentation must be disassembled. Brushing should be done in a to-and-fro motion underwater to prevent the occurrence of aerosols. Some instrumentation has movable parts that should be articulated or moved during the cleaning process to ensure all surfaces are thoroughly cleaned. The surface should be continually inspected to ensure all debris is removed.

Some instrumentation, such as a lens or plastic-coated device, has fragile surfaces that cannot withstand the rigors of a brush. Clean, low-linting cloths or single-use sponges should be used to clean these surfaces.

Once the instruments have been cleaned, they must be rinsed in accordance with the IFU. Typically, they are first rinsed in tap water, followed by a rinse in treated (critical) water.

Drying is the next step for a completely manually-cleaned instrument. Clean, lint-free or low-linting cloths should be used to completely dry the item. For lumened items or complex instruments that are difficult to dry with a cloth, instrument air should be used. Some lumened devices are fragile, so it is important to review the IFU for forced air limit of pressure. It is important to note that some instruments, such as flexible endoscopes and robotic instruments, have an upper limit of pressure. After using the pressure nozzle, it should be wiped, disinfected and allowed to dry before the next use.

After manual cleaning, the instrumentation should be inspected to ensure the removal of debris and identify any damage (e.g., broken instrumentation, staining, loose screws). Lighted magnification should be used for visual inspection for fine, delicate and complex instrumentation. Damaged instruments should be tagged for repair or replacement. If one’s facility performs cleaning verification for manually-cleaned instruments, that process will be performed before the instruments are passed to the preparation and packaging area.

At times, instrumentation may become stained or rusty. These defects may be removed with a stain and rust remover, after the manual cleaning process. Using a stain and rust remover will restore the luster to the stainless-steel instrument. A soaking solution should be prepared according to the stain and rust remover’s IFU. Note: It is important to follow the dilution and soak time exactly to prevent damage to the instrument. This solution removes hard water deposits, rust scale, discoloration, mineral and detergent buildup. After soaking the instrument, it should be inspected to ensure the stain has been removed. If so, it should be re-cleaned and sent on to the preparation and packaging area. If the rust and stain cannot be removed, the problem should be brought to the attention of the supervisor who can help determine whether the instrument should be sent for repair or replaced.

Some IFU include a low-level disinfection process before certain instruments are passed onto the clean side.

CONCLUSION

Cleaning is an important part of the sterilization process. The medical device manufacturer’s IFU must be diligently followed to prevent damage to the device and ensure all surfaces are thoroughly cleaned. All components of the cleaning process are important, beginning with the cleaning solutions and cleaning implements to be used. CS technicians must have the skills and knowledge to perform cleaning functions that results in a clean medical device.

RESOURCES

Association for the Advancement of Medical Instrumentation. ANSI/AAMI ST79:2017, Comprehensive guide to steam sterilization and sterility assurance in health care facilities.