Storage and Transport of Flexible Endoscopes

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LEARNING OBJECTIVES

1. Understand the current standards and professional society recommendations for proper transport of contaminated flexible endoscopes and types of containment devices used in this step
2. Outline the current standards and recommendations for proper storage of reprocessed flexible endoscopes and types of cabinets used for storage
3. Review the current standards and guidelines for proper transport of reprocessed endoscopes back to reuse and review types of containment devices used for this process

In accordance with ANSI/AAMI ST90, Processing of health care products—Quality management systems for reprocessing in health care facilities, healthcare facilities should establish a comprehensive quality assurance (QA) and safety program to monitor all aspects of device processing, including for flexible endoscopes. This program should incorporate proper transport of contaminated devices, storage of reprocessed endoscopes and transport of those items back to reuse. The process of transporting a soiled endoscope from the procedure area to the reprocessing area, storing a reprocessed endoscope and then transporting the reprocessed endoscope back to reuse can be thought of as a continuous cycle as seen in Figure 1.

Contaminated endoscopes should be transported to the reprocessing area as soon as possible after the procedure and after pre-cleaning has been performed. Soiled endoscopes must be handled in a manner that minimizes the risk of cross-contamination of the environment.

This is accomplished by containing the endoscope in a solid transport container, which supports and protects the endoscope from being damaged and prevents contamination of the surrounding environment. Once an endoscope has been reprocessed through high-level disinfection (HLD), steps must be taken to keep the endoscope from becoming recontaminated by the environment; proper drying and storage are necessary to accomplish this. Finally,
endoscopes that have been reprocessed must be properly transported back to reuse by donning proper personal protective equipment (PPE) and placing the device into a clean, labeled container. This step of clean transport is important to prevent a patient-ready endoscope from being inadvertently recontaminated. By completing this cycle of proper endoscope storage and transport, the risk of unsafe endoscopes being delivered back to the procedure room for reuse is reduced.

Objective 1: Understand the current standards and professional society recommendations for proper transport of contaminated flexible endoscopes and types of containment devices used in this step

Containment of the soiled instrument must be performed correctly to prevent exposure of staff and other patients to that biohazardous device.\textsuperscript{2,3} According to ANSI/AAMI ST91, \textit{Flexible and semi-rigid endoscope processing in health care facilities}, each endoscope should be isolated and transported with its components in its own closed system to the next stage of processing, as it is considered contaminated. The system should be marked with a biohazard label and must meet Occupational Safety and Health Administration [OSHA (29 CFR 1910.10306)] requirements for transporting hazardous items. The system should be large enough to accommodate a single endoscope without the need to over-coil the insertion or light guide tubes.\textsuperscript{2} See Figure 2 for an example of an OSHA-compliant transport container that is puncture-resistant, leak-proof and labeled as biohazardous.

The Association of periOperative Registered Nurses (AORN) states that contaminated endoscopes and accessories must be transported to the decontamination area in a closed container or closed transport cart. The container or cart must be leak-proof on the sides and bottom, puncture-resistant and large enough to contain all contents; this is an OSHA regulatory requirement\textsuperscript{6} that prevents exposure of personnel to potentially infectious materials.\textsuperscript{4} Since endoscopes are sharp in the respect that they have metal prongs that stick out of the light guide connector, they should be treated as sharp metal devices.

The transport container must be labeled as biohazardous to alert staff to the infectious nature of the device inside\textsuperscript{4} (See Figure 3). Additionally, a trolley system or cart may be used for transport of endoscopes to and from the procedure room. These trolleys/carts should be designed to protect the endoscope from damage and prevent contamination of the environment or the endoscope inside.\textsuperscript{3} Containers within the trolley system must still be labeled accordingly. Figure 4 shows a typical trolley system used for endoscope transport.

After the procedure, room staff must pre-clean the endoscope. It is recommended that the time after pre-cleaning is performed be documented and conveyed to the processing staff who will be cleaning and disinfecting that endoscope.\textsuperscript{4} This step is important because some major endoscope manufacturers only allow for a one-hour time delay between pre-cleaning and manual cleaning. Once the time goes beyond one hour, then the delayed reprocessing procedure is performed, which requires an extended soak in detergent solution for up to several hours. Refer to the endoscope manufacturer’s instruction for use (IFU) for recommendations on the timeframe between pre-cleaning and manual cleaning and the process that is to be used for delayed reprocessed for each model of endoscope. This documentation step is often accomplished by affixing an indicator tag to the endoscope (see example in Figure 5); by noting the time of pre-cleaning on the label of the transport container; or through documentation in an electronic system. Documentation of the time
of pre-cleaning and conveying that information to reprocessing staff allows for an objective decision of whether that endoscope requires the extended steps of delayed reprocessing.

One additional consideration for the transport of endoscopes is the recommendation that the device be kept moist, but not submerged for transport. Keeping the endoscope and accessories moist helps dilute and soften organic soils and simplify soil removal.

Objective 2: Outline the current standards and professional society recommendations for proper storage of reprocessed flexible endoscopes and types of cabinets used for storage

Specific storage conditions are required for reprocessed endoscopes. According to current standards and professional society guidelines, endoscopes should be placed into a storage cabinet that prevents them from recontamination by the environment or facility staff. Storage cabinets should have the ability to circulate high-efficiency particulate air (HEPA) around the endoscopes stored inside. Additionally, AORN states that the use of active drying cabinets is preferred. Active drying cabinets supply HEPA-filtered or instrument-quality air directly to the channels through connections to the endoscope that serve to dry the internal channels.

It is important to note that endoscopes must be completely dry prior to being placed into the cabinet; this includes both an external drying step using a non-linting cloth and an internal drying process of flushing the channels with instrument-quality air prior to being placed into a storage cabinet. Current literature shows that 10 minutes of flushing with compressed air is required to dry the internal channels. Alternatively, the endoscope can be placed into an active drying cabinet, which accomplishes this drying step within the unit. Note: Please review the previous CER LESSON PLAN (#505 Drying of Flexible Endoscopes) for more detailed information on drying flexible endoscopes prior to storage.

For storage, endoscopes should
Figure 8: Example of Label Used to Indicate Storage Interval

Figure 9: Example of Seven-day Indicator Tag Used as a Visual Cue during Storage

Figure 10: Example of Clean Gloves Used to Handle Clean Endoscopes

hang vertically, unless being placed into an active drying cabinet that has been validated for horizontal storage. All removable parts, such as caps and reusable valves, must be taken off the endoscope to facilitate airflow. It is recommended that these valves be kept together with the endoscope as a unique set throughout the process for tracking and identification purposes. This is often accomplished by placing the reusable items into a bag or other type of containment device (see example in Figure 7) that are stored with the endoscope in the cabinet.

Endoscopes in storage must be labeled with a distinct visual cue that allows for identification that the endoscope has been reprocessed and is ready for patient use. Proper labeling of the endoscope in storage helps prevent unintentional reuse of a dirty device and is, therefore, an infection control measure. A distinct visual cue is usually in the form of a tag or label affixed to the endoscope. The tag or label notes the date of reprocessing, the technician who performed the process, etc. This label/tag (see example in Figure 8), may also note when the endoscope must be reprocessed again, in accordance with the facility policy. Currently, standards and guidelines vary as to the recommendation for the length of storage for flexible endoscopes before they must be reprocessed again. ANSI/AAMI ST91 and AORN recommend that the facility perform a risk assessment to determine this storage interval, also known as hang time, based upon their internal logistics and circumstances; this should include details such as auditing of proper reprocessing steps, handling with gloved hands, the storage conditions, drying procedures prior to storage, etc. Based on the results of the risk assessment, the healthcare facility should develop its own internal policies and procedures to determine the maximum endoscope storage time. Alternatively, the Society of Gastroenterology Nurses and Associates Inc. (SGNA) states that a seven-day storage interval is appropriate if the endoscope was processed properly, protected from recontamination and is completely dried prior to storage. Figure 9 shows an example indicator tag that measures a seven-day storage interval.

Proper storage of flexible endoscope helps maintain the reprocessed device in a patient-ready state. Drying with compressed air prior to placement in the cabinet or use of a drying cabinet is an essential step of storage. There is no storage interval applicable to endoscopes that have been stored wet.

Objective 3: Review the current standards and professional society recommendations for proper transport of reprocessed flexible endoscopes back to reuse and review types of containment devices used for this process

Current guidelines require that flexible endoscopes be handled with clean gloves when contacting a disinfected endoscope. Additionally, clean PPE must be donned before removing the endoscope from an automated endoscope reprocessor (AER). The International Association of Healthcare Central Service Materiel Management (IAHCSMM) states in its Endoscope Reprocessing Manual that endoscopes should be handled with clean, gloved hands and the device should be placed into a designated storage device. AORN recommendations state that processing personnel should wear clean, low-protein, powder-free gloves when handling processed endoscopes and when transporting them to and from the storage cabinet. Therefore, this requirement also applies to the step of placing an endoscope into the clean transportation container for transport to the procedure room.

Although not a requirement in current professional society guidelines, some endoscope manufacturers’ IFU do recommend the use of sterile gloves as well as sterile wipes and other sterile items when handling and
drying processed endoscopes. This recommendation serves to control the quality of the items that touch the disinfected endoscope in order to prevent recontamination. Please refer to the endoscope IFU for more information on the quality level of gloves and other implements used with the endoscopes after disinfection. Figure 10 shows an example of the type of gloves typically worn to handle endoscopes. Note: Sterile gloves are required for handling processed flexible endoscopes that are intended to be placed in the sterile field in an OR setting.

Since endoscopes that have been reprocessed can be recontaminated by the environment or facility staff prior to reuse, the device must be placed into a clean container for transport back to the procedure room for reuse on a patient. The container itself must be cleaned and disinfected between uses in accordance with the transport container’s IFU. Some facilities use tray liners (see example in Figure 11) to help to control the soiling level of the transport container between uses, but this does not negate the need to clean/disinfect the container between uses.

It is important to label the clean transport container accordingly. Clear labeling of the bin helps to prevent confusion as to the reprocessing status of the device inside. Figure 12 shows an example of labeling for clean transport bins. ANSI/AAMI ST91 states that when transporting an endoscope that has been high-level disinfected, the endoscope should be protected from recontamination. Transport the endoscope using an impervious barrier method, such as seen in Figure 13, that will prevent recontamination. Within the container, the endoscope should be loosely coiled to prevent damage.

Proper PPE usage – including the use of clean gloves for transport of reprocessed endoscopes back to the procedure room and containing the device in a clean, labeled transport bin – helps prevent contamination and maintain the patient-ready state. Since disinfected endoscopes can become recontaminated by hands and/or by coming into contact with surfaces while being handled and transported, use of a barrier system can prevent recontamination.

**Conclusion**

Safe patient care requires that each endoscope be delivered to the procedure room in a contamination-free condition, while also being in good working order. Proper transport of contaminated endoscopes to the processing area, care in handling, proper storage practices and contained transport of a clean endoscope back to reuse are critical steps that help reduce the risk of unsafe endoscopes being used on patients.

**REFERENCES**

2. Association for the Advancement of Medical Instrumentation. ANSI/AAMI ST91: 2015, *Flexible and semi-rigid endoscope processing in health care facilities*.