





Sterile Storage and Maintaining Sterile Package Integrity

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LEARNING OBJECTIVES

1. Review the correct conditions for a sterile storage environment
2. Describe the Sterile Processing technician's role in maintaining the integrity of sterile packages
3. Explain methods to maintain the cleanliness of the sterile storage area

A lot of work goes into producing sterile products for safe patient use. After medical devices are sterilized, they are often placed into storage until they are needed. If the sterile storage conditions are not appropriate, the items can become contaminated, rendering them unsafe and unusable. Every healthcare facility can take action to create an environment to protect sterile packages. This includes providing a proper sterile storage environment and developing policies and procedures to safely store and handle sterile packages. This lesson plan discusses best practices for sterile storage.

Objective 1: Review the correct conditions for a sterile storage environment

Sterilized items should be stored in a room that is environmentally controlled to maintain optimal conditions for the sterile integrity of the packages and reduce the potential for contamination. The sterile storage area, preferably

an enclosed room, should be easily accessible from the sterilization cooling, breakout and case cart staging areas. It should be designated as a semi-restricted area, requiring those who enter to wear clean scrub attire. It should not be accessible to general traffic flow patterns or to untrained or unauthorized personnel.

All surfaces should be cleanable, durable, smooth and without seams. Floors should have a cove base (trim installed to transition from the floor to the wall); this provides a surface that allows for ease of cleaning and assists in preventing buildup of dirt and debris in crevices. The area should include hand hygiene stations and feature adequate lighting, both for personnel safety and so that package labels can be easily read.

The air supply should be as clean and dust-free as possible. This usually requires filtration. Doors and internal windows should be kept closed when not in use; any windows to the external environment should remain shut at all times. Air pressure should be positive



in relation to surrounding areas so air flows out of sterile storage when a door or window is opened, reducing the chance of airborne contamination. There should not be any free-standing fans to agitate dust or debris. The temperature in the sterile storage area may be as high as 75°F (24°C) with less than 70% relative humidity. Temperature, humidity and air pressure should be monitored and recorded at least daily.

The sterile storage process begins at the end of the sterilization cycle. After sterilization, packages should not be touched until they reach ambient (room) temperature. Touching warm packages can transmit microbes from the skin through the packaging material, contaminating the contents. A temperature meter can be used to test the temperature of a package without touching it. Once items are properly cooled, they may be moved into sterile storage.

For commercially sterilized packages purchased from outside vendors, a breakout room should be located adjacent to sterile storage so the packages can be safely removed from their shipping containers. External shipping containers and corrugated boxes can collect dust, debris and insects during shipment and can carry contaminants into the area. These cartons should not be permitted in clean/sterile storage areas.

Sterile items should be stored to protect against contamination and allow for adequate air circulation. Shelving must be at least eight to 10 inches above the floor. The bottom shelf must be solid to protect items from environmental cleaning; if a bottom shelf is not solid, a commercially purchased shelf liner may be used. Supplies on the top shelf must be 18 inches below the ceiling or sprinkler heads to ensure the effectiveness of sprinkler systems.

Although not required, a solid top shelf will help protect sterile items from dust. Shelving units should be at least two inches from outside walls to prevent contact between sterile items and condensation that could form on the interior surfaces of outside walls.

There are three different types of sterile storage shelving units: closed, semi-closed and open.

- Closed shelving is preferred as it protects sterile packages from dust, traffic, airflow, and other environmental and physical challenges within the storage area.
- Semi-closed shelving is shelving with at least three solid sides (top and two sides) and forms a closed unit when the shelves are moved together. These units are usually on tracks or have independent wheels. Shelves may be solid or open wire. The units should be pushed to the closed position when not accessing the sterile products. This type of shelving is often expensive, but it is versatile, user-friendly and offers good protection for stored items.
- Open shelf storage systems usually have open racks to prevent dust accumulation; however, the bottom shelf must be solid to protect the stored items from contamination. Open shelving is convenient and less expensive than closed shelving; however, packages are more vulnerable to physical hazards (usually accidental) and environmental challenges from cleaning solutions.

Regardless of the system used, the design of the shelving should provide enough space for easy access to all shelves and adequate room to allow for cart movement up and down the aisles. The shelves should be sized appropriately to fit the stored items. Trays that overhang shelving pose a safety hazard to all who work in the area and may become contaminated

by people walking by and brushing against them. Sterile packages should be handled with care and positioned so that they are not crushed, bent, compressed or punctured. Sterile items should not be stored on floors or windowsills or near or under sinks, exposed water pipes, sewage lines or air conditioning drains.

For safety and ease of handling, heavy instrument trays should be stored on middle shelves. Lightweight packages should be placed on higher shelves. Do not drag packages, especially wrapped trays. Lift them carefully. Transport trays with solid or perforated bottoms may be used to prevent tears in wrappers during handling. All equipment used to transport and store sterile packages should be maintained, organized, clean and dry. The bottom shelf of transport carts should be solid.

Objective 2: Describe the Sterile Processing technician's role in maintaining the sterile integrity of packages

Having a storage area designed to meet sterile storage requirements does not prevent all types of package contamination. Packages can become contaminated by mishandling and mismanagement of the area. Sterile Processing (SP) technicians can protect the integrity of the packages in the sterile storage area by following the handling protocols established by the healthcare facility. Soiled items should not be brought into the area.

SP technicians should maintain a high level of personal hygiene, including having clean hair, body, and short, natural nails (no polished, lacquered or artificial nails) and wearing clean, healthcare-issued scrub attire. Hand hygiene should be performed frequently by handwashing or using waterless hand sanitizers according to facility policy.



When handling packages, hands must be dry to prevent contaminating the contents. Fingernails should be short to reduce the microbial load under the nails and to minimize the potential for rupturing packages and pouches. Jewelry is discouraged because it can harbor microorganisms and tear holes in packaging.

Do not bring any outside items, such as cell phones, purses, etc., into the area that have not undergone cleaning and disinfection. If badge lanyards are worn, they should be placed in a pocket or contained in some manner to avoid catching them on the shelving or packaging. Lanyards should also be cleaned and disinfected on a routine basis so they do not contaminate the sterile items.

Purchased items should be removed from their shipping containers in the breakout room in a manner that will protect their integrity. As discussed earlier, external shipping containers and corrugated boxes should not be brought into the sterile storage area. When multiple sterile items are removed from boxes to transport to sterile storage, they should be loaded onto a cart. Transporting items by cart is easier and safer than hand carrying numerous items. Items should be placed on the cart loosely and securely to protect contents. Items should not hang off the edges of the cart. The bottom shelf of the cart should be solid to protect the items from dirt and dust contamination. The transport cart should be cleaned when soiled and placed on a routine cleaning schedule.

Some purchased sterile supplies are packaged in shelf boxes designed to be placed in clean or sterile storage areas. Each shelf box can contain one or multiple items. Because shelf boxes are packaged inside exterior shipping boxes, they are not exposed to exterior

conditions. Remove the shelf box from the outer shipping carton in the breakout area and place it on the sterile storage shelf. This practice provides extra protection for the sterile package; reduces the handling of the sterile items, especially if the shelf box contains multiple items; and can be regarded as a simple inventory unit.

Always place items in the correct location to prevent unnecessary handling. Gently handle sterile packages to prevent crushing them. Do not stack sterile packages unless specifically stated in the item and packaging manufacturer's instructions for use (IFU). Consider packages that contact the floor for any amount of time to be contaminated and discard or reprocess as appropriate.

SP technicians should follow the facility's stock rotation policy, which defines how items are placed and removed from the shelf. Sterile packages should be arranged and maintained to allow stock rotation on a first in, first out (FIFO) system. The longer a sterilized item remains in storage, the greater chance the item has to become contaminated, due to handling and environmental issues, such as dust. Practicing a FIFO inventory control system prevents "neglected packs syndrome" where hard-to-reach packs remain in storage much longer than others and are more likely to expire or become damaged or contaminated. Typically, facilities use a left-to-right system. The newest item is placed on the left and the older items move to the right. The pack on the far right is the first to be picked for use. Another option is to place the new packs in from the back of the shelf and to pick the oldest item from the front of the shelf. Expiration dates need to be watched carefully. Items with a close expiration date should be placed where they can be issued before expiring.

Objective 3: Explain methods to maintain the cleanliness of the sterile storage area

To maintain the sterile integrity of the packages, it is important to keep the sterile storage area clean, dry, and free of dust and debris. The floors should be damp mopped at least daily and when soiled. Dry mopping is not recommended since it results in dust getting into the air currents and then deposited onto surfaces, including packages. Trash should be emptied at least daily and when trash bins are full. Walls and vents should also be on a routine schedule for cleaning. Standards for environmental cleaning should be the same as those for the Operating Room (OR).

Shelves, storage bins and transport carts in sterile storage should undergo routine cleaning on a frequency determined by the facility. When the shelves are cleaned, the sterile packages should be gently removed from the shelf. The shelf should be cleaned and completely dried before gently returning the items to the shelf. Alcohol may be used as a drying agent if its use is included in the facility policy. Shelf cleaning should be documented.

High-touch objects and surfaces, such as handles, doorknobs and computer keyboards, should be identified. Policies and procedures should be in place to have these high-touch surfaces cleaned and disinfected at least daily. This reduces the contamination of environmental surfaces that are touched frequently and create a risk for hands to acquire pathogens that could be transmitted to packages.

Conclusion

After sterilization, items are often stored until needed. The activities of personnel in the sterile storage area and the environment itself impact



the maintenance of item sterility. If items are not properly protected, or something unexpected happens, stored items may become contaminated. Providing the proper technician training, environmental controls, and processes is critical to maintaining sterility. This lesson has discussed processes to maintain the integrity of packages in the sterile storage area so they are available and safe for patient use. **P**

RESOURCES

Association for the Advancement of Medical Instrumentation (AAMI). ANSI/AAMI ST79:2017 & 2020 Amendments A1, A2, A3, A4 (Consolidated Text) *Comprehensive guide to steam sterilization and sterility assurance in health care facilities*. Available for purchase at www.aami.org.

Association of periOperative Registered Nurses (AORN). "Guideline for Sterilization." In *Guidelines for Perioperative Practice*, 2023.

Healthcare Sterile Processing Association (HSPA). *Sterile Processing Technical Manual*. 9th ed. Chicago: HSPA, 2023.



CIS Self-Study Lesson Plan Quiz

Sterile Storage and Maintaining Sterile Package Integrity

Lesson No. CIS 298 (Instrument Continuing Education – ICE) · Lesson expires July 2026

1. What can occur to sterile packages if proper storage conditions are not met?
 - a. Nothing, as long as the supplies are not over handled
 - b. Nothing, as long as the policies and procedures for stock rotation are followed
 - c. The items can become contaminated, rendering them unsafe
 - d. The packages may only be used during an emergency
2. The sterile storage area:
 - a. Is restricted to Sterile Processing professionals
 - b. Is classified as unrestricted
 - c. Is classified as semi-restricted
 - d. None of the above
3. Why is it important that trays fit on a shelf and do not overhang?
 - a. Trays that overhang shelving may become contaminated by people walking by and brushing against them
 - b. Trays that overhang shelving are more difficult to rotate
 - c. With trays that overhang, it is not possible to perform FIFO inventory methods
 - d. Trays that overhang take up too much space
4. Why does the bottom shelf have to be solid?
 - a. Because heavy trays are stored on the bottom shelf
 - b. Because large trays are stored on the bottom shelf
 - c. To protect items from environmental cleaning
 - d. To prevent tears that can be caused by wire shelving
5. Why is it necessary to store supplies 18 inches below the ceiling or the level of the sprinkler heads?
 - a. To ensure the effectiveness of sprinkler systems
 - b. To prevent hand injuries when lifting trays off the top shelf
 - c. To prevent supply contamination from possible sprinkler drips
 - d. To avoid a humid condition that could contaminate the sterile supplies
6. How should sterile packages be placed on shelves?
 - a. Gently and loosely on the shelf
 - b. Front to back, with items gently compressed to fit the shelf
 - c. Stacked no higher than three trays or six peel packs
 - d. None of the above
7. Which of the following is not acceptable for storing sterile supplies?
 - a. Closed shelving
 - b. Covered cabinets
 - c. Wooden shelves
 - d. Solid shelves
8. A breakout room is an area for:
 - a. Storing sterile and unsterile items
 - b. Storing equipment
 - c. Transporting supplies
 - d. Removing commercially sterilized items from their outer shipping containers
9. When removing multiple items from an outside shipping container, how should they be transported to sterile storage?
 - a. Transported by cart, placing them loosely and securely to protect contents
 - b. Hand carried
 - c. Placed in a bag that doesn't have any holes
 - d. Placed in an open container
10. For safety and ease of handling, heavy instrument trays should be stored on a:
 - a. Top shelf
 - b. Middle shelf
 - c. Bottom shelf
 - d. Shelf closest to the level of the transport cart
11. What can cause a sterile package to become contaminated?
 - a. Lack of staff hygiene
 - b. Wearing jewelry in the sterile storage area
 - c. Mishandling
 - d. All the above
12. Which type of inventory box can be placed on a sterile storage shelf?
 - a. Corrugated box
 - b. Cardboard box
 - c. Shelf box
 - d. Wooden box
13. Which of the following is a common stock rotation practice?
 - a. First in, first out (FIFO)
 - b. Last in, first out (LIFO)
 - c. Last in, last out (LILO)
 - d. First sterilized, first out (FSFO)
14. To maintain the sterile storage area as a clean environment:
 - a. Shelves should be dry dusted at least weekly
 - b. Floors should be damp mopped daily
 - c. Walls and vents should be cleaned every six months
 - d. All the above
15. How often should high-touch surfaces be cleaned and disinfected?
 - a. Every shift
 - b. Daily
 - c. Weekly
 - d. Monthly

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