Four Critical Procedures for Infection Control with a Pneumatic Tube System

Infection control guidelines for hospital and lab personnel transporting materials in a pneumatic tube system

This document is intended as a guideline, to complement protocols recommended by the Occupational Safety and Health Administration (OSHA), Centers for Disease Control and Prevention (CDC), individual hospitals and other governing agencies. If conflicting material should arise between this document and any regulatory agency, default to that agency's information and regulations. These procedures do not supersede the judgment of a healthcare professional.

swisslog healthcare

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Overview

The Centers for Disease Control and Prevention (CDC) define healthcare-associated infections, of hospital associated infections (HAIs), as infections that patients acquire during the course or receiving healthcare treatment for other conditions[1].
Hospital surveillance for HAIs dates back to 1958 – originally recommended by the American Hospital Association in response to nationwide outbreaks of staphylococcus aureus.2. A few years later, the CDC followed suit by creating similar guidelines in an effort to obtain evidence for control measures[2].

Today, the Affordable Care Act is also having a major impact on how hospitals with high HAIs rates are being reimbursed.

According to the CDC, cleaning and disinfecting environmental surfaces in healthcare facilities is a critical step in reducing the potential contribution of those surfaces to the incidence of HAIs[4]. The National Patient Safety Agency (NHS) recommends that standard infection control precautions are applied at all times within a healthcare setting or where health care is being provided[5]. Among other organizations, The Joint Commission and the World Health Organization (WHO) also maintain guidelines regarding the importance of effective surface cleaning for infection control[6].

«Hospitals are gearing up for the third element to go into effect in 2015, when federal reimbursements will be cut by 1% for hospitals in the highest quartile of hospital-acquired infection rates.»

SOURCE

1 — Healthcare-Associated Infections (HAIs). The Burden. Centers for Disease Control and Prevention. Retrieved from: www.cdc.gov. 13 Dec 2010.
2 — Preventing Central Line–Associated Bloodstream Infections: A Global Challenge, a Global Perspective. The Joint Commission. May 2012. Retrieved from: www.jointcommission.org/assets/1/18/CLABSI_Monograph.pdf
3 — Fiore, K. (2013, June 28). Hospitals already feeling aca pinch. MedPage Today, Retrieved from www.medpagetoday.com/Washington-Watch/Reform/40160
4 — Fuglsang, M. Wiping out germs tips for cleaning and disinfecting environmental surfaces. Infection Control Today. 2004, October 01. Retrieved from www.infectioncontroltoday.com
5 — The National Patient Safety Agency, Clinical Governance. (2010). Standard infection control precautions(v3). Retrieved from: www.nhsprofessionals.nhs.uk
6 — It's all on the surface establishing protocols for cleaning and disinfecting environmental surface areas. Environment of Care. 2010. Retrieved from www.jointcommission.org

«Approximately 1.7 million HAIs occur in US hospitals every year, resulting in an estimated 99,000 deaths and an estimated $20 billion in healthcare costs.»[8]

HAI Medical Errors – Costly Mistakes

Healthcare organizations are under increasing pressure to reduce and prevent medical errors that may result in HAIs, as these represent a significant financial and social burden. In fact, the CDC statistics indicate HAIs affect five to 10 percent of hospitalized patients in the US annually. Several years ago, the CDC reported that HAIs estimated their overall annual direct medical costs to hospitals ranged from $28.4 to $33.8 billion[7].

The Association for Professionals in Infection Control and Epidemiology (APIC) has designed a calculation tool to demonstrate the costs associated with infections and the savings realized by preventing them. This tool (www.apic.org/Resources/Cost-calculators) also provides tables and graphs that describe the financial impact of infections at users' facilities. For facilities that don't have access to, or don't know their specific information, APIC provides data from national studies to estimate economic endpoints.

SOURCE

7 — Scott II, R Douglas. The Direct Medical Costs of Healthcare-Associated Infections in US Hospitals and the Benefits of Prevention. Division of Healthcare Quality Promotion National Center for Preparedness, Detection, and Control of Infectious Diseases Coordinating Center for Infectious Diseases Centers for Disease Control and Prevention. March 2009.

8 — (n.d.). Preventing healthcare-associated infections. Center for Disease Control and Prevention, Retrieved from: www.cdc.gov

Risks Associated With Pneumatic Tube Systems (PTS)

OSHA cites the primary routes of infectious disease transmission in US healthcare facilities are contact, droplet and airborne[9]. One healthcare surface that may be susceptible to the transmission of an HAI is a pneumatic tube system (PTS).

Pneumatic tube systems have been used for decades in health care to transport small payloads, including: pharmaceuticals, laboratory specimens, supplies and documents, as well as other more fragile items such as vaccines, blood and chemotherapy. Items transported by PTS carriers may be considered hazardous and require strict protocols to prevent or address potential contamination issues.

The primary concern in the transportation of clinical specimens, blood or medications in a pneumatic tube system is leakage into the carrier and potentially the system tubing, thus exposing healthcare workers to hazardous material. Leakage as a result of container breakage has been virtually eliminated through the use of carrier inserts and improvements to provide a soft delivery of the carrier.

Today, leakage generally results from improper content packaging and/or the use of primary containers that are not leak resistant. However, manufacturers have developed several methods to minimize the occurrence of improper packaging and thus, leakage.

A secondary concern, specifically when transporting critical materials, is timeliness. Pneumatic tube systems are designed for fast delivery, however not all manufacturers' systems are designed to handle high traffic volumes. Senders may need to exercise caution when sending critical materials to ensure that there won't be system delays as a result of traffic, spills, etc.

A PTS has the ability to monitor each transaction and track carriers, allowing users to avoid "lost" carriers and significantly reduce infected pathways. Additionally, today's advanced PTS tubing, transfer units and delivery station designs provide for soft, air-cushioned transport of carriers and their contents, resulting in safer transport overall.

Since no system is totally free from user error, standards and procedures should be in place to prevent and address any potential risks. These protocols must outline specific processes, roles, cleaning procedures and frequency in order to avoid transmission of potentially dangerous pathogens and biohazards to patients and healthcare workers. By following simple procedures within a healthcare environment, facilities will ensure increased safety and efficiency, and also avoid costly HAI errors.

Swisslog Healthcare has developed the following infection control procedures, designed to address pneumatic tube system materials and operations to minimize the potential hazards to a healthcare facility's personnel and patients.

SOURCE

9 — (n.d.). Infectious diseases. Occupational Health and Safety Administration. Retrieved from: www.osha.gov/SLTC/healthcarefacilities/infectious_diseases.html

Infection Control Procedures for PTS

Container Testing (Sample or medication containers, not the carrier)

Swisslog Healthcare recommends facilities validate the integrity of their sample and medication containers prior to use in pneumatic tube systems. NOTE: This is typically done prior to commissioning the PTS, to determine which containers meet the requirements for safe, leak-resistant transport. Thereafter, acceptable containers should be made available for users, so that unsafe containers are not chosen for critical transport activities. Specialty carriers (leak-resistant, antimicrobial, high-impact, etc.) can be chosen to ensure transport of fragile and/or hazardous materials.

If the pneumatic tube system is operational, follow these steps:

1. Fill container 3/4 full with water and tighten lid.
2. Place the container in a clear plastic bag (Ziploc™ or other sealed bag) and insert between padded liners into the PTS carrier (if this is the chosen packaging procedure for the facility).

OR

Insert the container into a biohazard pouch, as an alternative packaging procedure, and secure the pouch, placing it into the PTS carrier.

NOTE: Some biohazard pouches function as both the secondary containment system as well as the padding and immobilization device.

3. Select a distant receiving station to send test container.
4. Send the carrier with the water "specimen" through the tube system to the selected station. Coordinate with the receiving station to return the carrier immediately to its origination point.
5. Upon return, check the container and plastic bag for leakage.
6. Repeat steps one through six several times for each container to be used for PTS transport. Use a new primary container each time and simulate normal use of the system as closely as possible.

NOTE: If any containers leak in testing, it is recommended that a tighter sealing container be used.

If the system is not yet operational, follow steps 1 and 2 above, then:

3. Manually agitate sealed bag or biohazard pouch containing specimen container and check for leakage.
4. If container leaks, replace with a tighter sealing container.

Specimen Packaging

In accordance with the universal guidelines developed by the CDC and adopted by OSHA, all blood and body fluids should be handled as potentially infectious and hazardous material. Padded carrier liners and specially designed pouches must be used for protected transport to ensure the integrity and containment of specimens.

NOTE: All personnel handling specimens must wear the appropriate Personal Protective Equipment (PPE), as defined by the universal precautions and their facility protocol. Contaminated sharps should not be put into a pneumatic tube system.

Method One:

1. Place primary containers with body fluids in clear plastic bags (Ziploc® or other sealed bag).
2. Insert container between foam pads and place in carrier.
3. Place requisition slips between the plastic bag and foam.
4. Send carrier according to facility protocol.
5. In the event of a leak, use the requisition to identify the specimen source and other pertinent information for recollection of the specimen.

Method Two:

1. Place primary container in a specially designed biohazard pouch and seal. Biohazard pouches provide containment and cushioning, so no foam padding is needed. Some pouches also contain an outside slot for paperwork.
2. Place sealed pouch and paperwork in carrier and send according to facility protocol.
3. In the event of a leak, use the requisition to identify the specimen source and other pertinent information for recollection of the specimen.

System Spill Containment

Swisslog Healthcare recommends that all PTS carriers be inspected for spillage upon receipt. This procedure addresses decontamination when container leakage affects the outside of the carrier and, potentially, the pneumatic tube itself.

1. If a leak has contaminated the inside of the carrier only, set aside the carrier and liner or pouch and follow the procedure below for system decontamination.

2. If spillage is detected on the exterior of the carrier, immediately stop sending carriers from the station where the contamination was first noticed.

3. Utilize the "special emergency stop code" (if provided) when a leaking carrier is received. Consult the engineering department for details.

4. Notify the facility maintenance department immediately so they can initiate a system cleanup procedure, including temporary partial or total system shut down.

5. To isolate the spill to the fewest number of pipes, initiate an emergency shut down immediately at the station.

6. Notify the appropriate department (engineering or facilities) and provide:

   - The receiving station's number

   - The sending station's number (if known)

   - The type of spill (i.e., specimen type and suspected amount)

   - The time the contaminated carrier arrived (or was first noticed)

   - The number of contaminated carriers that arrived

7. Remove contents of carrier using appropriate PPE. If the carrier contents are unknown or are hazardous, remove them in a biological safety cabinet (BSC).

8. If the secondary containment bag or pouch is unable to be cleaned, discard the specimen according to facility protocol.

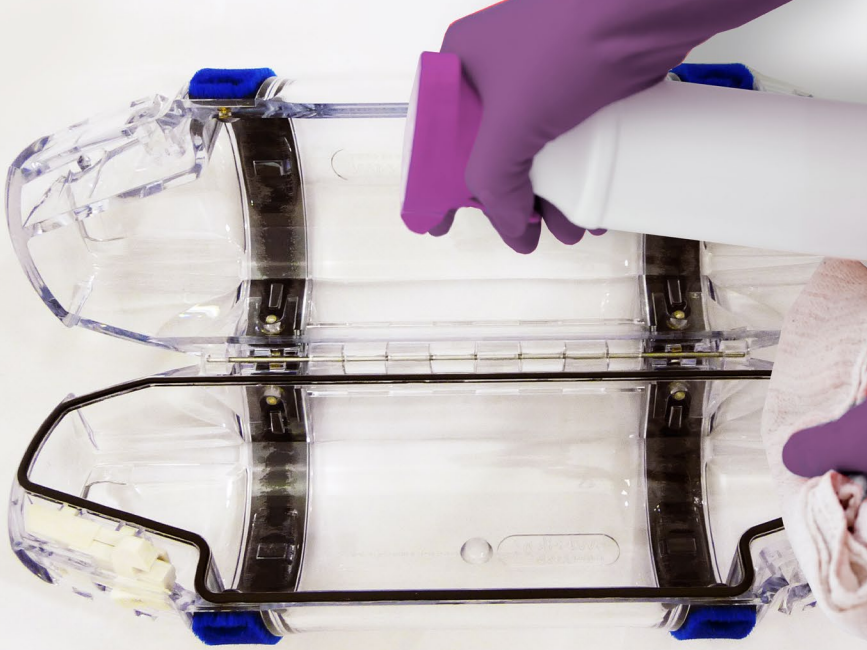
9. Check your facility's decontamination policy to proceed with cleaning of containers, carriers and liners and/or refer to the PTS decontamination procedure that follows.

10. Once cleaning is complete, have the department responsible for decontamination of the system return the system to service.

11. Complete an incident report per hospital facility procedure.

PTS System Decontamination

Swisslog Healthcare does not warrant the effectiveness of any particular solution for system disinfection. The hospital advisory or task force should determine which disinfectant will be used to decontaminate the carriers, packaging products, and the system itself (tubing) in the event of a spill. Test the cleaning agent chosen to ensure it does not adversely affect system components.



Disinfectant Guidelines

The following cleaning agents may be considered within the stated restrictions.

Chlorine (halogen) – sodium hydroxide – is effective against gram positive and gram negative bacteria and viruses including hepatitis B and HIV. Hold at room temperature for 15 minutes. Chlorine and chlorine compounds are the most widely used and are available in liquid (sodium hypochlorite or bleach) and solid (calcium hypochlorite). A 5.25 percent solution of hypochlorite diluted 1:10 with water, when used as described herein, has demonstrated to not be harmful to system components.

Glutaraldehyde is effective against gram positive, gram negative bacteria, fungus, spores and viruses. It is also a good agent in the presence of organic matter, but can be toxic.

Phenolics are effective against a wide spectrum of microorganisms – gram positive and gram negative bacteria, myco bacteria and viruses. This agent does leave a film on surfaces and requires 10 minutes of contact.

Quaternary ammonium compounds are effective against gram positive and gram negative bacteria, but the fumes are very strong.

Lodophors are effective against gram positive and gram negative bacteria, TB, spores and fungus. They have a rapid and powerful detergent action but are corrosive to metal and can be detrimental to rubber and some plastics.

Ethyl or isopropyl alcohol is effective against fungus, spore-forming bacteria, mycobacteria and virus. The contaminated surface requires wet contact for five minutes to achieve a level of disinfectant. Alcohol is corrosive to system carriers.

Decontaminating Carrier Liners

To disinfect a foam liner, choose one of the following:

1. Sterilize by ethylene oxide (EtO) gas.
2. Autoclave at 270˚ Fahrenheit for five minutes, dry at 270˚ F for one minute
3. Soak in an appropriate mycobactericidal germicide solution; rinse and allow to dry.

Decontaminating Plastic Carriers and Biohazard Pouches

To disinfect a PTS carrier or biohazard pouch, choose one of the following:

1. Sterilize by ethylene oxide (EtO) gas.
2. Soak in an appropriate mycobactericidal germicide solution rinse and allow to dry

WARNING: Do not autoclave carriers or pouches: high temperatures will cause irreparable damage.

Isolating Contaminated Systems and Tubing

Operator must immediately notify facility maintenance in the event of a spillage or contamination issue with the PTS. Isolation and containment steps that follow are completed by facility maintenance.

1. Facility maintenance must receive:

   - The station number where the issue occurred and the number of the sending station

   - The nature of the spill – specimen type and suspected amount

   - The exact time the carrier with the spill arrived (if it is known) or the time when someone observed the spill

2. Immediately verify that the system has been shut down.

3. Review the system transaction printout or log file to determine the extent of contamination. If the affected transaction can be pinpointed on the traffic printout and there have been no subsequent transactions involving the same route, a partial clean-out can be activated.

4. Restart the unaffected zones for normal traffic.

5. Disinfect the send and receive stations, and connecting tubing path as described below.

6. If the affected transaction can be pinpointed, but there have been subsequent transactions involving the same route, a partial, though more involved, clean-out may still be possible.

7. Determine all stations and tubing routes that were initially and subsequently affected; turn on any unaffected zones.

8. Disinfect all affected stations and tubing segments as described below.

9. If the transaction cannot be isolated on the printout, the entire system must be disinfected. Do not restart any part of the system prior to disinfecting all stations and tubing, including interzone lines.

Decontamination of System Components and Tubing

Swisslog Healthcare can assist in producing hospital protocols that revolve around material transport; however, we default to each individual facility's expertise when it comes to biohazard transport, handling and cleanup.

This procedure consists of sending a carrier containing a clean-out kit from station to station until all affected segments of the system have been traversed. As this carrier travels through the tubing, the clean-out bottle dispenses the cleaning solution while the carrier rubbing bands act as swabs.

1. Obtain a clean-out kit.
2. Fill the clean-out bottle with the appropriate mycobactericidal germicide solution to within 1/4" (0.6 cm) of the holes in the top of the bottle or as directed for that particular product.
3. Place the lid on the bottle.
4. Place the bottle in a carrier, taking care to maintain an upright position.
5. Close and latch the carrier.
6. At the system's central controlling station, set all affected stations to "off" or "off, dispatch."
7. Go to each affected station and send the clean-out carrier back to the originating station. Repeat as necessary to ensure cleansing of all affected tubing. Wear appropriate protective gloves, eyewear and clothing depending on the nature of the spill.
8. Periodically, check the level of the cleaning solution until the procedure is complete. When there is less than an inch of solution left in the bottle, refill it and towel dry the carrier wear bands.
9. If interzone lines are contaminated, place the clean-out carrier in the dispatcher of the station nearest the transfer unit that connects to the affected interzone tube. At the system's central controlling station use the diagnostics mode to manually dispatch the carrier and route it to the interzone tube. Repeat as necessary.
10. Disinfect the carpet in each affected station's receiver bin.
11. After cleaning, a slight amount of cleaning solution may remain in the tubing. This will not affect the system operation. A zone may be placed back into service when all stations and interzones connecting to that zone have been cleaned.

NOTE: Use good judgment in cleaning up after any spill or leak. Use the same universal precautions that would apply to any spill.

Training

A critical aspect of utilizing a PTS to transport specimens is in-service training. All employees using the system must be knowledgeable about proper packaging procedures and system use. It is recommended that facilities distribute clear procedural information for proper use of their pneumatic tube systems, including packaging, carrier inspection and decontamination procedures. Training may be conducted during monthly nursing in-services, new employee orientations and other similar situations. All training sessions should include documentation of those who attended.

In addition to training, simple procedure guidelines and relevant contact information should be located in each department describing effective system use and recommended maintenance to ensure compliance with best practices for infection control.

Conclusion

Infection control is a primary concern for all healthcare facilities in order to maintain a safe and healthy environment for patients and personnel. Simple measures to address infection control can contribute to a cleaner and safer transport system for patients and healthcare personnel alike. This information is provided as a guideline to encourage proper usage and maximum utilization of the pneumatic tube system.

Each facility is different, therefore individual healthcare facilities must establish their own policies as they see fit based on regulatory guidelines, best practices and current research.

Regulatory Agency Guidelines for Infection Control

Agency guidelines, publications and policies are subject to change/ revision. Facilities utilizing pneumatic tube systems are responsible for consulting current references directly from the relevant sources.

The following information provides an update on the positions held by the various agencies concerning the transport of specimens in a modern PTS. The assumptions are that pneumatic tube systems are computer controlled systems with soft handling/delivery capabilities. Older technology systems may be questionable in their ability to handle blood and other fragile specimens safely and reliably.

Excerpts from literature provided by various agencies are included based on their relevancy to the use of pneumatic tube systems for transport. Each excerpt is followed by a Swisslog Healthcare compliance recommendation regarding the application of the information to tube system use.

Center for Disease Control and Prevention

www.cdc.gov

Guidelines for safe work practices in human and animal medical diagnostic laboratories. *Morbidity and Mortality Weekly Report*, 13, 15. 2012:

3.1. Specimen Receiving and Log-In/Setup Station

- Use of pneumatic tubes for transport of specimens is acceptable for most specimens but might be contraindicated for specimens without sealed caps, such as urine cups; these are to be delivered by hand (see 3.1.6). Adopt specific standard operating procedures (SOPs) in the event that irreplaceable specimens are considered for transportation using these systems.

3.1.6. Pneumatic tube systems

- Establish SOPs for use and decontamination of the pneumatic tube system (PTS).
- Breakage or leakage of specimens transported using a PTS risks contamination of the transport system itself.
- Base limitations on use of the PTS on a complete risk/hazard assessment. Limit specimen size, volume, weight, and container types sent through the tube system, if warranted. This applies particularly to cytology specimens and certain types of urine containers.
- Place all specimens sent through a PTS in a sealed zip-lock bag.
- Test bags, and ensure they are leak-proof under the conditions in the PTS.
- Protect requisition forms by a separate pouch, or enclose them in a separate secondary bag to prevent contamination.
- A zip-lock bag must contain specimens from only one patient.
- Place absorbent wadding between patient bags to help absorb spills and minimize contamination to the outside of the carrier.
- Handle contaminated pneumatic tube carriers in accordance with standard precautions.
- Disinfect contaminated carriers with bleach solution or other disinfectant following the protocol recommended by the manufacturer and approved by the hospital's infection control committee if the system is in use in a hospital.
- Wear gloves when opening PTS carriers containing patient specimens.
- Decontaminate the outside of tube carriers before returning them to patient-care areas. Decontaminate the inside of the carrier if a leak occurs in the specimen container.

- Establish a facility hotline for immediately reporting problems with the PTS.

- Establish an emergency PTS shutdown plan, including roles and responsibilities; include implementation of an alternative specimen transport plan.

- Develop a system to track and analyze incidents of improperly closed carriers, cracked tubes, loose caps, and leaking containers. Increases in documented events may indicate the need to clarify or strengthen PTS-use policies or improve specimen collection practices, and could identify defective carriers and/or container lot numbers.

- Prepare SOPs for both laboratory operators and the non-laboratory service providers with their input and consultation.

- Document training and competency assessment of service providers and bench operators for PTS maintenance and decontamination procedures. Documented training and assessment of competency will include knowledge of the risks associated with using a PTS and the precautions to be taken to control those risks.

Compliance Recommendation for Swisslog Healthcare System Users:

1. Adopting the above procedures will address most of the guidelines provided herein, including the establishment of standard operating procedures, testing containers, protecting containers to be transported in PTS, tracking incidents and decontamination of the system components.

2. Facilities should establish specific procedures for emergency PTS shutdown and a hotline for reporting PTS problems to contain spills and leaks immediately.

3. Users should decontaminate carrier exteriors before returning them to use in patient care areas.

4. Train all users and document training, including periodic assessments of competency.

Clinical Laboratory Standards Institute (CLSI – formerly NCCLS)

www.clsi.org

Protection of Laboratory Workers from Instrument Biohazards and Infectious Disease Transmitted by Blood, Body Fluids and Tissue: Approved Guidelines – Third Edition. Section 9.5 Specimen Collection, Handling, and Transportation; Local Transport; Pneumatic Tube System, pages 41-42. 2012:

If specimens are transported via a pneumatic tube system, the primary and secondary containers should be tested and shown to be leakproof under the conditions present in the pneumatic system. If a spill occurs, it should be decontaminated according to the manufacturer's instructions.

It may be inappropriate for some samples to be sent through a pneumatic tube system. This may include samples of increased volume, irreplaceable samples (e.g., biopsy), or flammable materials. Local policy should be established to identify specimens that should never be transported through the pneumatic tube system.

Compliance Recommendation for Swisslog Healthcare System Users:

Procedure 1 for Container Testing addresses this recommendation

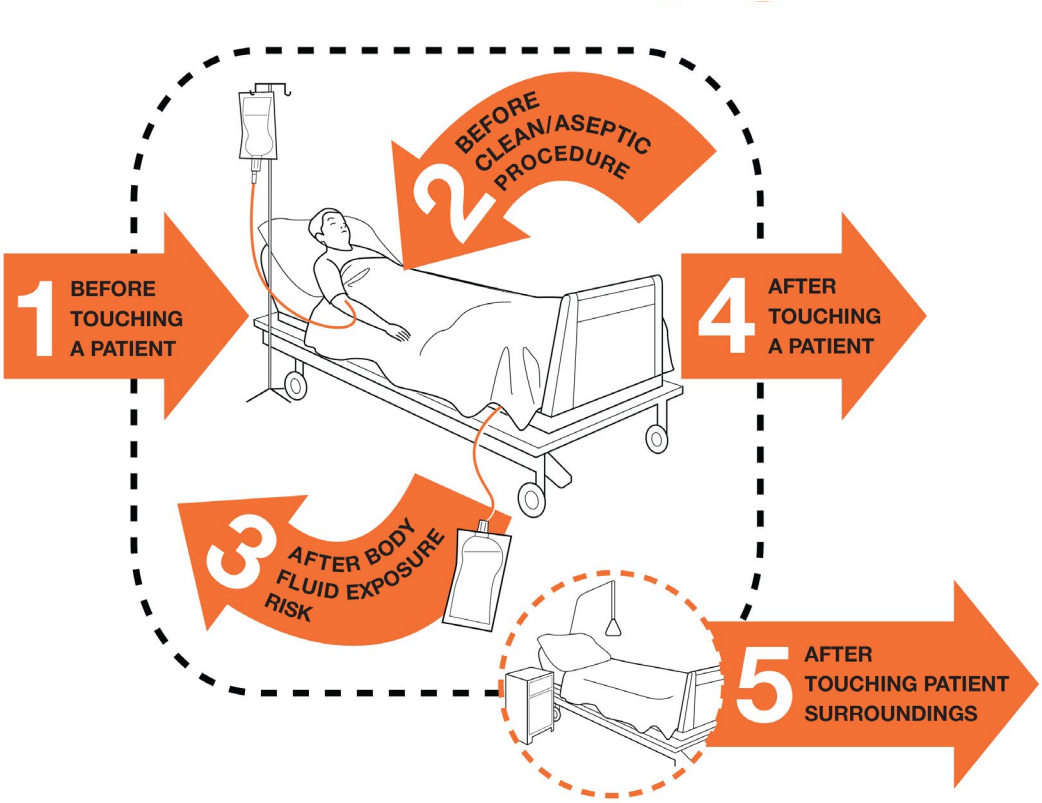
World Health Organization

www.who.int/en

The Five Moments for Hand Hygiene has emerged from the WHO Guidelines on Hand Hygiene in Health Care to add value to any hand hygiene improvement strategy. Quite simply, it defines the key moments for hand hygiene, overcoming misleading language and complicated descriptions. It presents a unified vision and promotes a strong sense of ownership.

Not only does the Five Moments align with the evidence base concerning the spread of HAI but it is interwoven with the natural workflow of care and is designed to be easy to learn, logical and applicable in a wide range of settings. Find out more about your Five Moments by visiting: www.who.int/gpsc/5may/background/5moments/en/

Your 5 Moments for Hand Hygiene



1	BEFORE TOUCHING A PATIENT	WHEN?	Clean your hands before touching a patient when approaching him/her.
		WHY?	To protect the patient against harmful germs carried on your hands.
2	BEFORE CLEAN/ ASEPTIC PROCEDURE	WHEN?	Clean your hands immediately before performing a clean/aseptic procedure.
		WHY?	To protect the patient against harmful germs, including the patient's own, from entering his/her body.
3	AFTER BODY FLUID EXPOSURE RISK	WHEN?	Clean your hands immediately after an exposure risk to body fluids (and after glove removal).
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
4	AFTER TOUCHING A PATIENT	WHEN?	Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient's side.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
5	AFTER TOUCHING PATIENT SURROUNDINGS	WHEN?	Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving – even if the patient has not been touched.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.

Source: World Health Organization, Five Moments for Hand Hygiene (www.who.int/gpsc/tools/Five_moments/en)

Occupational Safety and Health Administration (OSHA)

www.osha.gov

OSHA Directive CPL 02-02-069. Enforcement Procedures for the Occupational Exposure to Bloodborne Pathogens. 2001:

OSHA Methods of Compliance

10. Paragraphs (d)(2)(xiii) - (d)(2)(xiii)(C): These paragraphs deal with the containerization and labeling of specimens with the intent to eliminate or minimize the possibility of inadvertent employee contact with blood or OPIM which have leaked out of the container, contaminated exterior surfaces of the container, and/or surrounding surfaces. The labeling requirement warns employees that these substances are present so that proper handling precautions can be taken.

The labeling exemption listed in paragraph (d) (2) (xiii) (A) applies to facilities which handle all specimens (not just those specimens which contain blood or OPIM*) with universal precautions. This exemption applies only while these specimens remain within the facility. All employees who will have contact with the specimens must be trained to handle all specimens with universal precautions. If the specimens leave the facility (e.g., during transport, shipment or disposal) a label or red color-coding is required.

The use of pneumatic tube systems for transport of small materials in hospitals now includes transmittal of laboratory specimens and other more fragile items. The primary concern in transportation of clinical specimens in a pneumatic tube system is leakage of the specimen into the carrier and potentially into the system tubing. Some systems have virtually eliminated breakage as a cause of leakage by means of padded inserts for carriers and soft delivery of the carrier. Leakage generally results from improper packaging and/or the use of primary containers that do not prevent leakage during transport.

All employees who might potentially open a carrier must be trained to regard the contents as biohazardous in nature. Employees who open biohazard carriers must wear gloves in accordance with paragraph (d) (3) when removing specimens from the tube system carrier, because it may be contaminated with leakage. They must be trained in decontamination of the carrier and, if need be, the tube system in accordance with paragraph (g) (2).

All precautions and standards for manual transport of specimens also apply to the automated transport of specimens (e.g., containerization and tagging/ labeling).

1. Labels, paragraph (g)(1)(xiii): Labels must be provided on containers of regulated waste, on refrigerators and freezers that are used to store blood or OPIM, and on containers used to store, transport, or ship blood or OPIM. This requirement alerts employees to possible exposure since the nature of the material or contents will not always be readily identifiable as blood or OPIM.

DOT labeling is required on some transport containers (i.e., those containing "known infectious substances"). It is not required on all containers for which 29 CFR 1910.1030 requires the biohazard label. Where there is an overlap between the OSHA-mandated label and the DOT- required label, the DOT label will be considered acceptable on the out- side of the transport container, provided that the OSHA-mandated label appears on any internal containers which may be present. Containers serving as collection receptacles within a facility must bear the OSHA label since these are not covered by the DOT requirements.

Inspection and Citation Guidelines

A hospital compliance officer should determine that the warning labels in the facility are used as required by paragraphs (g)(1)(i)(A) through (D) and include the term "BIOHAZARD." OSHA does not require nor prohibit the use of warning signs or labels indicating source individuals' or specimens' known infectivity status, although, in accordance with Universal Precautions, the agency strongly recommends against such warning signs.

1. Paragraphs (g)(1)(i)(E) through (G): These paragraphs list exemptions from the labeling requirements which are additional to those exemptions listed for specimens in paragraph (d)(2)(xiii)(A) and for laundry in paragraph (d)(4)(iv)(A)(2).

Blood and blood products bearing an identifying label as specified by the Food and Drug Administration, which have been screened for HBV and HIV antibodies and released for transfusion or other clinical uses, are exempted from the labeling requirements.

When blood is being drawn or laboratory procedures are being performed on blood samples, then the individual containers housing the blood or OPIM (Other Potentially Infectious Materials) do not have to be labeled, provided the larger container into which they are placed for storage, transport, shipment, or disposal (e.g., a test tube rack) is labeled.

Compliance Recommendation for Swisslog Healthcare System Users:

1. Adequately label all biohazardous material to be transported in a PTS to alert users to their contents so that they take appropriate handling precautions.

2. Even with container testing, it is impossible to predict with absolute certainty that a primary specimen container will not leak while being transported in a PTS. Therefore, all specimens should be bagged with a secondary device.

3. If the primary specimen container is contaminated, care should be taken to avoid contaminating the outside of the secondary containment, the carrier and the station. Decontaminate any surface that may be contaminated following procedures previously outlined.

4. In a PTS, carriers containing specimens can be accidentally misdirected to a location other than a laboratory. Therefore, all workers who might potentially open a carrier should be given instructions as to how to redirect a carrier to the laboratory. However, unless a transparent biohazard system is employed, there is no way for the worker to know that a specimen is inside the carrier. Therefore, if there are departments within the hospital not utilizing universal precautions, the biohazard label must be visible somewhere within the carrier system. If all employees are utilizing Universal Precautions, the primary container containing blood or OPIM does not have to be labeled as biohazard. Secondary containment is still necessary when using foam liners. Most biohazard pouches serve to both secondarily contain and immobilize contents.

Use of Gloves

18. Paragraph (d)(3)(ix)(A) -(C). These paragraphs discuss the use of gloves. Gloves of appropriate sizes must be made available in accordance with paragraph (d)(3)(iii). Studies have shown that gloves provide a barrier, but that neither vinyl nor latex procedure gloves are completely impermeable. Thus, hand washing after glove removal is required. Disposable gloves must be replaced as soon as practical or as soon as feasible when contaminated.

Compliance Recommendation for Swisslog Healthcare System Users

If a leaking specimen container is received and the specimen is processed, hand washing after glove removal is required, if gloves have been contaminated.

Employee Information and Training

Information and Training - Paragraph (g)(2)(xiii): All employees with occupational exposure must receive initial and ...annual training on the hazards associated with blood and OPIM, and the protective measures to be taken to minimize the risk of occupational exposure. Retraining shall take place when changes in procedures or tasks occur which affect occupational exposure. While the provisions for employee training are performance oriented, with flexibility allowed to tailor the program to, for example, the employee's back- ground and responsibilities, the categories of information listed in paragraph (g)(2)(vii) must be covered at a minimum. These requirements include some site-specific information.

Compliance Recommendation for Swisslog Healthcare System Users

All potential users of the PTS should be included in the system training session with regular refreshing sessions. The training should include the proper packaging of specimens for the protection of the employee as well as a clear definition of the use of the biohazard labels involved. All sessions should be documented and attendees should sign a log sheet to verify attendance of the training session.

Inspection Guidelines

A compliance officer on the hospital staff must observe or document work practices to determine whether a secondary container is being used when necessary. If a bloody glove contaminates the outside of a primary container while the employee is placing a specimen, the employee must use a secondary container. Also, primary containers which may be punctured by their contents, including such items as pointed bone slivers, must be placed in a puncture-resistant secondary container.

Compliance Recommendations for Swisslog Healthcare System Users

1. Use gloves and other PPE when packaging and un-packaging specimens from secondary containment systems.
2. If leakage has occurred and the processing of the specimen may create aerosols or splashes, it is recommended that the specimen be processed beneath a biological safety cabinet, using appropriate PPE.
3. See previous procedures for the testing of primary containers and proper packaging of specimens for transport in a tube system.
4. See previous paragraphs on infection control procedures for the cleaning of a system and its components.

Online Resources

Additional resources on infection control procedures and best practices can be found on the following websites or journals.

Agency for Healthcare Research and Quality
www.ahrq.gov

Association for Professionals in Infection Control and Epidemiology
www.apic.org

Infection Control Today
www.infectioncontroltoday.com

The Joint Commission
www.jointcommission.org

The Journal of Hospital Infection
www.journalofhospitalinfection.com

The National Patient Safety Agency (NHS)
www.npsa.nhs.uk

World Health Organization
www.who.int/en

About Swisslog Healthcare

Swisslog Healthcare provides integrated medication supply chain solutions to hospitals and health systems to assist providers in treating patients across the continuum of care. Integrating transport and pharmacy automation, value-added services, and intelligent software, Swisslog Healthcare enables healthcare providers to respond to patient's needs quickly and with greater accuracy. The company minimizes many sources of operational waste, so providers achieve higher levels of productivity to impact the well-being of patients in positive ways.

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