



Infection Control Procedure for the Transport of Specimens in a Swisslog Pneumatic Tube System

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Important Information

Although Swisslog can assist in various ways to produce hospital protocols that revolve around material transport, Swisslog will default to each individual facility's expert when it comes to biohazard transport, handling and cleanup.

Please use the following document as a guideline only, to coexist with and not supersede those protocols that are dictated by OSHA, CDC, the hospital and other governing agencies. If a conflict should arise between this document and any biohazard regulatory agency, please default to that agency's information and regulations and/or contact your internal biohazard team for information and recommendations.

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Introduction

NOTE:

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Swisslog publishes a comprehensive manual entitled "TransLogic System Cleanout Process" (part number PN099-1113-61).

In the advent of a system spill, it is advised that you contact your operations department who may have this publication on file, and will be able to utilize the manual to address your specific spill situation.

Copies of the publication can be obtained by contacting:

Swisslog Customer Service department
Phone: 800.396.9666
Fax: 303.373.7871
Email: orderentry@swisslog.com

The use of pneumatic tube systems for transport of small materials in hospitals has been in existence for several decades.

Advancements in design and reliability enable the tube system to transport a wider variety of materials including pharmaceuticals, laboratory specimens and other more fragile items. Swisslog often achieves reliability rates in excess of 99% with the pneumatic tube system. The computer monitors each transaction so that the issue of "lost" carriers is significantly reduced. Advanced tubing, transfer, and delivery designs provide for soft, air-cushioned transport of the carriers and their contents.

Since no system is totally free from user error, it is necessary to provide information and standards for problems that potentially could occur. Most items sent through a tube system are not considered hazardous. The following material will address those materials and situations that could be potentially hazardous to hospital personnel.

Specimen Transport and Handling

The primary concern in the transportation of clinical specimens in a pneumatic tube system is leakage of the specimen into the carrier and potentially the system tubing, thus exposing workers to hazardous material. Breakage as a cause of leakage can be greatly reduced with the proper use of carrier inserts for soft delivery of the carrier.

Leakage generally results from improper packaging and/or the use of primary containers that have not been shown to be leak proof. Several methods have been developed to minimize the occurrence of improper packaging and thus, leakage. The following procedures can be implemented to virtually eliminate risk.

Test the Containers

With the system operational:

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

OR

3. Insert the container into a Zip N' Fold™ pouch, as an alternative packaging procedure, and secure the pouch.

NOTE: (The Zip N' Fold™ functions as both the secondary containment system as well as the padding and immobilization device).

4. Select a distant station to send test container and coordinate with the receiving station to return the carrier back to the laboratory.
5. Send the carrier with the water "specimen" through the tube system to the selected station.
6. Upon return of the carrier to the laboratory, check the container/plastic bag for leakage.
7. Repeat steps 1 through 7 several times using a new primary container each time and simulating normal use of the system as closely as possible.

NOTE: If the container leaks, it is recommended that a tighter sealing container be ordered. A list of some container manufacturers is provided at the end of this publication. Swisslog recommends that each PTS system owner test their containers due to differing system configurations at every healthcare facility.

If your system is not yet operational:

1. Manually agitate bag or Zip N' Fold™ containing specimen container and check for leakage.
2. If container leaks, replace with a tighter sealing container.

Packaging of Specimens

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 material and, therefore, hazardous. Padded liners and specially designed pouches have been developed by Swisslog specifically for specimen transport and must be used to insure integrity and containment of specimens.

Primary containers with body fluids should be placed in clear plastic bags (Ziploc or other approved bag) before being inserted between foam pads in one packaging method. Requisition slips should be placed between the plastic bag and foam.

Another packaging method is the Zip N' Fold™ pouch. If the Zip N' Fold™ method is employed, the primary container should be placed in the pouch and the pouch sealed. As the Zip N' Fold™ is a stand alone system providing containment and cushioning, no foam padding is needed. An outside slot for paperwork is provided on the Zip N' Fold™ pouch.

In the event of a leak, the requisition can be used to identify the source of the specimen and other pertinent information for recollection of the specimen.

All workers handling specimens should wear the appropriate protective barrier clothing as defined by the universal precautions.

Contaminated sharps **should not** be put into the transport system.

Sample System Spill Procedure for Users

1. Check the outside of the carrier for spillage. If spillage has occurred, immediately stop sending carriers from the station where the contamination was first noticed.

WARNING:

The maintenance department should be notified so they can initiate a system cleanup procedure. This will entail shutting down parts or all of the system for a period of time. If you are the owner of a CTS-30 or later generation system, the emergency shut-down feature can be initiated immediately at the laboratory station prior to notifying maintenance. This will help isolate the leak to a fewer number of pipes.

2. If a leak has contaminated the inside of the carrier only, the carrier and liner or pouch will require decontamination and should be set aside.

Check your hospital's decontamination policy to proceed with cleaning of carriers and liners and/or refer to the Decontamination Procedure that follows.

3. Call Laboratory to perform emergency shutdown.
4. Notify the appropriate department (which could be Engineering) and provide:
 - a. The receiving station's number
 - b. The sending station's number (if known)
 - c. The type of spill (i.e. specimen type and suspected amount)
 - d. The time the contaminated carrier arrived (or was first noticed)
 - e. The number of contaminated carriers that have arrived
5. Remove contents of carrier using protective clothing under biohazard hood.
6. Discard the specimen and secondary containment bag or pouch (if unable to be cleaned).
7. Remove gloves and wash hands.
8. Contact appropriate department for carrier cleaning if this has not yet been arranged.
9. Call the sending station and request another specimen.
10. The department responsible for decontamination of the system will return the system to service when cleaning is completed.
11. Laboratory may be given a "Special Emergency Stop Code" to utilize when a leaking carrier is received. Consult your Engineering department for details.
12. Complete an incident report per hospital facility procedure.

PTS System Decontamination Procedure

WARNING:

Swisslog makes no claims as the effectiveness of any particular solution with regard to its ability to disinfect the system. This determination should be made by each facility's infection control committee based on the nature of a specific spill. The cleaning agent chosen should be tested to ensure that it does not adversely affect system components.

Your 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.

Disinfectant Guidelines

The following agents can also be considered within the stated restrictions.

Chlorine (halogen) - Sodium Hydroxide - Room temperature for 15 minutes. Chlorine and Chlorine compounds are the most widely used and are available in liquid (sodium hypochlorite) and solid (calcium hypochlorite). Effective against gram positive and gram negative bacteria and viruses including hepatitis B and HIV. In addition a 5.25% solution of hypochlorite diluted 1:10 with water, when used as described herein, has demonstrated not be harmful to system components.

Glutaraldehyde - Effective against gram positive, gram negative bacteria, fungus, spores, and viruses. A good agent in the presence of organic matter, but it can be toxic.

Phenolics - Effective against a wide spectrum of microorganisms - gram positive and gram negative bacteria, mycobacteria, virus. This agent does leave a film on surfaces and requires 10 minutes of contact.

Quaternary Ammonium Compounds - Effective against gram positive and gram negative bacteria, but the fumes are very strong.

Lodophors - Effective against gram positive and gram negative bacteria, TB, sporicidal, and fungus. It has a rapid and powerful detergent action but is corrosive to metal and can be detrimental to rubber and some plastics.

Alcohol (ethyl or isopropyl) - Effective against fungus, spore forming bacteria, mycobacteria, virus. The contaminated surface requires wet contact for 5 minutes to achieve a level of disinfectant. Alcohol is corrosive to system carriers.

Carrier Liners

Clean foam liners using any of the following methods:

1. Gas sterilization (ethylene oxide)
2. Autoclaving at 270 degrees for five (5) minutes, dry at 270 degrees for one (1) minute.
3. Soaking in an appropriate mycobactericidal germicide solution. Rinse and allow to dry.

Zip N' Fold™ Pouches

1. Gas sterilization (ethylene oxide).
2. Soaking in an appropriate mycobactericidal germicide solution. Rinse and allow to dry.

Plastic Carriers

Carriers can be cleaned by any of the following methods:

1. Gas sterilization (ethylene oxide).
2. Soaking in an appropriate mycobactericidal germicide solution. Rinse and allow to dry.

WARNING:

Do not autoclave carriers: high temperatures will damage!

System and Tubing Decontamination Procedure

1. Operator Action:
Immediately notify the maintenance department of:
 - a. Your station number and the number of the sending station.
 - b. The nature of the spill: specimen type and suspected amount.
 - c. The exact time the carrier with the spill arrived (if it is known) or the time when you observed the spill.
2. Maintenance Action
Immediately verify that the system has been shut down.
The system can be turned off at the System Central Controller (SCC) or on a CTS-30, at any station enabled with the Emergency Off feature. 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.
 - a. Restart the unaffected zones for normal traffic
 - b. Disinfect the send station, receive station and connecting tubing path as described below.
3. 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.
 - a. Determine all stations and tubing routes which were initially and subsequently affected. Turn on any unaffected zones.
 - b. Disinfect all affected stations and tubing segments as described below.
4. 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.

Disinfection of System Components and Tubing

NOTE:

Although Swisslog can assist in various ways to produce hospital protocols that revolve around material transport, Swisslog will default to each individual facility's expert when it comes to biohazard transport, handling and cleanup.

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

1. Fill the clean-out bottle with the appropriate mycobactericidal germicide solution to within 1/4" of the holes in the top of the bottle.
2. Place the lid on the bottle.
3. While maintaining the upright position of the bottle place it in a carrier.
4. Close and latch the carrier.

At the SCC set all affected stations to "Off, Dispatch." Go to each affected station and send the clean-out carrier back to your station (select the station you are sending from). Repeat as necessary to insure cleansing and sterility. Protective gloves, eyewear, and clothing should be worn if the spill is a biologic specimen.

Periodically check the level of the cleaning solution. When there is less than an inch of solution left in the bottle, refill it and towel dry the carrier rubbing bands.

If interzone lines are involved, place the clean-out carrier in the dispatcher of the station nearest the transfer unit which connects to the affected interzone tube. At the SCC use the diagnostics mode to manually dispatch the carrier and route it to the interzone tube. Repeat as necessary.

Disinfect the carpet in each affected station's receiver bin as you would any other carpet.

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.

Remember, use good judgment in cleaning up after any accident. Use the same universal precautions you would apply to any other spill.

System Clean-Out Bottles are available to order on-line using the PTS Carriers Material Order Form: www.translogic-corp.com/PTScarriers.htm.

Training

A very important aspect of utilizing the system to transport specimens is in-service training. It is necessary that all employees who will be using the system be knowledgeable about proper packaging procedures and system use. It is recommended that some means of distributing procedural information be implemented. Monthly nursing in-services are a good opportunity, as are new employee orientations.

In addition to training, simple procedures should be located in each department describing system use and maintenance. Telephone numbers for assistance should also be provided.

All training sessions should include documentation of who attended the training sessions.

Conclusion

This information is provided to encourage proper usage and maximum utilization of the pneumatic tube system. Since each facility is different, individual medical facilities must establish their own policies as they see fit based on sound medical practices.

Use this information as a guideline, but also continue to adhere to procedures established by the Center for Disease Control and Prevention and other such agencies concerning the proper handling of specimens for the maximum protection of the employee.

Regulatory Agency Guidelines - Citations

NOTE:

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

1. CDC: Recommendations for Preventing Transmission of Infection with Human T-Lymphotropic Virus Type III/Lymphadenopathy-Associated Virus in the Workplace. MMWR November 15, 1985 / 34(45);682-6,691-5
2. OSHA Instruction: OSHA Directives - Enforcement Procedures for the Occupational Exposure to Bloodborne Pathogens CPL 02-02-069, November 27m 2001
3. CDC: Biosafety in Microbiological and Biomedical Laboratories (BMBL) 4th Edition, April 1999
4. CLSI: Clinical Laboratory Standards Institute (formerly NCCLS): Protection of Laboratory Workers from Instrument Biohazards and Infectious Disease Transmitted by Blood, Body Fluids and Tissue: Approved Guidelines M29-A2 & A3, December 1997

The following information is provided as an update on the current position held by the various agencies concerning the transport of specimens in a modern pneumatic tube system. The assumptions are that the system is a computer controlled system and has soft handling capabilities. Previous technology systems are questionable in their ability to handle blood specimens safely and reliably.

Excerpts from literature provided by various agencies have been broken out based on their relevancy to the use of pneumatic tube systems. Each excerpt is followed by a recommendation regarding the application of the information to tube system use.

Clinical Laboratory Standards Institute (CLSI - formerly NCCLS)

CLSI Document M29-A

Protection of Laboratory Workers from Instrument Biohazards and Infectious Disease Transmitted by Blood, Body Fluids and Tissue: Approved Guidelines. Section 6.4 Specimen Collection, Handling, and Transportation, pages 21-23.

CLSI recommendation is: Section 6.4.7 "If specimens are transported via a pneumatic tube system, the primary and secondary containers should be tested and shown to be leak proof under the conditions present in the pneumatic tube system."

Center for Disease Control (CDC)

The CDC has maintained the verbal position that as long as universal precautions are adhered to for the protection of the worker, the method of transport is not of consequence. The precautions focus on the handling of the specimen before and during insertion into the pneumatic tube carrier, and the proper packaging of the specimen inside the carrier.

Occupational Safety and Health Administration (OSHA)

CPL 2-2.69 - Enforcement Procedures for the Occupational Exposure to Bloodborne Pathogens: OSHA Instruction CPL 2-2-69 does provide guidelines on the use of pneumatic tube systems. This Instruction, issued by the Office of Health Compliance Assistance, should be used as the guide for compliance.

Sections of both the Final Rule and the Instruction, as well as Swisslog's recommendations to system users, follows:

OSHA Methods of Compliance

10.Paragraph (d)(2)(xiii):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).

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.

Employee Information & Training

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 outside 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

Swisslog Note:

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.

*OPIM = Other Potentially Infectious Materials: performed on blood samples, then the individual containers housing the blood or OPIM do not have to be labeled provided the larger container into which they are placed for storage, transport, shipment, or disposal (e.g., test tube rack) is labeled. Coverage under this definition also extends to blood and tissues of experimental animals that are infected with HIV or HBV.

Recommendation for Swisslog System Users:

1. Because it is impossible to predict with absolute certainty that a primary specimen container will not leak while being transported in a pneumatic tube system, all specimens should be bagged with a secondary device.
2. 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.
3. In a pneumatic tube system, 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 the transparent Zip N' Fold™ 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 using foam liners. Zip N' Fold™ pouches serve to both secondarily contain and immobilize contents.

Use of Gloves

OSHA Instruction CPL 2-2.69

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.

Recommendation for Swisslog System Users:

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

Employee Information and Training

OSHA Instruction CPL 2-2.69

4. 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 background 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.

Recommendation for Swisslog System Users:

All potential users of the pneumatic tube system should be included in the system training session. 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 would need to 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.

Recommendations for Swisslog System Users:

1. Use gloves when packaging and un-packaging specimens from secondary containment system.
2. If transporting or handling the CLOSED, INTACT secondary containment system, such as a Zip N' Fold™, between locations within the laboratory, it is not necessary to use gloves. However, when the secondary containment system is broken, it is required that gloves be worn.
3. 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 biohazard hood, using appropriate personal protective equipment (i.e., glasses, gloves, coat, etc.).
4. See previous procedures for the testing of primary containers and the proper packaging of specimens for transport in a tube system.
5. See previous paragraphs on infection control procedures for the cleaning of a system and system components.

References

Regulatory Agencies

Centers for Disease Control (CDC)
Division of Healthcare Quality Promotion
(404) 639-3407
(800) 311-3435
www.cdc.gov

Occupational Safety and Health Administration (OSHA)
Office of Information and Consumer Affairs
(202) 219-8151
(800) 321-6742
(202) 523-9655 - Publications
www.osha.gov

Clinical Laboratory Standards Institute (CLSI -
formerly NCCLS)
(610) 688-0100
www.clsi.org

ECRI (formerly Emergency Care Research Institute)
www.ecri.org

Institute for Safe Medication Practices (ISMP)
www.ismp.org/default.asp

Leak Prevention Container Manufacturers

BD (Becton, Dickinson and company)
201-847-6800
www.bd.com

Bio-Medical Products Corp
201-543-7434
www.biobank.co.kr

Biomedical Polymers, Inc.
800-253-3684
www.biomedicalpolymers.com

Globe Scientific
800-394-4562
www.globescientific.com

Sarstedt, Inc.
828-465-4000
www.sarstedt.com

Starplex Scientific
Canada: 416-674-7474
www.starplexscientific.com

Web Search Resource

Medical Device Register
www.mdrweb.com

Swisslog Web Resources

Swisslog Healthcare Solutions Division Home Page
www.swisslog.com/hcs-index

Swisslog HCS NA Customer Service Main Page
www.swisslog.com/hcs-support-northamerica

Swisslog HCS Patient Protection Resources Page
www.swisslog.com/hcs-protection

Publications on Line

Guidelines for Environmental Infection Control in Health-Care Facilities
(Published by the Centers for Disease Control)
www.cdc.gov/ncidod/dhqp/gl_environmentinfection.html

The Journal of Hospital Infection
www.harcourt-international.com/journals/jhin/

Infection Control Today
www.infectioncontroltoday.com

Hospital Infection Control Monthly
www.ahcpub.com/products_and_services/?prid=185&spcid=0,10&mtid=5&cetid=0,1,2&pdr=1&clntr=0&clntru=/clinical_trials/?clu=185&mtid=c

Yale New Haven Hospital Infection Control Manual
<http://info.med.yale.edu/ynhh/infection/>

Swisslog Contact Information

Customer Support / Technical Support
Phone: 800.396.9666
Fax: 303.373.7871
Email: orderentry@swisslog.com

Customer Solutions / Sales
Phone: 800.764.0300 or 303.373.7993
Fax: 303.373.7932
Email: healthcare@swisslog.com



For More Information in North America:
Email: healthcare@swisslog.com
USA: 800-764-0300; 303-373-7993
Canada: 877-294-2831; 905-629-2400

Visit Healthcare Solutions at: www.swisslog.com