Injector Pump: Multi-Dosing Set-Up

Medrad® Centargo 24 Hour Injector System

Purpose

To ensure safe practice when multi-dosing contrast media and prevent the transmission of infections to and between patients undergoing contrast enhanced imaging tests

Site Applicability

This procedure applies to Medical Imaging departments within Lower Mainland Medical Imaging (LMMI) across Fraser Health (FH), Providence Health Care (PHC), Provincial Health Services Authority (PHSA), and Vancouver Coastal Health (VCH) where multi-dosing has been approved for the administration of contrast.

Practice Level

Profession	Skill
Medical Radiation Technologists (MRT) certified in: • Radiology Technology • Nuclear Medicine • Radiation Therapy	With education and where the following core competencies and expectation of the role met: • Hand hygiene • Cleaning and Disinfection • Delegation to administer intravenous contrast • Delegation for peripheral intravenous needle insertion • Certification in multi-dosing

Need to Know

1. Only personnel who have been trained and evaluated on their performance of the procedures described in this procedure will be authorized as users of the multi-dosing system.
2. Department supervisors will maintain a record of authorized users of the multi-dosing system that includes the date of training and performance evaluation.
3. The safe practice of multi-dosing and prevention of nosocomial infections is achieved with maximal attention to detail, careful aseptic technique, ensuring the sterile connections of supplies are not contaminated during handling, and appropriate hand hygiene.
4. The multi-dosing system setup must be disposed of at 24 hours after set-up.
5. Punctured contrast bottles will be labeled with the time they were spiked and end use time. Any unused contrast must be disposed of or recycled at 8 hours after opening, or as per manufacturer's recommendations.
6. Contrast medial bottles must be labeled with date, time they were spiked and time of expiry.
7. A new single-use Patient Line with 2 back check valves will be used for every patient. The reuse of this product is strictly prohibited.
8. Authorized multi-dose users are expected to be in compliance with this procedure at all times.
9. Any noted malfunctioning of the system or failure to follow recommended procedures must be reported immediately to the site co-coordinator and/or modality supervisor.
10. In the event any of the multi-dosing system products or open luer lock ends is contaminated by incidental contact: discard contaminated products.

Principles

Multi-dosing may be performed in BC so long as the following conditions set by the Ministry of Health's Health Operations Committee are met:

1. Ensuring that all back check valve systems have been validated by the manufacturer using an independent certified laboratory. Any changes in the use of the back check valve or changes in back check valve manufacturers by the Patient Line manufacturer, must go through the same validation process;
2. Reinforcing the rules of aseptic technique for intravenous contrast medium administration at the Medical Imaging Department by writing a formal procedure, and by training and evaluating personnel on this procedure;
3. Complying with the guideline to puncture contrast medium containers only once;
4. Changing the injector Day Set every 24 hours;
5. Using a new single-use Patient Line with two check valves for every patient;
6. Disposing of any unused contrast medium after 8 hours or after opening the container or according to manufacturer's recommendations.
7. Imaging staff clear on the principles of this procedure and familiar with its procedures, who receive training and performance evaluation from another authorized multi-dosing user, will be recorded as an authorized user of multi-dosing. Only authorized users may multi-dose.

Exceptions

There are no exceptions.

Warnings

1. Patient injury or death could result from air embolism. Ensure all trapped air is expelled from the Day Set and single-use Patient Line.
2. Multiple patient injury or death could result from contamination of the multi-dosing setup due to the transmission of nosocomial infections. Follow proper hand hygiene and aseptic technique during loading, connecting to patients, disconnecting from patients, and reloading.
3. Once loading of the injector has commenced, it must be completed.
4. To minimize air exposure and risk of contamination to the Patient Line Port, a new single-use Patient Line must immediately be inserted after removing the dust cap or a used Patient Line. The system alarms if a new Patient Line is not inserted into the Patient Line Port within 30 seconds.
5. To minimize cross contamination, the Medrad® Centargo injector must be cleaned and disinfected between every patient, especially high touch points.

Procedure: Medrad® Centargo Injector

Supplies:

1. Sterile Medrad® Centargo 24 Hour Injector Day Set (CENT-DS) See Appendix A.
2. Single-Use Patient Line (CENT-PL) See Appendix B
3. Replacement Spike (CENT-RS)
4. Low or iso-osmolar iodinated contrast media labelled and /or approved for multi-dispensing.
5. Normal saline 0.9%
6. Disinfectant wipes for low level cleaning and disinfecting
7. 70% Isopropyl alcohol swab
8. Gloves
9. Alcohol based hand rub (ABHR)

Centargo Injector Initial Setup:

1. Perform hand hygiene
2. Don clean gloves
3. Clean and disinfect (low level) the injector following equipment manufacturers' recommendations, and using a suitable work surface, ensuring a dwell time of 1 to 3 minutes.
4. Doff gloves and then perform hand hygiene
5. Collect supplies listed above and set out on designated work surface that has a clean, uncluttered surface, free of dirty and potentially contaminated supplies.
6. Remove protective cap or caps from top of contrast container(s).

Warning: when loading contrast fluid reservoirs, only use contrast media with the same active pharmaceutical ingredient (API). E.g. Iodixanol and Iohexol. Mixing different API's may alter the composition of the contrast material and cause harm to the patient.

7. Disinfect the contrast container rubber membrane using a friction rub technique with a 70% isopropyl alcohol swab and allow to completely air dry (15 – 30 seconds).
   a) If connecting more than one contrast media bottle, disinfect each rubber membrane using a separate 70% isopropyl alcohol swab

Warning: Repeat Step 7 if at any time during the injector set-up the rubber membrane of the contrast media bottle is inadvertently contaminated.

8. Press the "Unlock Door" button on the left side to open the injector door.
9. Install Day Set into the injector.
10. Depress both "Lock Levers" down together until a "click" is heard. This ensures the Centargo Day Set is securely in place.
11. Position the "Air Detector Tube" into the outlet air detector, then close the orange outlet detector door.
12. Insert contrast spikes adapters from the Day Set into their assigned inlet air detector, until it clicks.
13. Confirm the outlet air detector door is closed, then close the injector door.
15. Remove protective cap from saline bag.
16. Remove dust cap from saline spike and fully insert spike into saline bag spike port.
17. Snap in saline spike adapter from the Day Set into assigned inlet air detector, until it "clicks".
18. Hang saline bag on the far left clamp hook, then pinch saline clamp to raise the saline bag high enough so the saline bag port is not kinked. (See Appendix C)
19. Remove protective cap from middle or far right contrast media spike, ensuring the exposed spike does not become contaminated.

Note: If a spike becomes contaminated, remove the contaminated spike and place in a Sharps container. Insert a new Replacement Spike into the vacant spike adapter.

20. Insert the contrast media spike into the centre of the contrast bottle rubber membrane at a 90 degree angle.
21. Pinch and slide the clamp down to secure the contrast media bottle.
22. Repeat Steps 19 and 21 if using a second contrast media bottle.
23. Select "Injector" from the System Home screen to load contrast media and saline into the Day Set.
24. Select a fluid icon on the Scan Room Unit (SRU)
    a) **Contrast** – select the middle and or right hand icon on the SRU touch screen.
    b) **Saline** – select the far left icon on the SRU touch screen
25. Select the fluid type from the display list or scan the contrast bottle barcode, if applicable.
26. Press "Fill".
27. Allow the injector to complete the auto-load and air purging process.

Note: The Centargo injector auto-loads and purges air from the selected fluid reservoir(s).

Note: The single-use Patient Line is primed automatically once it is inserted into the Patient Line Port. The Patient Line Port light turns blue when the Patient Line is primed and ready.

28. Insert a new single-use Patient Line into the Patient Line Port on the Centargo injector until it "clicks". The system alarms if a new Patient Line is not inserted into the Patient Line Port within 30 seconds.
29. Label contrast container with the time spiked and end use time. Any unused contrast must be disposed of at 8 hours after opening or as per manufacturer's recommendations. Sites participating in the Contrast Recycling Program may empty any unused contrast material in the contrast recycling container.
30. Perform hand hygiene
31. Don clean gloves.
32. Remove the patient end of the single-use Patient Line from the Patient Line Port on the injector and connect to the patient's venous access device, maintaining sterility of the exposed end.

Note: If a single-use Patient Line becomes contaminated, discard the contaminated Patient Line. Open a new single-use Patient Line and connect to the Patient Line Port on the injector.

33. Doff gloves.
34. Perform hand hygiene.

Discharging a Patient after CT Examination when working alone:

1. Perform hand hygiene.
2. Don clean gloves.
3. Disconnect the distal end of the single-use Patient Line and place end in a trash receptacle.

Warning: Never cut the single-use Patient Line as this results in contamination of the entire system

4. Discharge patient from the CT area.
5. Doff gloves.
6. Perform hand hygiene.
7. Don clean gloves.
8. Clean and disinfect (low level) injector after each patient following equipment manufacturers' recommendations, ensuring a dwell time of 1 to 3 minutes.
9. Disconnect the proximal end of the single-use Patient Line from the Patient Line Port on the injector and dispose of the entire tubing into the trash receptacle.
10. Immediately connect a new Patient Line to the Patient Line Port on the injector to minimize air exposure. The system alarms if a new Patient Line is not inserted into the Patient Line Port within 30 seconds.

Warning: Use caution when removing the Patient Line from its packaging as each end is exposed. An audible and visual alert will notify staff if the Patient Line Port is exposed more than 30 seconds

11. Doff gloves.
12. Perform hand hygiene.

Reloading the Centargo Injector between Patients:

1. Perform hand hygiene
2. Don clean gloves
3. Clean and disinfect (low level) the injector after each patient following equipment manufacturers' recommendations, ensuring a dwell time of 1 to 3 minutes.
4. Doff gloves
5. Perform hand hygiene.
6. Disconnect the proximal end of the single-use Patient Line from the Patient Line Port on the injector and dispose of the entire tubing into the trash receptacle.
7. Immediately connect a new single-use Patient Line to the Patient Line Port on the injector to minimize air exposure. Ensure the distal end remains on until it is time to connect to the patient.
8. In the event any of the open luer lock ends is contaminated by incidental contact: discard contaminated products and replace with new.
9. Perform hand hygiene

Removing or Replacing Spikes:

1. Perform hand hygiene.
2. With one hand, depress levers on either side of the spike adapter (see Appendix D)
3. While depressing the levers, use the opposite hand to remove the spike and discard into the appropriate trash receptacle or Sharp's container
4. Insert a new Replacement Spike into the Spike Adapter, ensuring the orange vent on the spike is aligned with the indent on the back of the Spike Adapter.

Adding a new contrast bottle within 24 hours:

1. Perform hand hygiene.
2. Select the most appropriate size of contrast bottle with consideration for the volume required, number of patients and the time remaining before the 24 hour Day Set expires.

3. Label contrast container with the time spiked and end use time. Any unused contrast must be disposed of or recycled at 8 hours after opening or as per manufacturer's recommendations.
4. Inspect contrast container to ensure correct product and expiration date, color, clarity and the presence of any foreign bodies.
5. Remove cap from top of new contrast bottle.
6. Disinfect the contrast container rubber membrane using a friction rub technique with a 70% isopropyl alcohol swab and allow to completely dry (15 – 30 seconds)
7. Raise the contrast clamp to remove empty contrast bottle from the contrast spike adapter.
8. Immediately insert spike fully into new contrast bottle at a 90 degree angle without twisting, making sure not to contaminate the sterile spike or rubber membrane.

Add a new saline bag within 24 hours:

1. Perform hand hygiene.
2. Select the most appropriate size saline bag based on estimated volume required for the remaining portion of 24 hours.
3. Inspect saline container for correct product and expiration date, color, clarity and the presence of any foreign bodies.
4. Pinch saline clamp to lower empty saline bag and remove.
5. Remove spike adapter from saline inlet air detector and then remove the spike from the empty saline bag.
6. Remove protective cap from port on the bottom of new saline bag. Discard empty saline bag into an appropriate waste receptacle.
7. Immediately insert spike fully into new saline bag spike port to minimize air exposure to spike, making sure not to contaminate the sterile end.
8. In the event any of the sterile connections is contaminated by incidental contact: discard contaminated products and insert a new Replacement Spike (CENT-RS). See Removing or Replacing Spikes.

At 24 hours after setup:

1. Perform hand hygiene
2. Don clean gloves.
3. Press "Eject Day Set" on the SRU touchscreen.

Warning: Do not re-spike contrast or saline containers across multi-dosing set-ups

4. Press "Yes" to confirm. The pistons in the fluid reservoirs retract.
5. Open the injector door
6. Lift the lock levers
7. Open the outlet air detector door and remove the Outlet Air Detector tubing.
8. Close the outlet air detector door.
9. Remove Day Set from injector.
10. Remove the used spikes from the Spike Adapter and discard in Sharps container.
11. Dispose of or recycle any unused contrast media in the appropriate container.
12. Discard used Day Set into an appropriate trash or recycling container.
13. Clean and disinfect (low level) a suitable work surface and injector head using the two step process following equipment manufacturers' recommendations, ensuring a dwell time of 1 to 3 minutes.

14. Doff gloves
15. Perform hand hygiene.
16. Follow Centargo Injector Initial Set-Up to install new Day Set.

Cleaning and Disinfecting (low level):

Cleaning and Disinfecting between Patients: Clean and disinfect the injector touch screen and other high touch points between each patient, including any contrast drips or spills.

Ensure the SRU Screen Lock (Appendix E) is activated to prevent accidental injector actions.

1. **Cleaning:** Obtain a wipe from the packaging, ensuring the wipe itself is damp. Using a rubbing motion, scrub the surface of equipment or device with the wipe. The friction generated from the scrubbing will remove any foreign matter and debris. It is important to clean from the cleanest area to the dirtiest. More than one wipe may be used for this step. Ensure the surface remains damp throughout this step.
2. **Disinfection:** Immediately following step 1, remove a new wipe from the packaging, again ensuring that it is damp. Using a back and forth or up and down motion, wipe the surface of the equipment. Allow the item to dwell or air dry for 1-3 minutes, as listed by the manufacturer which can be found on the packaging. In order to be effective, air dry or dwell time must be maintained.

Piston Cleaning

Piston Cleaning should be completed once every 24 hours or when the Day Set is replaced.

1. Select the “Home” button on the top left are of the touchscreen.
2. Select the “Injector” section on the left side of the touchscreen.
3. Select “Piston Clean Area”.
4. Select the icon with the three (3) up (↑↑↑) arrows. The pistons will rise from their base position.
5. Power off the injector once the pistons have risen.
6. Clean and disinfect (low level) the injector pistons using the two step process following equipment manufacturers’ recommendations, ensuring a dwell time of 1 to 3 minutes.
7. Power on the injector.
8. Select the “Home” button on the top left are of the touchscreen.
9. Select the “Injector” section on the left side of the touchscreen.
10. Select “Piston Clean Area”.
11. Select the icon with the three (3) down (↓↓↓) arrows. The pistons will lower to the base position.
12. Follow Centargo Injector Initial Set-Up to install new Day Set.

Training and Performance Evaluation:

1. All potential multi-dosing users must read and be familiar with this clinical practice standard.
2. The modality regional practice lead will provide initial clinical practice standard in-servicing, training, performance evaluation, and authorization of key users at each multi-dosing site.
3. Key users will provide on-going training, performance evaluation and authorization of remaining staff. A sample authorization record is included in Appendix F.

4. The modality supervisor will maintain a record of authorized users of the multi-dosing system that includes the date of training and performance evaluation on the LMMI CT Multi-Dosing Quality SharePoint Site

Related Documents

LMMI

Bayer_Covid19_Disinfecting_Guide_Interactive
Multi-Dosing Competency Assessment Tool
LMMI CT Multi-Dosing Quality SharePoint Site
Contrast Recycling Program

FHA

Best Practice Guidelines for Cleaning, Disinfection and Sterilization of Critical and Semi-critical Medical Devices (2011)
FHA Hand Hygiene Policy (2018)
Infection Control Hand Hygiene Practice Guideline

PHC

Low Level Cleaning and Disinfection (Infection Control)
Point of Care Risk Assessment – IPAC Best Practice Guideline (healthcarebc.ca)
PHC Hand Hygiene Policy
How to Hand Rub
Video - How to Hand Rub
How to Hand Wash
Video - How to Hand Wash

PHSA

PHSA Hand Hygiene Policy
How to Hand Rub
How to Hand Wash

VCH

Low Level Cleaning Disinfecting (Infection Control) March 2020
VCH Hand Hygiene Policy
How to Hand Rub
How to Hand Wash

Other

Your 5 Moments for Hand Hygiene (World Health Organization)

References

Ministry of Health letter to Dr. David Ostrow Re: Safe Administration of Computed Tomography Contrast Media to Patients, 882388, June 17, 2011

Provincial Infection Control Network (PICNet) of British Columbia. An Evaluation of Multi-Use Contrast Media Injector Sets and Vials for Computerized Tomography in BC Hospitals: A Discussion Paper, Version: Final, March 2011

Government of Canada website. Accessed 2023.01.13. https://www.canada.ca/en/health-canada/services/drugs-health-products/compliance-enforcement/information-health-product/drugs/active-pharmaceutical-ingredients-questions-answers.html

Medrad Centargo CT Injection System, Operation Manual, Catalog # CE 2797 (240) 86342812 ENG. Rev.D Medrad Inc. 2021.06.10. Courtesy of Medrad Inc.

Medrad Centargo CT Injection System, Operation Manual, Catalog # CE 2797 (240) 88766512 2022.05.29

Vancouver Coastal Health. Acute Care Resource Manual (2022) http://ipac.vch.ca/resource-manuals/acute-care-resource-manual

FH Pulse, Infection Control Manual http://fhpulse/clinical_programs/residential_care_and_assisted_living/resources/Pages/InfectionControlManual.aspx

Capital Health Regional Infection Prevention and Control Program, Best Practice Recommendation on Infection Prevention and Control Criteria for Use of Multi-dosing Injector System for Low Osmolar Intravenous Contrast Solution Infusion used in Diagnostic Imaging Procedures.

Protocol for Multi-Dosing with Medical Systems Products, CT Scanning Procedures – Grey Nuns Hospital.

Centres for Disease Control and Prevention, Healthcare Associated Infections (2020) https://www.cdc.gov/hai/prevent/resource-limited/high-touch-surfaces.html

Definitions

"Aseptic Technique" means a set of practices performed to prevent the transmission of germs from a contaminated site to a susceptible site. These techniques decrease microbe counts and assure that cross-contamination does not occur.

"Multi-dosing" means the economic and efficient practice of administering contrast medium and/or saline multiple patients using a common injection system, single use patient lines with 2 back-check valves, and an automatic injector. Multi-dosing nosocomial infections are prevented by a single-use patient lines with two sprung back check valves that effectively separates the fluid reservoirs from the serially connected patients. This protective measure prevents any biological matter from transferring from the patients to the system and allows multi-dose and/or single-dose containers and single-use syringes to be used across multiple patients.

"Dwell time or **contact time"** means the amount of time the disinfectant needs to remain wet on the surfaces to properly disinfect.

"Active Pharmaceutical Ingredient" means the substances in drugs that are responsible for the beneficial health effects experienced by consumers. The active ingredient in a pharmaceutical drug is called an active pharmaceutical ingredient (API).[3]

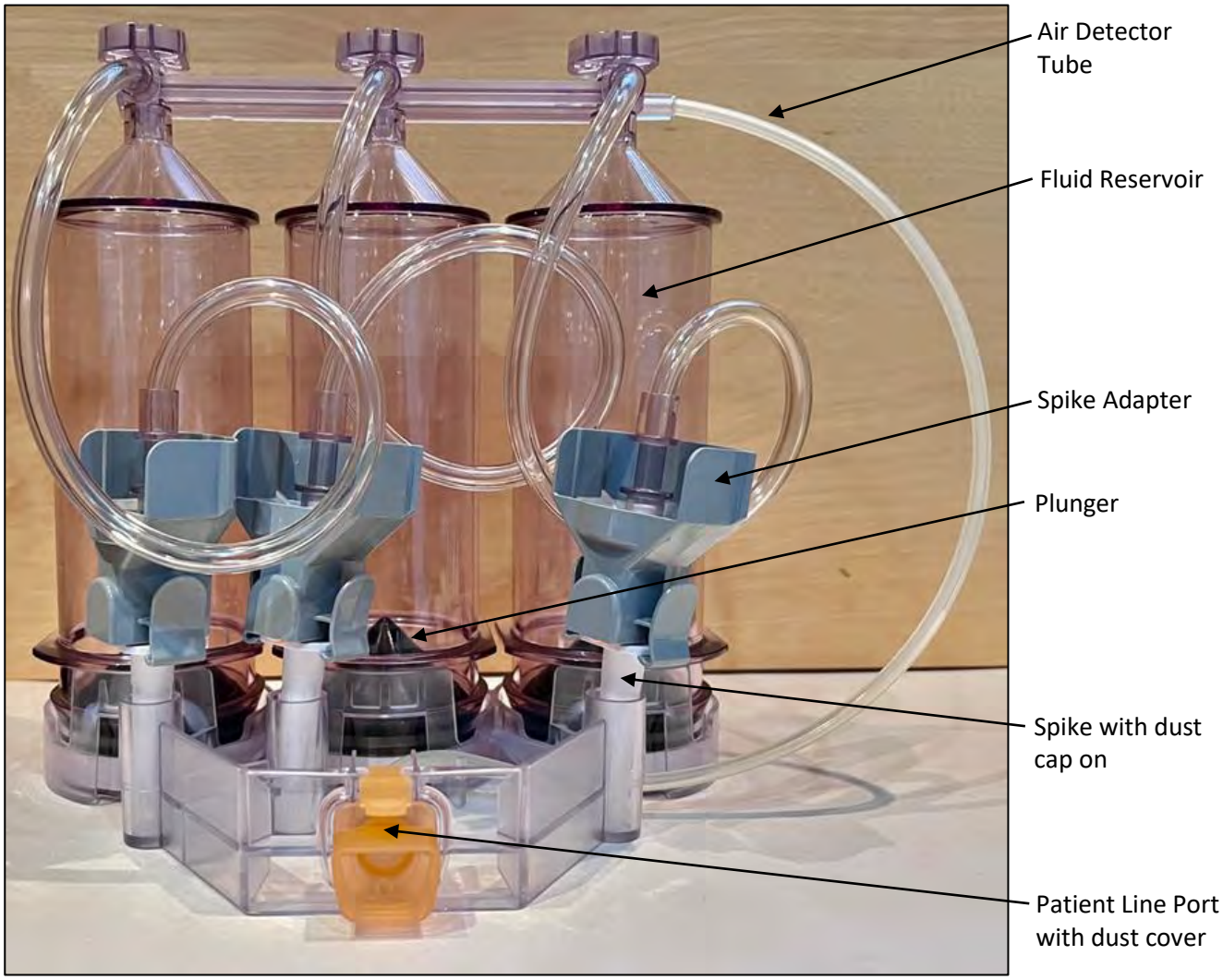
"Recycled" refers to General Electric Healthcare has a contrast recycling program and Lower Mainland Medical Imaging sites are participating in this to reduce our impact to the environment. For more information on this program, contact your local GEHC Account Manager or GEHC Customer Service at 1 800 387 7146.

"High Touch Points" means surfaces or objects on the injector that are routinely touched during a patient interaction. Examples of high touch points include but not limited to handles, touch screen, pinch clamps, spike adapters, and Patient Line Port.

Appendices

- Appendix A: Medrad Centargo 24 Hour Day Set (Multi-Patient)
- Appendix B: Single-Use Patient Line
- Appendix C: Pinch Clamp for Saline Bag
- Appendix D: Spike Removal from Spike Adapter
- Appendix E: SRU Screen Lock
- Appendix F: Medical Imaging Multi-Dosing Certificate of Competence

Appendix A: Bayer Centargo 24 Hour Day Set (multi-patient)

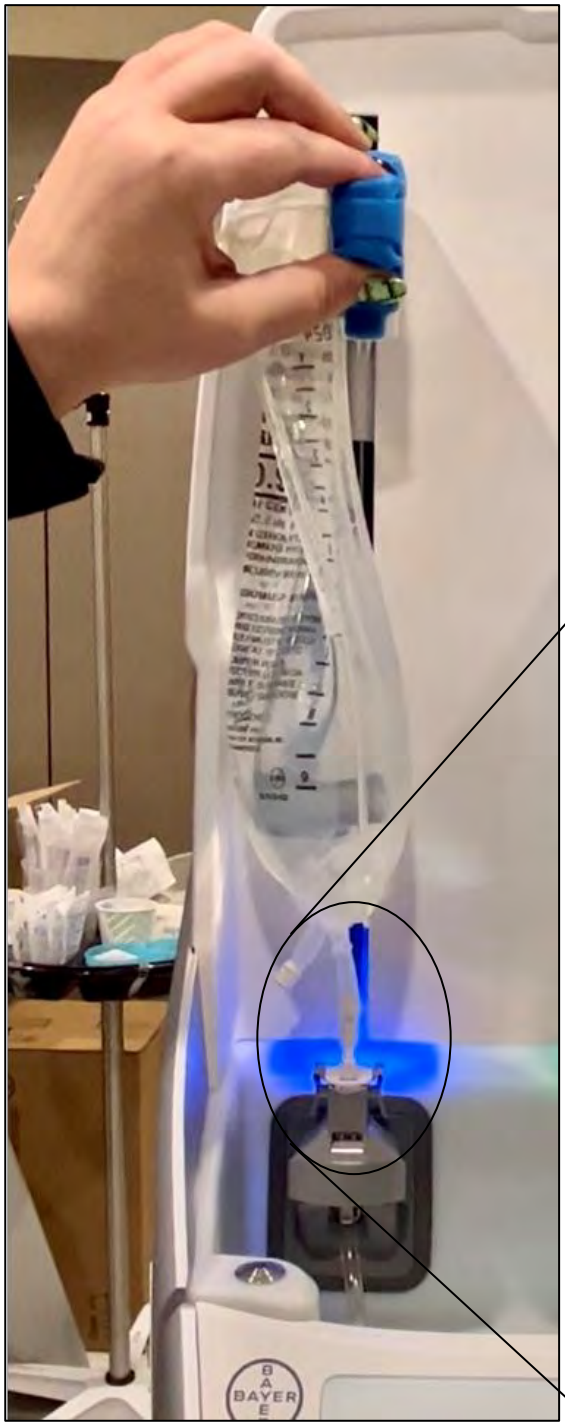


Appendix B: Single Use Patient Line

Single-Use Patient Line

Appendix C: Pinch Clamp for Saline Bag

Pinch Clamp to secure saline bag and keep saline bag port from kinking.

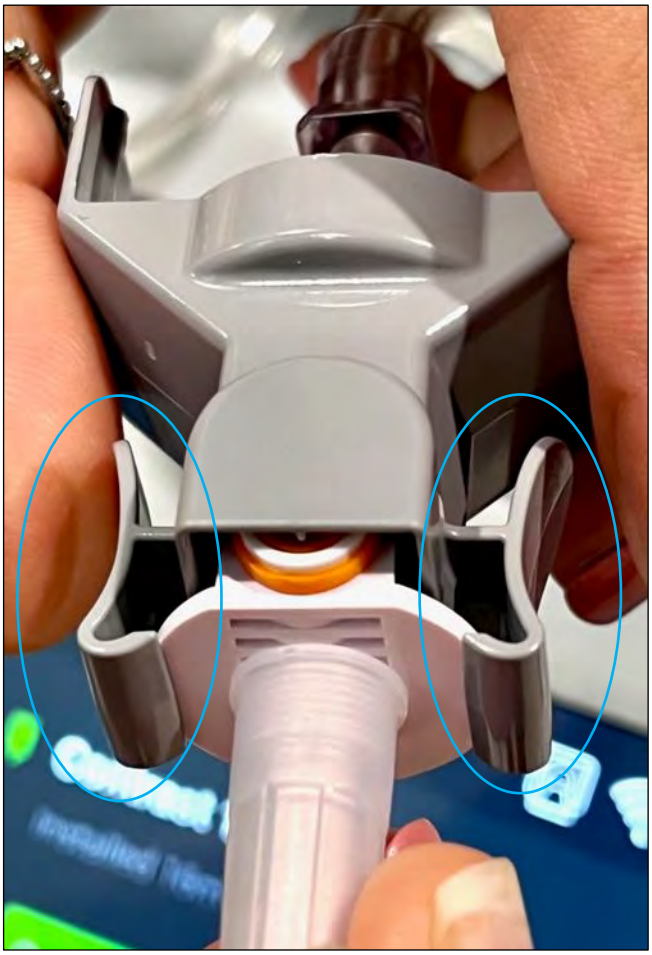


Saline bag spike port must be straight to allow proper loading of saline into fluid reservoir

Appendix D: Spike Removal from Spike Adapter

Removing Spike from spike adapter

Depress both levers (blue ovals) on either side of the spike adapter to remove the spike



Appendix E: Screen Lock for Bayer Centargo Injector

SRU Lock Screen button on touchscreen (yellow circle)

Appendix F: Medical Imaging Multi-Dosing Certificate of Competency

MEDICAL IMAGING

Record of training, performance evaluation, and authorization to Multidose

_____ has read and understands the *Injector Pump: Multi-Dosing Set-Up* for Bayer 24 Hour Centargo Injector Set-Up. Through training and performance evaluation this user has been deemed authorized to multi-dose.

_____ _____

User Signature Signature of Trainer / Evaluator

Date of Training: _____

Date of Authorization: _____

COPY TO: Medical Imaging Site Coordinator or Modality Supervisor responsible for Multi-dosing

Effective Date:	17-AUG-2023			
Posted Date:	17-AUG-2023			
Last Revised:	17-AUG-2023			
Last Reviewed:	17-AUG-2023			
Approved By:	Medical Imaging Executive Committee			
	CT Professional Practice Committee			
Owners:	CT Regional Practice Lead, LMMI			
Revision History:	**Version**	**Date**	**Description/ Key Changes**	**Revised By** (Name and Position)
	1.0	17-AUG-2023	Initial Release	Sean West, CT RPL