Injector Pump: Multi-Dosing Set-Up

Bayer 12 Hour Syringe 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 and/or Nuclear Medicine	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 time will be noted on the contrast syringe such that the complete multi-dosing system including syringes, multi-dosing transfer set/start-up kit, and connected contrast and saline containers will be disposed of at 12 hours after setup.
5. Punctured containers of contrast will be labeled with the time they were spiked and end use time. Any unused contrast must be disposed of at 8 hours after opening.
6. Contrast medial bottles must be labeled with date, time they were spiked and time of expiry.
7. A new single use extension set with 2 back check valves will be used for every patient. <u>The reuse of this product is strictly prohibited.</u>

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 extension tubing 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 syringe and the tubing connecting the container to the injector every 12 hours;
5. Using new extension set tubing with two spring check valves for every patient;
6. Disposing of any unused contrast medium according to manufacturer's recommendations within a maximum of 8 hours after opening the container.
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. Expel all trapped air from the syringe, transfer set, and extension tubing.
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. Incomplete loading of syringes that are left unattended with exposed luer lock connections must be assumed contaminated and discarded.

Procedure: Dual Head Injector

Supplies:

1. Sterile Bayer 12 Hour Injector Syringe Kit (SDS MP1) See Appendix A.
2. Single-Patient Tubing Set (SPD 250)
3. Low or iso-osmolar iodinated contrast media labelled and /or approved for multi-dispensing.
4. Normal saline 0.9%
5. Disinfectant wipes for low level cleaning and disinfecting
6. 70% Isopropyl alcohol swab
7. Gloves
8. Alcohol based hand rub (ABHR)
9. Indelible marker

Dual Head Injector (Medrad Stellant) Initial Setup:

1. Perform hand hygiene
2. Don clean gloves
3. 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.
4. Doff gloves
5. Perform hand hygiene.
6. Collect supplies listed above and set out on designated work surface that has a clean, uncluttered surface, free of dirty and potentially contaminated supplies.
7. Ensure both pistons are fully retracted into base of the injector.
8. Open the injector syringes package and install syringes (2) in the base of the injector.
9. Allow the injector to automatically advance the pistons to expel all air in both syringes.
10. Remove the protective luer lock caps from the syringes, maintaining the sterility of all connections.
11. Remove the protective luer cap from the first transfer set (1) and connect to the contrast syringe, making sure not to contaminate the sterile ends.
12. Remove the protective luer cap from second transfer set (1) and connect to the saline syringe, making sure not to contaminate the sterile ends.
13. Remove the luer lock cap from the short end of Multi-Patient Tubing Set (4) and connect to contrast side of the transfer set.
14. Remove the luer lock cap from the long end of the Multi-Patient Tubing Set (4) and connect to the saline side of the transfer set.
15. Select the most appropriate size of contrast bottle with consideration for the volume required, number of patients and the time remaining before the 12 hour syringe set expires.
16. Label contrast container with the time spiked and end use time. Any unused contrast must be disposed of 8 hours after opening.
17. Remove cap from top of contrast bottle.

18. 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).

> **Warning:** If the rubber membrane of the contrast media bottle is touched accidently, perform additional disinfecting of the rubber membrane using a friction rub technique with a 70% isopropyl alcohol swab and allow to completely dry (15 to 30 seconds)

19. Remove cap from spike and insert fully into contrast bottle at a 90 degree angle (to prevent coring the rubber stopper) into the centre of the stopper.
20. Remove protective cap from bottom of saline bag port.
21. Remove protective cap from saline transfer set spike and insert fully into saline bag spike port.
22. Remove male luer lock cap from multi-patient transfer set.
23. Open a new Single-Patient Tubing Set (5) with 2 back check valves, remove the female luer lock cap, and connect to the Multi-Patient Tubing Set (4), ensuring the male luer lock cap remains on until it is time to connect to the patient.
24. With the contrast injector head pointing up, fill contrast and saline syringes.
25. With the contrast injector head pointing up, expel any residual air bubbles from the syringes and prime the Single-Patient Tubing Set with saline.

> **WARNING – Residual Air:** Do not apply blunt force using a hand or instrument to the syringe to free residual air bubbles. This action may damage the injector or syringes. Reverse the piston 3 – 5 mL, then gently rock the injector head on the pivot with the syringe pointing up to gather and accumulate the small bubbles.

26. To ensure the next user knows the extension line and injector is ready for use:
    a) Tip the injector head down
    b) Position the Single-Patient Tubing Set (see Appendix B):
        i. Draped over the Multi-Patient Tubing Set (4) with the luer lock cap attached
        ii. Placed on a hook (labelled with “Clean”) with the luer lock cap attached
    c) Activate the “Check for Air” button on the injector head (turns blue).
27. In the event any of the open luer lock ends is contaminated by incidental contact: discard contaminated products.
28. For the Multi-dosing syringe and tubing configuration, document on the Expiration Label (3) and attach to the Multi-Patient Tubing Set (4):
    a) injector syringe start and end use times.
    b) technologist initials
29. Perform hand hygiene.
30. Inspect the patient’s venous access device for presence of blood or body fluid contamination.
31. Don gloves if venous access device is contaminated with blood or body fluids.
32. Remove the male luer lock cap from the Single-Patient Tubing Set and connect it to the patients’ venous access device for contrast injection.
33. Doff gloves.
34. Perform hand hygiene

Discharging a Patient after CT Examination:

1. Perform hand hygiene
2. Inspect venous access device for presence of blood or body fluid contamination.
3. Don clean gloves if venous access device is contaminated with blood or body fluids.
4. Disconnect the distal end of the Single-Patient Tubing from the Multi-Patient Tubing Set and place end in a trash receptacle

> **Warning**: Do not cut the Single-Patient Tubing Set as this results in contamination of the entire system

5. Discharge patient from the CT area
6. Doff gloves (if wearing)
7. Perform hand hygiene
8. Don clean gloves
9. Clean and disinfect (low level) injector head using the two step process following equipment manufacturers' recommendations, ensuring a dwell time of 1 to 3 minutes.
10. Disconnect the proximal end of the Single-Patient Tubing from the Multi-Patient Tubing Set and dispose of the entire tubing into the trash receptacle
11. Doff gloves
12. Perform hand hygiene
13. Open a new Single-Patient Tubing Set with 2 back check valves, remove the female luer lock cap, and connect to the Multi-Patient Tubing Set, ensuring the male luer lock cap remains on until it is time to connect to the patient.

Reloading the Dual Head Injector between Patients:

1. Perform hand hygiene
2. Don clean gloves
3. Clean and disinfect (low level) the injector head using the two step process following equipment manufacturers' recommendations, ensuring a dwell time of 1 to 3 minutes.
4. Doff gloves
5. Perform hand hygiene.
3. Open a new Single-Patient Tubing Set with 2 back check valves, remove the female luer lock cap, and connect to the Multi-Patient Tubing Set, ensuring the male luer lock cap remains on until it is time to connect to the patient.
4. With the contrast injector head pointing up, re-fill contrast and saline syringes as required.
5. With the contrast injector head pointing up, expel any residual air bubbles from both syringes and prime the Single-Patient Tubing Set with saline.

6. To ensure the next user knows the Single-Patient Tubing Set and injector is ready for use:
    a) Tip the injector head down,
    b) Position the Single-Patient Tubing Set (see Appendix B):
        i. Draped over the Multi-Patient Tubing Set (4) with the luer lock cap attached
        ii. Placed on a hook (labelled with "Clean") with the luer lock cap attached
    c) Activate the "Check for Air" button on the injector head.
7. In the event any of the open luer lock ends is contaminated by incidental contact: discard contaminated products.
8. Perform hand hygiene

Adding a new contrast bottle to multi-dosing syringe set-up within 12 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 12 hour syringe set expires.
3. Label contrast container with the time spiked and end use time. Any unused contrast must be disposed of 8 hours after opening.
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. Remove spike from existing contrast container and immediately following, insert spike fully into new contrast bottle at a 90 degree angle, making sure not to contaminate the sterile end.

Adding a new saline bag to multi-dosing syringe set-up within 12 hours

1. Perform hand hygiene.
2. Select the most appropriate size saline bag based on estimated volume required for the remaining portion of 12 hours.
3. Inspect saline container for ensure correct product and expiration date, color, clarity and the presence of any foreign bodies.
4. Remove protective cap from port on the bottom of new saline bag.
5. Remove spike from existing saline bag and immediately following, fully insert spike from multi-patient fill set into saline bag spike port, making sure not to contaminate the sterile end.
6. In the event any of the sterile connections is contaminated by incidental contact: discard contaminated products.

At 12 hours after setup:

1. Perform hand hygiene
2. Inspect syringes and tubing for presence of blood or body fluid contamination.
3. Don gloves if syringe set-up is contaminated with blood or body fluids.
4. Discontinue entire setup and dispose of any unused contrast and/or saline.

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

5. 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.
6. Doff gloves
7. Perform hand hygiene.

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 C.
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 Lower Mainland Quality SharePoint Site.

Cleaning and Disinfecting (low level):

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.

Resources

LMMI

Bayer_Covid19_Disinfecting_Guide_Interactive
Multi-Dosing Competency Assessment Tool
Lower Mainland Quality SharePoint Site

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)
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)
Bayer MEDRAD Stellant Videos

Definitions

Aseptic Technique: is 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: the economic and efficient practice of administering contrast medium and/or saline multiple patients using a common injection system, single use valved extension sets, and an automatic injector. Multi-dosing nosocomial infections are prevented by a single-use valved extension set 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, is the amount of time the disinfectant needs to remain wet on the surfaces to properly disinfect.

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

Medrad Stellant Injection System, Operation Manual, Catalog # SOM 700 EN.201071 Rev. D. 2014, Medrad Inc.

Medrad Stellant Injection System with Certegra, Operation Manual, Catalog 85539213 Rev. I February 25, 2019
https://www.radiology.bayer.com/sites/g/files/vrxlpx8576/files/2020-08/60723581_RevE.pdf

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.

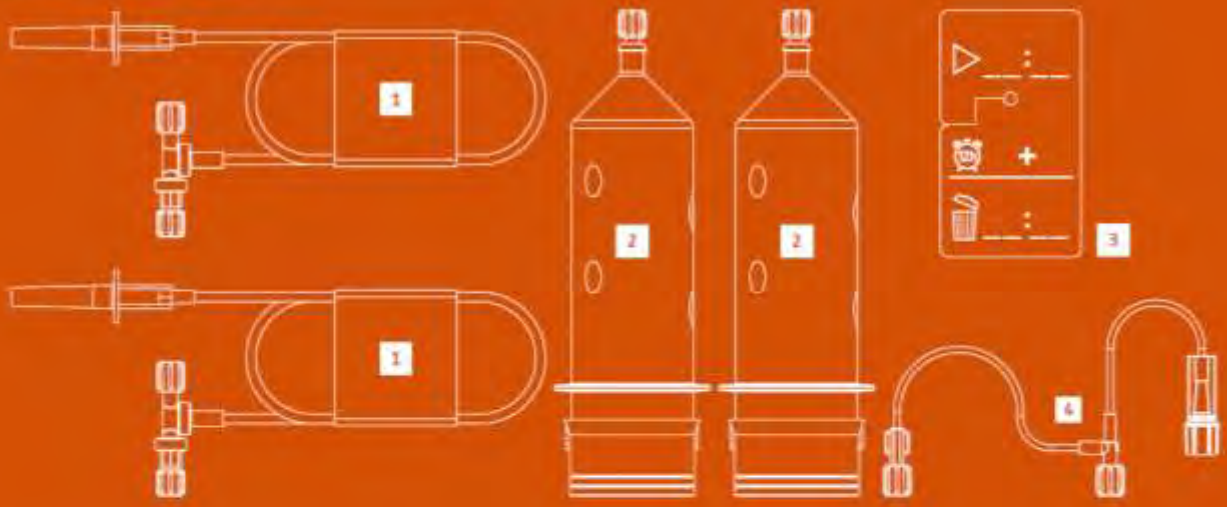
Appendices

- Appendix A: Bayer 12 Hour Multi-Patient Syringe System
- Appendix B: Pictures of Single-Patient Tubing Set draped over the Multi-Patient Tubing Set and on Hook
- Appendix C: LMMI Multi-Dosing Certificate of Competence

APPENDIX A: Bayer 12 Hour Multi-Patient Syringe System

Technical Data
Stellant Multi-Patient Kit and Single Patient Disposable

Multi-Patient Kit
Catalog Number: SDS MP1



Single Patient Disposable
Catalog Number: SPD 250

Item	Component	Material	Other Information
1	2 Multi-Patient Transfer Sets (MPTS)	Polyvinyl Chloride (PVC), Acrylonitrile butadiene styrene (ABS), Polystyrene (PS), Polycarbonate (PC), High Density Polyethylene (HDPE), Polypropylene (PP), Silicone Rubber	Use life: 12 hours Length: 115 cm Two check valves per MPTS
2	2 Syringe Assemblies (includes plunger)	Polyester (PET), PC, PP, Santoprene, Silicone	Use life: 12 hours Capacity: 200 mL
3	Expiration Label	Coated Vinyl	None
4	Multi-Patient Tubing Set (MPTS)	PVC, PC, PP	Use life: 12 hours
5	Single-Patient Tubing Set (SPTS)	PVC, Polycarbonate, Silicone Rubber, Silicone	Use life: 1 patient Length: 250 cm when fully extended Two check valves

General Information	
Shelf Life: 4 years	Not made with Natural Rubber Latex
Sterilization Method: Radiation	SDS MP1 Primary Packaging: Polystyrene with Tyvek® cover
Pressure rated to 350 psi	SPD 250 Primary Packaging: Polyethylene with Tyvek® cover
Di(2-ethylhexyl)phthalate (DEHP) Free	Secondary Packaging: Cardboard Shipper
Non-Pyrogenic fluid path	

APPENDIX B:

Single-Patient Tubing Set draped over the Multi-Patient Tubing Set

Single-Patient Tubing Set placed over a Hook

APPENDIX C: LMMI Multi-Dosing Certificate of Competence

MEDICAL IMAGING

Record of training, performance evaluation, and authorization to Multidose

_____ has read and understands the *Multi-dosing with Injector Pumps Procedure* for Bayer 12 Hour Syringe System. 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:	20-DEC-2022			
Posted Date:	20-DEC-2022			
Last Revised:	20-DEC-2022			
Last Reviewed:	22-SEP-2022			
Approved By:	Lower Mainland Medical Imaging Executive Committee			
	07-SEP-2022			
Owners:	CT Regional Practice Lead, LMMI			
Revision History:	**Version**	**Date**	**Description/ Key Changes**	**Revised By** (Name and Position)
	1.0	27-SEPT-2011	Multi-Dosing with CT Injector Pumps	Bruce Hartnett
	2.0	07-SEP-2022	Revision to reflect 12hr Bayer system Include Feedback from PHC IPAC	Sean West, CT RPL
	3.0	13-OCT-2022	Revisions to incorporate IPAC observational feedback and Appendix 2 image Revisions to reflect site practice	Sean West, CT RPL
	4.0	20-DEC-2022	Revision to add a safety warning Renamed Appendices	Sean West, CT RPL