

Injector Pump: Multi-Dosing Set-Up: Bracco EmpowerCTA+

Purpose

To ensure safe practice when multi-dosing contrast media in order to prevent the transmission of infection to and between patients undergoing contrast enhanced imaging exams.

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).

Practice Level

| Profession | Skill |
|---|---|
| Medical Radiation Technologists (MRT's) certified in Radiology Technology and Nuclear Medicine. | With education and where the following core competencies and expectation of the role met: <ul style="list-style-type: none"> • Hand hygiene • Delegation to administer intravenous contrast • Delegation for peripheral intravenous insertion • Certification in multi-dosing |

Need to Know

1. Only personnel who have been trained and evaluated on their performance of the procedure described 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. Contrast media bottles will only be punctured once.
5. The time the multi-dosing system is setup 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 within 4 hours after setup. (Note: Health Canada has approved the MUST kit PLUS CT for 12 hours based on results of vendor submitted bacterial and viral load testing).
6. A new single patient tubing with 2 anti-backflow valves will be used for every patient. The reuse of this product is strictly prohibited.
7. Punctured containers of contrast will be labeled with the time they were spiked and any unused portion must be disposed of at twelve (12) hours after opening.

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8. The expectation is that authorized users of multi-dosing will 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.

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 syringes and multi-patient transfer set connecting the container to the injector every 12 hours.
5. Using new extension set tubing with two backcheck valves for every patient.
6. Disposing of any unused contrast medium within a maximum of four (4) hours after opening the container.
7. Imaging staff clear on the principles of this procedure and 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 set-up and loading procedure 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.
4. Disconnect the tubing from the contrast and saline syringes before retracting the syringe plungers. Failure to do so will create a vacuum within the syringes and could damage the injector.

Procedures

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Dual Syringe Injector

Materials:

1. BRACCO EmpowerCTA® + contrast injector system
2. BRACCO MUST® Kit PLUS CT (Syringe kit)
3. BRACCO single use patient line (included with MUST® kit)
4. Iodinated Contrast Media (select most appropriate size based on number of CEM exams)
5. Normal Saline 0.9% (select most appropriate size based on number of CEM exams)
6. Gloves
7. Indelible marker

EmpowerCTA+ Injector Setup:

1. Clean and disinfect injector head using approved cleaning agents.
2. Perform hand hygiene.
3. Hang contrast bottle and saline bag.
4. Position injector head to point up for syringe installation.
5. Open the contrast and saline syringe doors.

Note: if syringe doors do not open, the rams may not be fully retracted into the base of the injector. Select "Replace Syringes" on the injector console to reset the rams.

6. Using aseptic technique, insert the syringes and then close the syringe doors.
7. Press and hold:
 - a) "Dual Initialize" icon for both syringes on the injector controller until you hear a beep and the syringes are initialized
 - b) "Initialize" icon on the injector controller until you hear a beep and the syringe is initialized.
8. Injector rams automatically purge the air from the syringes and tubing.
9. Remove the luer lock caps from both syringes, maintaining the sterility of all connections.
10. Open the MUST® Kit Plus CT transfer set.
11. Remove the female luer caps and connect to the male end of the contrast and saline syringes, making sure not to touch the sterile ends.
 - a) Connect yellow tubing to contrast media syringe
 - b) Connect tubing with blue line to saline syringe.
12. Remove cap from the coiled tubing of the transfer set Y-line.
13. Remove female luer lock cap from a new single use patient line with 2 anti-backflow valves and connect to the distal end of the coiled transfer set Y-line. Except when purging the line of air, a protective luer lock cap must be in place at the distal end of the extension set until it is time to connect to the patient
14. Remove cap from top of contrast bottle. (Try to select the most appropriate contrast bottle size based on estimated volume of contrast patients within the upcoming 4 hours.)
15. Disinfect the contrast container membrane using a friction rub technique with a 70% alcohol swab and allow to completely dry (15 - 30 seconds).

16. 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.
17. Remove cap from bottom of saline bag port.
18. Remove cap from spike and insert fully into saline bag spike port.
19. With the contrast injector head pointing up, fill contrast and saline syringes using one of the following options.
 - a) Protocol Fill (pre-programmed volumes)
 - b) Dual Fill (manually set volumes for both contrast and saline)
 - c) Manual fill (fill contrast and saline using the arrow keys on the injector module)
20. With the contrast injector head pointing up, remove protective male luer lock cap then expel any residual air bubbles from the syringe and prime the single use patient line.

Note: To perform a test injection, you must clear the line of contrast first, followed by saline.

21. Replace with sterile red dead end luer lock cap
22. To arm the injector, tilt the head of the injector down.
23. To ensure the next user knows the extension line and injector is ready for use:
 - a) Tip the injector head down.
 - b) Leave the male luer lock cap of the single use patient line with 2 anti-backflow valves attached and in place until connecting to the patient.
 - c) Position the single use patient line with 2 anti-backflow valves into either of the two the tubing channels at the base of the syringe. See [Appendix I](#).
24. In the event any of the open luer lock ends becomes contaminated by incidental contact, discard contaminated products.
25. Label the syringe with the time of setup and technologists' initials.
26. Remove the male luer lock cap from the single use patient line immediately before connecting to the patient's peripheral vascular access device for contrast injection.
27. Perform hand hygiene.

Reloading the Dual Head Injector in-between patients:

1. Disconnect the distal valve of the single use patient extension tubing from the patients' venous access device and discard in an appropriate trash receptacle. (Do not cut the extension set as this defeats the purpose of two back check valves).
2. Perform hand hygiene.
3. Disconnect the single use patient tubing from the proximal valve of the fill set and dispose of the used extension set (only the clean proximal end of the extension set is to be handled).
4. Open a new single use patient tubing with 2 back check valves, remove the female luer lock cap, and connect to the fill set. Except when purging the line of air, a protective luer lock cap must be in place at the distal end of the extension set until it is time to connect to the patient.
5. With the injector head pointing up, re-fill the contrast and saline syringes.
6. With the injector head pointing up, remove male luer lock cap then expel any residual air bubbles from the syringe and prime the single use patient line.
7. Replace with sterile red dead end luer lock cap
8. To ensure the next user knows the extension line and injector is ready for use:

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- a) Tip the injector head down.
 - b) Leave the extension tubing coiled in its original packing tape.
 - d) Position the single use patient extension set with 2 anti-backflow valves into either of tubing channels at the base of the injector. See [Appendix I](#).
9. In the event any of the open luer lock ends becomes contaminated by incidental contact: discard contaminated products.
 10. Remove the male luer lock cap from the single use patient line to connect to the patient.

Adding additional contrast or saline to containers within 12 hours or 5 patients:

1. Perform hand hygiene
2. Remove cap from top of new contrast bottle or cap from bottom of new saline bag. (Try to select the most appropriate contrast bottle size based on estimated volume of contrast patients for the remaining portion of 4 hours.)
3. Disinfect the contrast container membrane using a friction rub technique with a 70% alcohol swab and allow to completely dry (15 – 30 seconds).
4. Remove spike from existing contrast or saline container and insert fully into new contrast bottle at a 90 degree angle or new saline bag spike port.
5. Perform hand hygiene.

At 12 hours after setup or after 5 patients:

1. Perform hand hygiene
2. Position injector head so syringes point up.
3. Select appropriate “Replace Syringe” option:
 - a) Dual – remove and replace both the contrast and saline syringes at the same time
 - b) Single – remove the selected syringe only
4. Discontinue entire setup and dispose of any unused contrast and/or saline. (Do not re-spike contrast or saline containers across multi-dosing setups)
5. Wipe down the injector head with the appropriate disinfectant.
6. Perform hand hygiene

Training and Performance Evaluation:

1. All potential multi-dosing users must read and be familiar with this procedure.
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.
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’s Quality SharePoint site.

Resources

LMMI

[Injector Pump Multi-Dosing Set-Up: Bracco Empower CTA+](#)

FHA

[FHA Hand Hygiene Policy \(2018\)](#)

[Infection Control Hand Hygiene Practice Guideline](#)

PHC

[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

[VCH Hand Hygiene Policy](#)

[How to Hand Rub](#)

[How to Hand Wash](#)

Definitions

Aseptic Technique: is the purposeful prevention of the transfer of germs from one person to another by keeping the microbe count to a minimum, and for assuring that cross-contamination does not occur.

Multi-dosing: the economic and efficient practice of administering contrast medium and/or saline to 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.

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

Bracco EmpowerCTA®+ Contrast Injection System, User's Guide, 901176-001, 04, 2015-02 English
<https://bracco-one.com/public/5633/15/EmpowerCTA+%20User%20Guide.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 I: Tubing Channel for Single Use Patient Line with 2 Anti-Backflow Valves



Image courtesy of Bracco Injengineering EmpowerCTA®+ Injector System User Manual

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