Contrast Agents: Safe Use and Storage

Purpose

Lower Mainland Medical Imaging (LMMI) supports best practices for the use and storage of contrast agents. This practice standard is intended to educate Medical Imaging (MI) staff on the safe use and storage of contrast agents in MI departments.

Site Applicability

This practice standard is applicable to all MI departments within LMMI across Fraser Health, Providence Health Care, Provincial Health Services Authority and Vancouver Coastal Health.

Practice Level

This practice standard applies to MI staff (technologists, sonographers, echocardiographers, nurses, aides, radiologists, and cardiologists) who use and/or store contrast agents.

Exclusions

This practice standard does not apply to the radiopharmaceuticals that are used in Nuclear Medicine departments.

While this practice standard provides best practice recommendations for the use and storage of contrast agents, alterations for individual patients are at the discretion of the attending physician

Need to Know

Contrast agents are used to improve images produced by x-rays, computed tomography (CT), magnetic resonance (MR) imaging, ultrasound, and echocardiography. By improving the tissue conspicuity of specific organs, blood vessels or tissues, contrast materials help physicians diagnose and treat medical conditions.

There are several types of contrast materials and they can be administered:

- orally
- rectally
- intravenously

Positive contrast agents such as iodinated agents and barium-sulfate compounds, negative agents such as air, carbon dioxide, and neutral agents such as methylcellulose and water alter the ability of x-rays to pass through them and are used in x-ray and CT exams. Positive agents restrict the ability of X-rays to pass through them while negative agents enhance this ability. Gadolinium is the key component of the contrast material most often used in MRI exams. It alters the magnetic properties of nearby water molecules, enhancing the quality of MR images. An emerging agent currently used

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in MRI research is hyperpolarized Xenon-129 gas, which allows for pulmonary imaging. Rather than imaging proton molecules, the resonant frequency of the inhaled gas is measured. Microbubbles and microspheres can be administered to enhance ultrasound images.

Standard

Safe Use

Warming and Cooling of Contrast

- Warming iodinated contrast alters fluid dynamics. When warmed it becomes less viscous and may allow lower injection pressures with less trauma to the patient's vein.
- Intravascular iodinated contrast is expected to be administered at temperatures ranging from 18-37°C (room to body temperature). It can therefore be warmed to 37°C prior to administration.
- Gadolinium contrast should be stored between 15-30°C and should never be warmed or frozen.
- Orally administered barium can be slightly chilled. For patient comfort, barium administered rectally can be warmed by mixing it with warm water.

Administration of Contrast

- Ensure that contrast administration is performed according to departmental protocols [1].
- Where appropriate, ensure that the appropriate blood-work results to assess renal function have been reviewed prior to administration [1].
- Ensure appropriate premedication in patients with a history of known or suspected allergic reactions [2]

Multi-dosing of Contrast in Computed Tomography [2]

- At a minimum, Multi-dosing CT departments use back check valve systems that have been validated by the manufacturer using an independent certified laboratory.
- Only personnel who have been trained and evaluated on their performance of the procedures are authorized as users of the multi-dosing system.
- The CT department supervisor should maintain a record of authorized users of the multi-dosing system that includes the date of training and performance evaluation.
- The safe practice of multi-dosing in CT 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.
- Contrast media bottles must only be punctured once.
- The time the multi-dosing system is setup should 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.

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- A new single use extension set with two back check valves must be used for every patient. The re-use of this product is strictly prohibited.
- Punctured containers of contrast should be labeled with the time they were spiked and any unused portion must be disposed of 4 hours after opening.

Multi-dosing of Contrast in MRI [2]

- Multi-dosing in MRI is available for pharmacy bulk packs approved by Health Canada. Information regarding multi-dosing applicability is available in the product monograph or package insert.
- The rubber stopper should never be pierced more than once.
- The transfer of gadolinium to a syringe must be performed in a designated prep area using aseptic technique.
- Once punctured, gadolinium should not be removed from the designated prep area during the entire 24 hour period of use.
- A vented transfer spike is used
- The date and time of expiry is noted on the vial (e.g. 24 hours after initial puncture).
- Any unused portion must be discarded 24 hours after initial puncture.

Multi-dosing of Contrast in Other Modalities [2]

- Refer to manufacturer's instructions for use.
- Refer to *Multi-dose Medication Vials: Safe Use and Storage* [2].

Reporting of Adverse Events

- Ensure that the appropriate actions are undertaken in case of an adverse reaction to a contrast agent [3].

<u>Safe Storage/Special Instructions</u>

- Contrast should be stored in a clean area that is protected from potential sources of contamination such as dust, moisture, insects, etc.
- If evidence of contamination is present or the vial or package integrity has been breached, the product must be discarded.
- Contrast bottles and packets must be rotated when restocking takes place.
- See Appendix A

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Related Documents

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2. ABCD-21-12-90016. *Multi-dose Medication Vials: Safe Use and Storage*. Retrieved from https://my.vch.ca/dept-project/lower-mainland-medical-imaging/Documents/ABCD-21-12-90016_Multi-dose_Medication_Vials.pdf

3. ABCD-21-12-90017. *Adverse Reactions - Reporting and Documentation in Medical Imaging Departments*. Retrieved from https://my.vch.ca/dept-project/lower-mainland-medical-imaging/Documents/ABCD-21-12-90017_Adverse_Reaction_Reporting_and_Documentation.pdf

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5. Lower Mainland Medical Imaging. Breast Milk and Contrast Media. Retrieved from: https://vch.eduhealth.ca/PDFs/GK/GK.560.7441.pdf

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Definitions

Contrast agent – a substance used to enhance the visibility of internal structures in x-ray, ultrasound, and MRI based imaging techniques. Contrast agents are also known as contrast materials and contrast media.

SOP – standard operating procedure

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APPENDIX A

Contrast Type	Contrast Name	Substance (S) or Medication (M)	Administration Route	Imaging Modality	Storage Temperature	Special Instructions
Gadolinium Based	Gadovist™	M	IV	MRI	Room temperature Store at 15°C to 30°C	Do not freeze Do not use if solution is discolored or particulate matter is present
	MultiHance™	M	IV	MRI		
	Primovist™	M	IV	MRI		
Barium Sulphate Suspension	Liquid Polibar Plus	S	PO	GP, IR	Room temperature. Store 20°C to 25°C	Do not freeze Do not store after diluting. Liquid Polibar Plus - use within 10 days of opening the container
	E-Z-HD™	S	PO	GP, IR		
	Barium Oral Cream / Paste	S	PO	GP		
	Readi-Cat® 2 Smoothie	S	PO	CT		
Iodine Based	Gastrografin®	M	PO	CT, GP, IR, MRI	Room temperature. Store at 20°C to 25°C	Discard any unused portion at end of day
			Rectal	CT, GP, IR		
	Telebrix® 38 Oral	M	PO	CT, GP, IR, MRI	Store at 15°C to 30°C	Do not freeze If product is frozen or if crystallization of the salt occurs, examine the container for physical damage. Bring the container to room temperature. Intermittent shaking may be required to completely re-dissolve the crystals Product is sensitive to light. Protect from strong daylight or direct exposure to the sun. Recommended procedure is to prepare diluted solution immediately prior to use. Discard any unused portion
	Conray® 30	M	PO	GP	Store below 30°C	Protect from strong daylight or direct exposure to the sun Exposure to cold temperatures may cause crystals to form. Before use, shake vigorously to assure complete dissolution of any crystals.
	Cysto-Conray II®	M	Endo	GP, IR	Store at 20°C to 25°C	
	Visipaque™ 270/320 (Iodixanol)	M	IV	CT, IR	Store at controlled room temperature, 20°C to 25°C; excursions permitted to 15°C to 30°C	Protect from freezing Protect vials and glass or polymer bottles from strong daylight and direct exposure to sunlight Discard any unused contrast after 8 hours Store contrast bottles in an upright position until used.[1]
			IA	IR		
	Omnipaque™ 180 (Iohexol)	M	I-T	GP	Store at controlled room temperature, 20°C to 25°C; excursions permitted to 15°C to 30°C	Do not use if discoloured or precipitate has formed. Prior to administration, product may be stored in a contrast media warmer at 37°C for up to 30 days. Discard any unused contrast after 8 hours. Store contrast bottles in an upright position until used.[1] Protect from freezing Protect vials and glass and polymer bottles from strong daylight and direct exposure to sunlight.
			PO	CT, GP		
			Rectal	CT, GP		
	Omnipaque™ 240 (Iohexol)	M	Endo	GP, IR		
			I-Arc	CT, GP, IR		
			I-T	CT, IR, MRI		
			IV	CT, GP, IR		
	Omnipaque™ 300 (Iohexol)	M	Endo	CT, GP, IR		
			IA	IR		
			I-Arc	CT, GP, IR		
			IO	CT		
			I-T	CT, GP, IR, MRI		
			IV	CT, GP, IR		
			PO	CT		
	Omnipaque™ 350 (Iohexol)	M	Endo	CT, GP, IR		
			IA	IR		
			I-Arc	CT, GP, IR		
			IO	CT		
			IV	CT, GP, IR		
			PO	CT		
	Isovue™ 300/370 (Iopamidol)	M	IV	CT	Store at 20°C to 25°C	Protect from light Discard any unused contrast after 10 hours of initial puncture.
			IA	IR		
Polyethylene Glycol	PegLyte® 3350	M	PO	CT, MRI	Room temperature. Refrigerate any unused product at 2°C - 8°C	If kept at room temperature after mixing with water, use within 48 hrs. If kept refrigerated, use within 30 days.
Perflutren lipid microspheres	Definity™	M	IV	US, Echo	Keep refrigerated. Store at 2°C - 8°C	
Sulphur hexafluoride phospholipid microbubbles	Sonovue™	M	IV	US, Echo	No special storage conditions	
Agitated Saline (aka, saline bubbles)	Normal saline	S	IV	Echo	No special storage conditions	
Hyperpolarized (^{129}Xe) Xenon gas	Xenon Gas	S	Inhaled	MRI	Compressed xenon gas cylinders stored at room temperature	Only trained individuals (non-MRTs) can prepare and administer this agent.

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Carbon Dioxide (CO^2)	E-Z Gas II™	M	PO	GP, IR	Store at room temperature in a dry place	Do not store in bathroom and protect from moisture. Do not flush down the toilet or drain.
	Carbon Dioxide	M	Rectal IV	CT IR	Compressed carbon dioxide cylinders stored at room temperature	Use and store in a well ventilated area. Cylinders should be stored in a vertical position Secure to prevent from getting knocked over. Close valve after each use/when tank is empty. Protect from sunlight when ambient temperature exceeds 52°C (125°F)
Breeza®	Breeza®	S	PO	CT, MRI	Store indoors in a tightly closed container and protected from extreme temperatures.	

The medications listed above do not require formulary review since they are considered contrast agents

Legend:

Administration Route	Endocavity (Endo), Inhaled (Inhaled), Intra-arterial (IA), Intra-articular (I-Arc), Intra-osseous (IO), Intrathecal (I-T), Intravenous (IV), Oral (PO), Rectal (Rectal)
Imaging Modality	Computed Tomography (CT), Echocardiography (Echo), General Procedures (GP), Interventional Radiology (IR), Magnetic Resonance Imaging (MRI), Ultrasonography (US)

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	1.0	01-Jun-2020	Initial Release (note: this document is to be used in all modalities and replaces FH MICM0700 Safe Use and Storage of Contrast Media October 2005)	Brent Barton, US RPL
	2.0	10-Aug-2020	Add Breeza, Conray-30, EZ-Gas II Add Legend Pharmacy (Angela Lo) categorized contrasts as either a medication or substance.	Sam Yim, MRI RPL

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