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Optimizing the Use of Iodinated Contrast Media: Conservation Strategies Used Across Canada During the 2022 Shortage

CMII Service Report

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Key Messages

- A shortage of iodinated contrast media (ICM) used in contrast-enhanced CT exams led to the adoption of necessary conservation strategies across Canada.
- Conservation strategies included multidispensing from single-use and multiuse ICM bottles, diluting or reducing ICM dose volumes, switching to weight-based dosing from fixed-based dosing, lower tube voltage, performing unenhanced CT scans, using alternative imaging modalities, or prioritizing urgent cases. One of the more common alternative conservation strategies was to prioritize urgent cases for contrast-enhanced CT exams.
- Most medical imaging staff who responded to a national survey on ICM conservation strategies reported they would return to their regular doses used before the shortage despite little to no perceived effect on the contrast conspicuity of images or on patient adverse events with reduced ICM volumes.
- The ICM shortage represents an opportunity to reconsider ICM usage practices given environmental sustainability concerns with ICM and potential cost savings in reducing its use.

Context

Iodinated contrast media (ICM) is used to enhance the visualization of images during medical imaging exams and interventional procedures.[1] ICM is most frequently used for contrast-enhanced CT exams.[2,3] In 2019, approximately 5.4 million CT exams were conducted nationwide,[4] of which around 50% used ICM.[5,6] The demand for these exams continues to grow. The majority of the ICM used in Canada (Omnipaque and Visipaque) is supplied by GE Healthcare.[2,5] Other ICM available in Canada, including Isovue (Bracco) and Ultravist (Bayer), are used to a lesser extent.[2,5]

The GE Healthcare's main ICM production facility, located in Shanghai, China, was shut down in April 2022 for several weeks due to lockdown measures during the COVID-19 pandemic. This was followed by a period of reduced ICM production.[5] Global labour shortages and shipping delays created supply chain bottlenecks that further contributed to severe shortages of ICM in Canada and worldwide.[5] In June 2022, Health Canada added Omnipaque and Visipaque to tier 3 of its drug shortage list (indicating that a shortage of these brands were likely to have a significant impact on the health care system).[7]

Information regarding the conservation strategies used across Canada during the ICM shortage can help plan for potential future supply chain disruptions. In addition, the implementation of some conservation strategies on an ongoing basis may create opportunities to support the sustainable use of ICM, lower costs, lessen dependence on suppliers, and help reduce unnecessary exams.[8] Given there are some reported health risks and environmental sustainability considerations associated with ICM, reducing ICM volumes could be advantageous from these perspectives as well.[8,9]

Objective

This report summarizes information collected through a survey on the strategies used across Canada to conserve ICM supplies during the shortage, including:

- multidispensing practices used in medical imaging and pharmacy departments to conserve ICM supply
- dilution practices in medical imaging departments used to extend ICM supply
- changes in ICM volumes used before and after the shortage
- the adoption of other ICM conservation strategies (including weight-based dosing or using alternative imaging modalities).

The report also explores the survey respondents' perceived impact of reducing ICM volumes on image quality related to visibility of contrast (contrast conspicuity) and the perceived effect of reducing the ICM dose on patients' adverse reactions.

A report published by CADTH in March 2023 summarized information identified through a literature search on conservation strategies used to manage the shortage of ICM globally:[9] Optimizing the Use of Iodinated Contrast Media for CT: Managing Shortages and Planning for Sustainable and Secure Supply.

About This Document

This document summarizes information identified through a survey distributed to medical imaging staff and radiologists across Canada. The survey was developed in collaboration with medical imaging departments. Most questions were closed ended and respondents were required to choose between multiple options. A total of 40 responses were received, representing each of the provinces and the Northwest Territories. Alberta adopted a centralized approach to handle the ICM shortage and their response is representative of practices of Alberta Health Services. Manitoba's response was completed by 1 site radiologist and 1 medical radiation technologist and was intended to represent a provincial response to the shortage. Several health regions in Newfoundland, Nova Scotia, and New Brunswick aggregated multiple hospital sites into 1 survey response.

Results

Multidispensing Practices Within Medical Imaging Departments

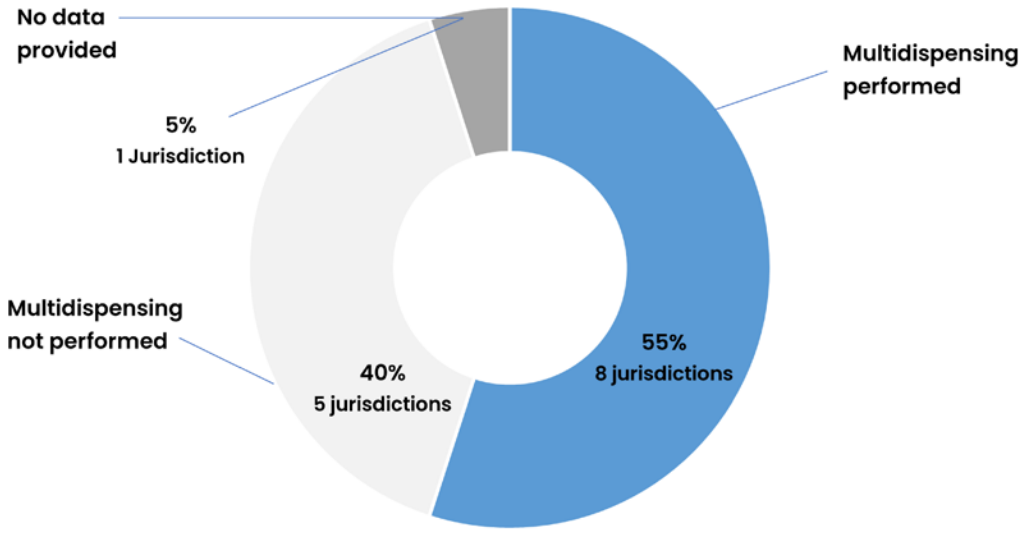
Multidispensing (the repackaging of larger vials of ICM into single syringe unit doses) can be used to minimize waste of ICM.[1] Multidispensing allows 1 vial of ICM to be used for multiple patients.[1] There are several propriety syringe kits that provide a needle-free solution to avoid the risk of infection to patients when withdrawing ICM from bottles.[2,3,10,11] These kits consist of tubing with 1-way valves to prevent contamination

and a spike system to access the container of ICM. Within medical imaging departments, multidispensing of ICM is undertaken by trained staff in a dedicated workspace that has been cleaned and disinfected.

Occurrence of Multidispensing Practices

Multidispensing of ICM to conserve ICM supply was practised by 55% of imaging departments that participated in the survey (Figure 1). Of these, 2 imaging departments reported using Isovue exclusively. Multidispensing of ICM was not performed by 40% of medical imaging departments. Of these, 37% used other strategies to conserve ICM supply, and 3% did not practice multidispensing of ICM at their site and did not report using other ICM conservation strategies. One was from an imaging department that used Isovue exclusively. No information regarding multidispensing practices was received from 1 imaging department. Data were from survey responses from 39 sites.

Figure 1: Multidispensing Practices of ICM During the ICM Shortage at 39 Sites With CT

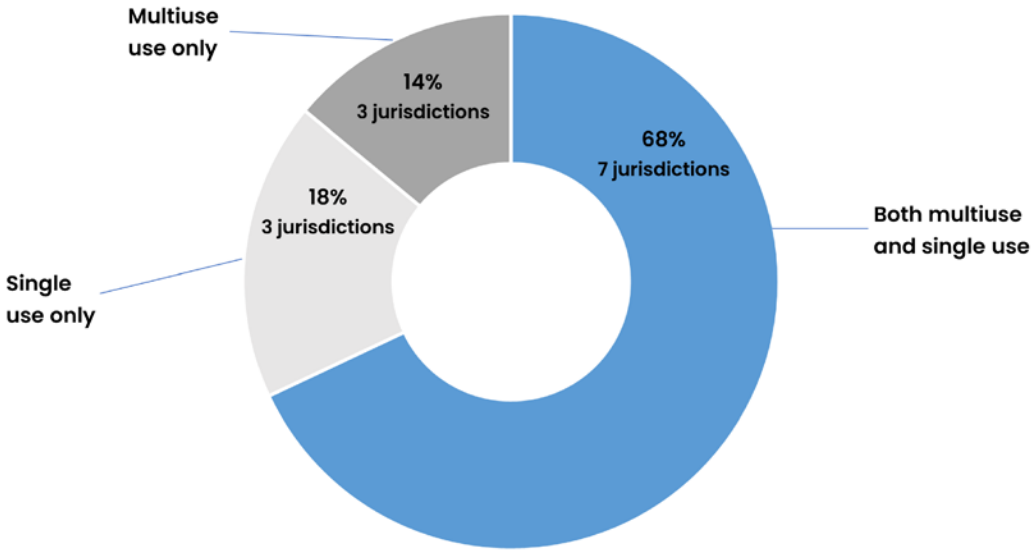


ICM = iodinated contrast media.
Note: "Jurisdictions" indicates the number of provinces and territories that responded to the survey question.

Multidispensing From Different ICM Bottle Types

Of the imaging departments that reported performing multidispensing into single syringe unit doses, 68% dispensed from both single-use and multiuse bulk ICM bottles. Multidispensing of single-use or single-patient ICM bottles was performed at 18% of imaging departments; 14% reported only multidispensing from multiuse ICM bottles (Figure 2). Data were from survey responses survey responses from 22 sites.

Figure 2: Multidispensing From Different ICM Bottle Types



ICM = iodinated contrast media.

Notes: "Jurisdictions" indicates the number of provinces and territories that responded to the survey question.

Data are derived from the survey question "As part of a medical imaging contrast conservation strategy within the medical imaging department at your institution, do you perform, or have you performed, multidispensing from a single-use or single-patient ICM bottle, or a multiuse bulk ICM bottle?"

Bottle Puncturing Methods

Puncturing ICM bottles can be achieved using a spike system or a needle. Of the imaging departments that reported multidispensing, 95% used a spike system. One site reported using a needle and another site reported using both a needle and a spike system. Data were from survey responses from 26 sites.

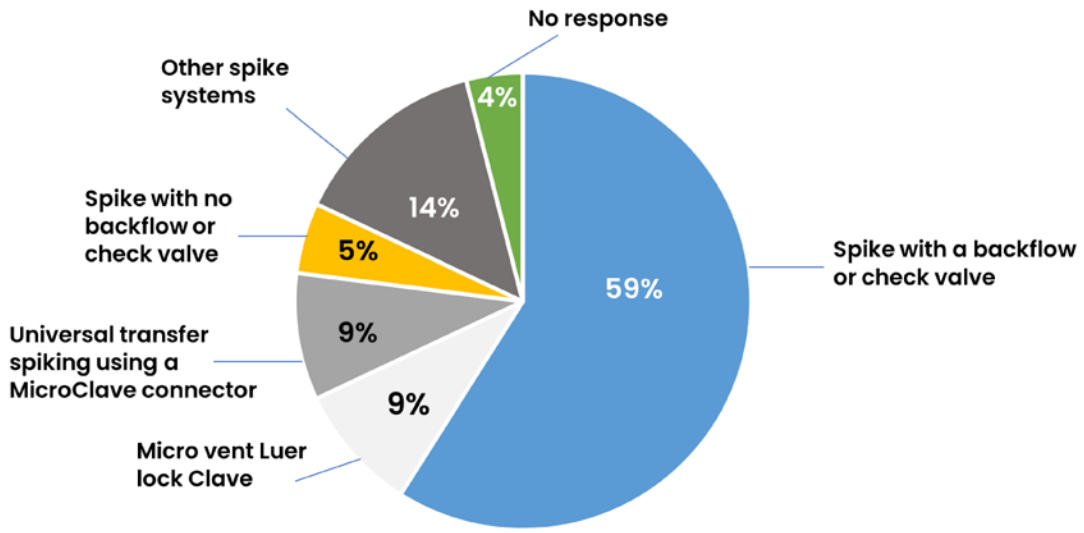
Puncturing ICM Bottles Using a Spike System

Of the imaging departments that reported using a spike system to puncture ICM bottles, 91% used the spike system to puncture the bottle once to dispense ICM into single syringe unit doses. Data were from survey responses from 34 sites.

Types of Spike Systems Used

The most commonly used spike system device, as reported by 59% of imaging departments, was the spike with a backflow or check valve. Other spike systems used included the micro vent Luer lock using a Clave connector (9%), the universal transfer spike using a MicroClave connector (9%), and the spike with no backflow or check valves (5%). Alternative spike systems were used by 14% of imaging departments, and 4% did not provide a response to this question. One respondent reported using both a spike system with a backflow or check valve and a micro vent Luer lock using a Clave connector (Figure 3). Data were from survey responses from 24 sites.

Figure 3: Type of Spike System Used for Puncturing ICM Bottles



ICM = iodinated contrast media.
Note: Data are derived from the survey question "If you use a spike system, which device do you use?"

Puncturing ICM Bottles Using a Needle

Of the 2 medical imaging departments that used a needle to puncture ICM bottles, 1 used either a needle or a spike system (with no backflow of check valve) to dispense ICM from both single-use and multiuse bottles into single syringe unit doses and reported that bottles were punctured more than once. Each unit dose of ICM was dispensed as needed throughout the workday and contents were discarded 24 hours after the initial bottle puncture. The site did not indicate if a label was attached to each unit ICM dose listing the contents and beyond-use date of the contents.

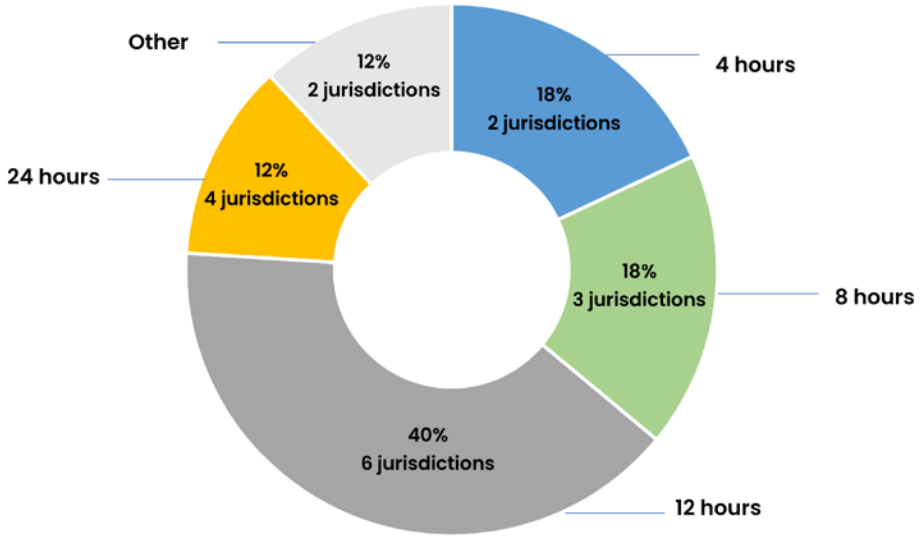
The other site used a needle to dispense ICM from single-use bottles into single syringe unit doses. Bottles were punctured by the needle more than once for the same patient. Each unit dose of ICM was dispensed as needed throughout the workday and contents were discarded 12 hours after initial puncture. No label was attached to each unit ICM dose.

ICM Dose-Dispensing Practices With a Spike System or Needle

A total of 40% of imaging departments reported that 12 hours was the maximum time before ICM bottle expiration, irrespective of whether a needle or spike system was used. A maximum ICM bottle expiration of 4 hours was reported by 18%, whereas 18% reported 8 hours, 12% reported 24 hours, and an additional 12% reported "other" (Figure 4). Of those that reported "other," 2 sites reported loading the right amount of ICM required for the number of patients to be scanned, 1 reported keeping punctured bottles for longer than 24 hours for oral preparation use only and syringes were discarded if any sign of crystallization occurred. The other site reported extending the shelf life of an open ICM bottle to 36 hours during the shortage but returned to an 8-hour time frame when supplies became less limited.

Other comments included extending the shelf life of an open ICM bottle to be used at the start of the next workday and that the beyond-use date varied depending on the type of contrast agent used (i.e., 8 hours for Omnipaque or Visipaque and 4 hours for Isovue). Data were from survey responses from 33 sites.

Figure 4: Maximum Time Reported Before Expiration of ICM Bottle Contents



ICM = iodinated contrast media.

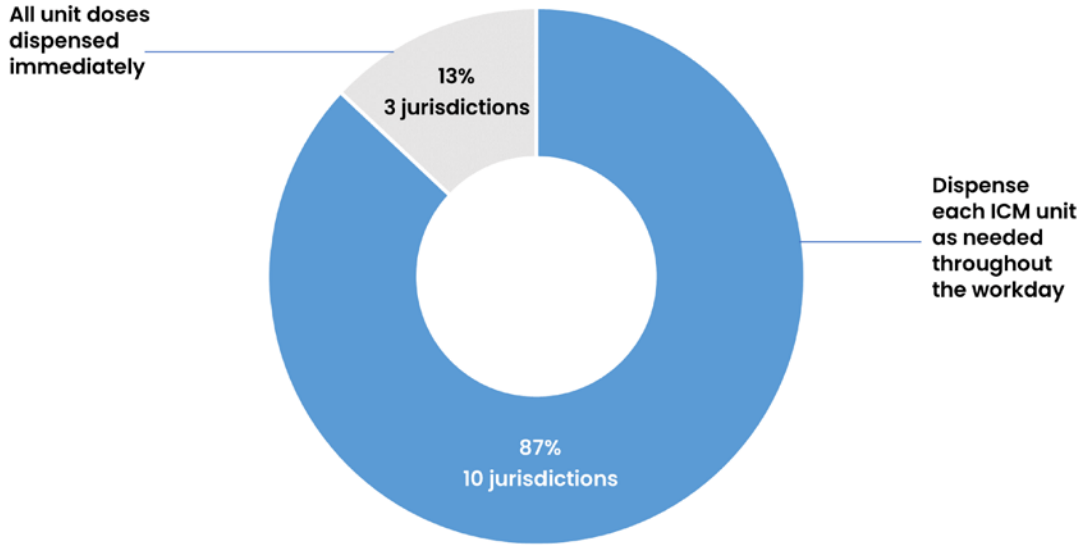
Notes: "Jurisdictions" indicates the number of provinces and territories that responded to the survey question

Data are derived from the survey question "After an initial bottle puncture with a needle or spike system, what is the maximum time (in hours) before the bottle's contents expire and must be discarded?"

Unit Dose-Dispensing Intervals for Spike Systems or Needles

After initial bottle puncture with a spike system or needle, 87% of imaging departments dispensed each unit dose of ICM as needed throughout the workday, and the remaining sites dispensed all unit doses of ICM immediately (Figure 5). These data are based on survey responses from 30 sites. Of the 13% of sites that reported dispensing all unit doses of ICM immediately, 2 sites reported that 4 hours was assigned as the beyond-use date for unit doses of ICM that drawn into a syringe, and 2 sites reported "other" as the time interval in hours but did not provide further comments.

Figure 5: Dose-Dispensing Intervals for ICM



ICM = iodinated contrast media.
Notes: "Jurisdictions" indicates the number of provinces and territories that responded to the survey questions.
Data are derived from the survey question "After an initial bottle puncture with a needle or spike system, when are ICM doses dispensed?"

Sources of Literature Used to Inform the Beyond-Use Date Needle

Peer-reviewed literature and vendor-specific white papers were the most commonly reported sources of literature used to help inform decisions about establishing a beyond-use date assigned to unit doses of ICM drawn into a syringe, each were used by 34% (Figure 6). Clinical studies were used by 8% of imaging departments; 24% reported "other" as their source of literature to inform decisions to establish a beyond-use date. Clinical guidelines were reported as a source of information under the category of "other" by 1 site, and standard operating procedures for hospital infection control were reported by another site. Data were from survey responses from 13 sites.

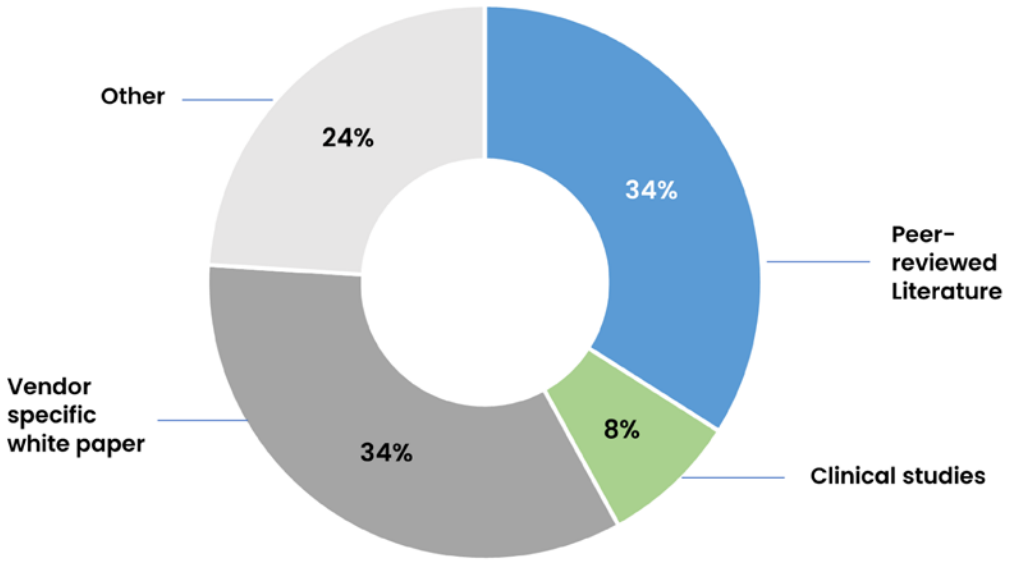
Label Attachments Indicating Beyond-Use Date

A total of 56% of imaging departments attach a label to each unit dose of ICM that lists the beyond-use date of the contents; the remaining sites do not attach labels (Figure 7). Data were from survey responses from 16 sites.

Storage of Multidispensed ICM Before Patient Administration

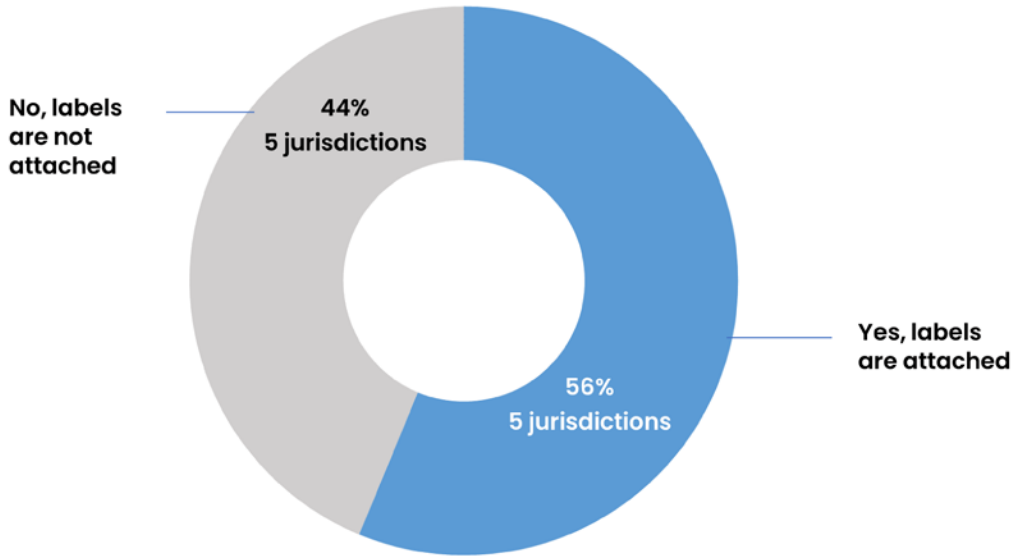
According to 67% of the medical imaging departments, multidispensed doses of ICM were mostly stored in contrast warmers before patient administration (Figure 8). Fourteen percent of imaging departments reported storing ICM in injector systems and 14% in other storage areas within the radiology department. Two sites noted that they did not prepare doses of ICM before patient administration. Data were from survey responses from 21 sites.

Figure 6: Source of Literature Used to Help Inform Decisions to Establish a Beyond-Use Date



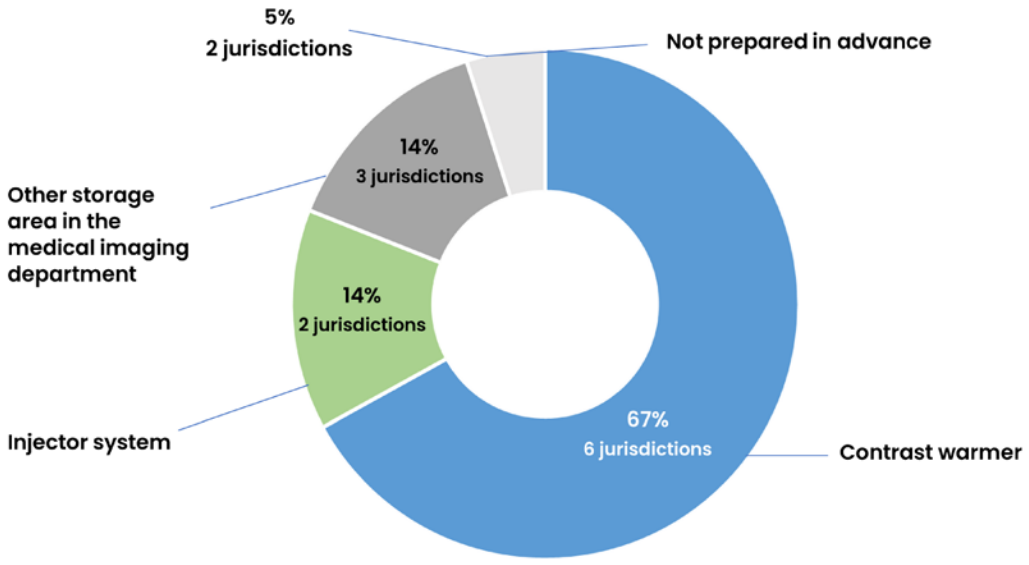
Note: Data are derived from the survey question "What sources of published literature helped inform your decision to establish a beyond-use date?"

Figure 7: Label Attachments Indicating Beyond-Use Date



Notes: "Jurisdictions" indicates the number of provinces and territories that responded to the survey question.
Data are derived from the survey question "Is a label attached to each unit ICM dose listing the contents and the beyond-use date of the contents?"

Figure 8: Storage of Multidispensed ICM Before Patient Administration



ICM = iodinated contrast media.
Notes: "Jurisdictions" indicates the number of provinces and territories that responded to the survey question.
Data are derived from the survey question "Where do you store multidispensed unit doses of ICM before patient administration?"

Multidispensing Practices Within Pharmacy Departments

Engagement of Pharmacy Department Support

Pharmacy departments have trained staff that can repackage ICM in a sterile compounding environment into single-unit doses to support medical imaging departments. Four sites in 2 jurisdictions, representing 10% of all sites that participated in the survey, reported using pharmacy support to multidispense ICM into separate vials. Three of these sites reported multidispensing from vendor bottles labelled for multiuse while 1 site reported multidispensing from single-use vendor bottles. Two sites exclusively used the pharmacy department for multidispensing, whereas the other 2 sites also performed multidispensing in the medical imaging department.

Puncturing of ICM Bottles

Two sites (from different jurisdictions) reported that the pharmacy punctured the ICM bottles only once using a spike system. Another site reported using a spike system but did not report how many times the bottle was punctured. The third site did not respond.

Dispensing Single-Unit Doses

Three sites (in 2 different jurisdictions) reported that after initial puncture, all ICM unit doses were dispensed into vials immediately. The last remaining site did not report this information.

Maximum Shelf Life of Single-Unit Doses

Of the 4 sites, 3 (across 2 different jurisdictions) reported assigning a beyond-use date of 4 days when stored at room temperature. When single-unit doses were stored in the fridge, the beyond-use date assigned to the dispensed vials of ICM for all 4 sites was extended to 9 to 10 days. These maximum beyond-use dates are in keeping with considerations for ICM conservation put forth by the American Society of Hospital Pharmacists during the shortage.[12,13]

Dilution Practices to Extend ICM Supply

The practice of diluting ICM to extend supply was used by 13% of imaging departments. One respondent reported that diluting ICM affected imaging quality while the rest reported no difference. Another respondent indicated that diluted Omnipaque 300 was only used for urology cases in the operating room or ambulatory care department, and for voiding cystograms in the diagnostic imaging department. Data were from survey responses from 4 jurisdictions.

ICM Dilution for Intrathecal Injection

Intrathecal administration (injection into the spinal canal) of ICM was performed by 38% of sites. Of these, 2 sites used diluted ICM for intrathecal administration, and both reported using Omnipaque 300. The only reported clinical indication of diluted ICM used for intrathecal administration was for myelograms. One of these respondents indicated that the vendor provided written endorsement for the intrathecal use of diluted ICM. The other respondent indicated that peer-reviewed literature was used to support the decision to use diluted ICM intrathecally. Data were from survey responses from a maximum of 34 sites across 6 jurisdictions.

Reductions in ICM Volumes Used for CT Protocols

Different ICM volume reduction strategies were used across Canada during the shortage, including decreasing the volume of fixed-dose contrast, switching from fixed dosing to weight-based dosing, decreasing weight-based dosing volumes, using different concentrations of the same contrast agent, or substituting a different contrast agent (such as Isovue) with less limited supply challenges (Table 1). One respondent reported reductions in fixed-based dosing of Isovue. Overall, ICM volume reduction strategies were applied heterogeneously across different targeted body areas (i.e., abdomen, extremities, head, neck, pelvis, spine, chest, and cardiac).

Respondents were asked to report the ICM dose volume used before and after the implementation of ICM conservation measures. Respondents were also asked if any changes to CT protocols affected contrast conspicuity of targeted body areas. The possible responses to this question included “never,” “rarely,” “sometimes,” “often,” or “always.” Respondents were also asked whether they would retain any changes made to CT protocols. Changes were made to CT protocols in all body areas except cardiac protocols for which 6 respondents reported any changes. A summary of average ICM volume reductions by body area follows. Details of the average ICM doses used before and during the shortage and the CT protocols that were modified for each body area are provided in Appendix 1. Two respondents from different jurisdictions did not report any strategies to reduce ICM volumes.

Average ICM Volume Reductions by Body Area

An overall reduction in ICM dosage was reported by 68% of sites after the implementation of ICM conservation measures, with an average percentage volume reduction of 22%. The remaining sites reported either switching to weight-based dosing, using alternative ICMs, or not changing ICM dose volume. Many sites reported using multiple ICMs (e.g., Omnipaque and Visipaque) for all exams or for specific body areas. Two sites reported switching from Omnipaque 300 to Omnipaque 350 with subsequent dose alterations to adjust for the new concentrations (Table 1). Data were from survey responses from a maximum of 38 sites across 10 jurisdictions.

Abdomen

For exams of the abdomen, 66% of sites across 7 jurisdictions reported an ICM dosage reduction after the implementation of ICM conservation measures, with an average percentage volume reduction of 22%. The abdomen was the most common body area that received a dose reduction of all the target body areas. For abdominal examinations, there were 11 users of Omnipaque 300, 15 users of Omnipaque 350, 1 user of Visipaque 270, 6 users of Visipaque 320, and 1 user of Isovue 370 (Table 1). Data were from survey responses from 38 sites.

Extremities

For exams of the extremities, 44% of sites across 5 jurisdictions reported an ICM dosage reduction after the implementation of ICM conservation measures, with an average percentage volume reduction of 23%. There were 8 users of Omnipaque 300, 9 users of Omnipaque 350, and 1 user for each of Visipaque 320 and Isovue 370 (Table 1). Data were from survey responses from 36 sites.

Head

For head exams, 43% of sites across 5 jurisdictions reported an ICM dosage reduction after the implementation of ICM conservation measures, with an average percent volume reduction of 21%. There were 7 sites that used Omnipaque 300, 9 sites reported using Omnipaque 350 and 3 sites reported using Visipaque 320 (Table 1). Data were from survey responses from 37 sites.

Neck

For neck exams, 49% of sites across 7 jurisdictions reported an ICM dosage reduction after the implementation of ICM conservation measures, with an average percentage volume reduction of 26%. The neck received the highest average percentage dose reduction of all the target body areas. For neck examinations, 7 sites reported using Omnipaque 300, 11 sites reported using Omnipaque 350, 3 sites reported using Visipaque 320, and 1 site reported using Isovue 370 (Table 1). Data were from survey responses from 37 sites.

Pelvis

For pelvic exams, 60% of sites across 6 jurisdictions reported an ICM dosage reduction after the implementation of ICM conservation measures, with an average percentage volume reduction of 21%. Eight sites reported using Omnipaque 300, 12 sites reported using Omnipaque 350, 3 sites reported

using Visipaque 320, and 1 site reported using Isovue 370 (Table 1). Data were from survey responses from 35 sites.

Spine

For spinal exams, 45% of sites across 5 jurisdictions reported an ICM dosage reduction after the implementation of ICM conservation measures, with an average percentage volume reduction of 20%. Of the respondents who reported an ICM volume reduction, 6 sites used Omnipaque 300, 9 sites used Omnipaque 350, and 2 sites used Visipaque 320 (Table 1). Data were from survey responses from 33 sites.

Chest

For chest exams, 51% of sites across 6 jurisdictions reported an ICM dosage reduction after the implementation of ICM conservation measures, with an average percentage volume reduction of 20%. Of the respondents who reported an ICM volume reduction, 9 sites reported using Omnipaque 300, 10 sites reported using Omnipaque 350, 1 site reported using Visipaque 270, 3 sites reported using Visipaque 320, and 1 site reported using Isovue 370 (Table 1). Data were from survey responses from 37 sites.

Heart (Cardiac Exams)

For cardiac exams, 21% of sites across 2 jurisdictions reported an ICM dosage reduction after implementing ICM conservation measures, with an average percentage volume reduction of 22%. The fewest number of sites reported dose reductions for cardiac examinations. Of the respondents who reported an ICM volume reduction, 1 site reported using Omnipaque 300, 3 sites reported using Omnipaque 350, 1 site reported using Visipaque 320, and 1 site reported using Ultravist 370 (Table 1). Data were from survey responses from 29 sites.

Table 1: ICM Volume Reductions Used Across Canada During Shortage

Province or territory	ICM used	Volume reduction strategies	CT protocols modified in different body areas[a]
Alberta	Omnipaque 350	Reduction in fixed-based dosing, reduction in weight-based dosing	All body areas except cardiac (no change)
British Columbia	Omnipaque 300 Omnipaque 350 Visipaque 320 Isovue 300	Reduction in fixed-based dosing, switching to a higher concentration of contrast agent at a lower volume, reduction in weight-based dosing maximum volume, switching to Isovue	All body areas except cardiac (no change) and 1 site that switched from Omnipaque 300 to Isovue 300 (no change)
Manitoba	Omnipaque 350	Reduction in fixed-based dosing, weight-based dosing (abdomen only)	All body areas except cardiac (no change)
New Brunswick	Visipaque 320 Isovue 300 Isovue 370	Visipaque 320: Reduction in fixed-based dosing Isovue 300 and 370: None	Visipaque 320: All body areas (except extremity and spine where CT was not used) and cardiac (no change) Isovue 300 and 370: No changes (except extremity and spine where CT was not used)

Province or territory	ICM used	Volume reduction strategies	CT protocols modified in different body areas[a]
Northwest Territories	Omnipaque 350	None	No changes (except cardiac where CT was not used)
Nova Scotia	Omnipaque 300 Omnipaque 350	Reduction in fixed-based dosing, decrease in weight-based dosing maximum volume, switch from Omnipaque 350 to Omnipaque 300	All body areas (except extremity and spine where there was either no change or rarely used) and cardiac (no change)
Ontario	Omnipaque 300 Omnipaque 350 Visipaque 320 Isovue 370 Ultravist 370 (cardiac only)	Reduction in fixed-based dosing, reduction in weight-based dosing, decrease in weight-based dosing maximum volume	All body areas
Quebec	Omnipaque 300 Omnipaque 350 Visipaque 270 Visipaque 320 Isovue 370 (cardiac only)	Reduction in fixed-based dosing, switch from fixed- to weight-based dosing, reduction in weight-based dosing maximum volume, using a higher concentration of a contrast agent at a lower volume	All body areas except cardiac where Isovue 370 was used (no change)
Saskatchewan	Isovue 300	None	No changes (except cardiac where CT was not used)

ICM = iodinated contrast media.

Note: Data were derived from the survey question "For CT exams, please indicate the volume of ICM used before and after the shortage for each of the following body areas?" No responses were received from Newfoundland and Labrador and Prince Edward Island.

[a]Body areas included abdomen, extremity, head, neck, pelvis, spine, chest, and cardiac.

Outcomes of Reductions in ICM Volume

Contrast Conspicuity

The majority of respondents reported that changes in ICM volume for CT protocols "never" or "rarely" impacted contrast conspicuity of the target anatomy, particularly for exams of the spine, extremities, and head, with 67%, 60%, and 60% reporting this, respectively (Table 2). Some respondents mentioned that reductions in contrast conspicuity were only noticed in patients with obesity, in which case volumes were increased to maintain diagnostic quality. The abdomen, neck, and pelvis were described to be most often impacted by decreases in ICM volume, but the number of respondents reporting this occurrence was low at 18%, 13%, and 12%, respectively. The neck, pelvis, and abdomen were reported by approximately 25% of respondents to be "sometimes impacted." It is also noted that approximately half of respondents who reported that contrast conspicuity was "always" impacted, reported this for all CT exams irrespective of body area at their site. Data were from survey responses from a maximum of 27 sites, representing 7 jurisdictions.

Table 2: Impact of Contrast Conspicuity of Reduced ICM Dose

Body area (number of responses)	Response type, %				
	Never	Rarely	Sometimes	Often	Always
Abdomen (27)	33	11	25	15	18
Extremities (20)	60	20	10	5	5
Head (23)	60	22	9	0	9
Neck (23)	39	17	26	4	13
Pelvis (25)	36	20	24	8	12
Spine (22)	67	14	9	5	5
Chest (24)	42	33	17	0	8
Cardiac (13)	54	24	15	7	0

ICM = iodinated contrast media.

Patient Adverse Effects

ICM is associated with a small risk for allergic reactions and contrast-induced acute kidney injury.[10] A single respondent reported that reductions in ICM resulted in fewer adverse reactions in patients. Most respondents noted no changes to patient adverse effects or did not know if there was any impact on patient adverse effects.

Retention of ICM Conservation Methods

Approximately 46% of sites reported that they would "always" return to the ICM dose volumes used before implementing conservation strategies, irrespective of the body area being examined using CT, while 25% reported that they would "never" return to the ICM dose volumes used before implementing conservation strategies (Table 3). Approximately 14% of sites reported that they would "sometimes" return to the ICM dose volumes used before implementing conservation strategies, irrespective of the body area being examined by CT. Approximately 10% of sites reported that they would "rarely" return to the ICM dose volumes used before implementing conservation strategies, irrespective of the body area being examined by CT. Approximately 5% of sites reported that they would "often" return to the ICM dose volumes used before implementing conservation strategies, irrespective of the body area being examined by CT. Data were from survey responses from a maximum of 27 sites, representing 7 jurisdictions.

Table 3: Plans to Return to Preshortage ICM Doses by Body Area

Body area (number of responses)	Response type, %				
	Never	Rarely	Sometimes	Often	Always
Abdomen (27)	22	4	22	8	44
Extremities (24)	33	8	13	0	46
Head (25)	24	16	8	4	48
Neck (25)	16	12	20	4	48
Pelvis (27)	30	4	18	11	37
Spine (24)	28	13	13	0	46
Chest (24)	26	16	8	4	46
Cardiac (17)	24	6	12	6	52

ICM = iodinated contrast media.

Other Conservation Strategies Used to Optimize ICM Supply

Several other strategies to reduce ICM consumption were used by medical imaging departments across Canadian jurisdictions (Table 4). Note no responses were received from Newfoundland and Labrador, Prince Edward Island, and Saskatchewan (all reporting they used Isovue) and New Brunswick (reporting the use of Isovue or Visipaque 320 at their sites). The most common ICM supply conservation strategy across all targeted body areas was the prioritization of urgent cases (Table 5). Other common strategies used by the most respondents for most body areas (except cardiac protocols) were weight-based dosing, and increased use of noncontrast CT. A reduction of tube voltage (allowing the use of a lower contrast dose while maintaining similar contrast attenuation in the image) was also commonly used across Canada, except for Alberta. Increased use of alternative imaging modalities (such as MRI, ultrasound, or nuclear medicine) was not used in Quebec, Nova Scotia, or the Northwest Territories and was more commonly used in Alberta, British Columbia, Manitoba, and Ontario. Of the alternative imaging modalities used, MRI was the most commonly used, followed closely by ultrasound. Nuclear medicine was used the least frequently, and only in Ontario and Alberta. The use of X-ray as an alternate imaging exam was reported by a single respondent.

Table 4: ICM Supply Conservation Strategies Used Across Canada

Body area	Weight-based dosing[a]	Reduced ICM dose and lowered tube voltage	Performed unenhanced CT	Performed alternative exams[b]		
				MRI	Ultrasound	Nuclear medicine
Abdomen	AB, BC, MB, NS, NT, ON, QC	BC, MB, NWT, ON, QC	AB, BC, NS, ON, QC	BC, ON	BC, MB, ON	ON
Extremities	AB, NT, ON, QC	BC, MB, ON, QC	BC, MB, NS, NT, ON, QC	BC, ON	BC, ON	NR
Head	ON, QC	BC, MB, ON, QC	AB, BC, MB, NS, NT, ON, QC	AB, BC, MB, ON	BC, ON,	NR

Body area	Weight-based dosing[a]	Reduced ICM dose and lowered tube voltage	Performed unenhanced CT	Performed alternative exams[b]		
				MRI	Ultrasound	Nuclear medicine
Neck	BC, NT, ON, QC	BC, MB, NS, NT, ON, QC	AB, BC, NS, NT, ON, QC	BC, ON	AB, BC, ON	NR
Pelvis	AB, BC, NS, NT, ON, QC	BC, MB, NT, ON	BC, NS, NT, ON, QC	BC, MB, ON	BC, ON	NR
Spine	AB, BC, NT, QC	BC, NT, ON, QC	AB, BC, NS, NT, ON, QC	BC, MB, ON	BC, ON,	NR
Chest	BC, NT, ON, QC	BC, MB, NT, ON, QC	AB, BC, MB, NS, NT, ON, QC	BC, ON	BC, ON	AB, ON
Cardiac	ON	NS, ON	ON	BC, ON	BC, ON	NR

AB = Alberta; BC = British Columbia; ICM = iodinated contrast media; MB = Manitoba; NT = Northwest Territories; NR = not reported; NS = Nova Scotia; ON = Ontario, QC = Quebec.

Note: Data are derived from the survey question "Which ICM dose conservation strategies were used?" No responses were received from New Brunswick, Newfoundland and Labrador, Prince Edward Island, and Saskatchewan.

[a]Could be interpreted as either a switch from fixed to weight-based dosing or a decrease in weight-based dosing volume.

[b]X-rays as an alternate exam for the abdomen was also reported by a respondent in Ontario.

Limitations

The findings in this report present an overview of the conservation strategies used at the provincial and territorial level to navigate the ICM shortage. Of the 40 responses received, most (68%) were received from Ontario and British Columbia. For the other jurisdictions (except for the Northwest Territories which has a single CT unit), 1 to 3 responses were received representing an average of the ICM conservation practices used across all sites during the shortage. Findings may not accurately represent practice variations within different health regions because responses were aggregated at the regional level.

Table 5: Percentage of Sites Across Canada That Prioritized Using ICM for Urgent Cases

Body area	BC (n = 12)	AB (n = 1)	SK (n = 2)	MB (n = 1)	ON (n = 15)	QC (n = 3)	NB (n = 1)	PE (n = 1)	NL (n = 1)	NS (n = 2)	NT (n = 1)
Abdomen	67%	100%	NR	—	53%	33%	NR	NR	NR	50%	100%
Extremities	58%	NR	NR	100%	53%	33%	NR	NR	NR	NR	100%
Head	50%	100%	NR	100%	53%	33%	NR	NR	NR	NR	100%
Neck	58%	100%	NR	100%	53%	33%	NR	NR	NR	NR	100%
Pelvis	58%	100%	NR	100%	53%	33%	NR	NR	NR	NR	100%
Spine	58%	100%	NR	100%	40%	33%	NR	NR	NR	NR	100%
Chest	58%	NR	NR	100%	47%	33%	NR	NR	NR	50%	100%
Cardiac	25%	NR	NR	100%	40%	NR	NR	NR	NR	50%	NR

AB = Alberta; BC = British Columbia; ICM = iodinated contrast media; MB = Manitoba; NT = Northwest Territories; NB = New Brunswick; NL = Newfoundland and Labrador; NR = not reported; NS = Nova Scotia; ON = Ontario; PE = Prince Edward Island; QC = Quebec; SK = Saskatchewan.

Notes: Data are derived from the survey question "Which ICM dose conservation strategies were used?"

No responses were received from New Brunswick, Newfoundland and Labrador, Prince Edward Island, and Saskatchewan.

Conclusion

The sudden and severe shortage of ICM in Canada led to the implementation of different ICM-conserving interventions. Based on survey results, multidispensing from single-use or multiuse bottles into single-unit doses to reduce waste during the shortage was conducted by 55% of sites. Pharmacy support was used by 10% of sites that practised multidispensing. Diluting ICM was rarely used to extend supply. Different ICM volume reduction strategies for CT protocols were used, including decreasing the volume of fixed-dose contrast, switching from fixed dosing to weight-based dosing, decreasing weight-based dosing volumes, using a different concentration of the same contrast agent, or substituting an alternative contrast agent (such as Isovue) that had fewer supply limitations. Most respondents indicated they would return to the ICM dose they used before the shortage for certain target anatomy scans although a reduction in ICM volume for CT protocols was perceived to never or rarely impacted contrast conspicuity. Given the environmental concerns related to water contamination, as well as potential cost savings by reducing ICM use, the adoption of strategies used during the ICM shortage poses a potential opportunity to reconsider standard practice regarding ICM use with the support of evidence. Based on the survey, reduced ICM volumes did not reduce adverse reactions in patients. The most common additional strategies used by most respondents to extend ICM supply were increased use of noncontrast CT and the prioritization of urgent cases.

References

1. Eibschutz LS, Gholamrezanezhad A. How low can we go? Strategies and recommendations to combat the iodinated contrast shortage. *Emerg Radiol.* 2022;29(5):925-928. PubMed
2. Ontario Health. Ontario Health clinical guidance for the conservation of iodinated contrast media (ICM). 2022 Jun 3:https://radiology.mcmaster.ca/app/uploads/2022/06/Clinical-Guidance-for-the-Conservation-of-Iodinated-Contrast-Media-FINAL.pdf. Accessed 2023 May 10.
3. Grist TM, Canon CL, Fishman EK, Kohi MP, Mossa-Basha M. Short-, Mid-, and Long-term Strategies to Manage the Shortage of Iohexol. *Radiology.* 2022;304(2):289-293. PubMed
4. Chao Y-S, Sinclair A, Morrison A, Hafizi D, Pyke L. The Canadian Medical Imaging Inventory 2019–2020. Ottawa: CADTH; 2021: https://www.cadth.ca/canadian-medical-imaging-inventory-2019-2020. Accessed 2023 Jun 16.
5. Canadian Association of Radiologists. Statement on iodinated contrast media shortage. 2022; https://car.ca/news/statement-on-iodinated-contrast-media-shortage/. Accessed 2023 May 10.
6. Alberta Health Services. Global shortage of contrast dye results in postponement of some imaging procedures. 2022; https://www.albertahealthservices.ca/news/Page16614.aspx. Accessed 2023 Jun 16.
7. Health Canada. Tier 3 drug shortages. https://www.canada.ca/en/health-canada/services/drugs-health-products/drug-products/drug-shortages/tier-3-shortages.html#wb-auto-4. Accessed 2023 Jun 16.
8. Koeppel DR, Boehm IB. Shortage of iodinated contrast media: Status and possible chances - A systematic review. *Eur J Radiol.* 2023;164:110853. PubMed
9. CADTH. Optimizing the Use of Iodinated Contrast Media for CT. 2023 March: https://www.cadth.ca/sites/default/files/attachments/2023-03/CM0100-CMII%20Contrast%20shortages_final.pdf. Accessed 2023 May 10.
10. Nadolski GJ, Stavropoulos SW. Contrast alternatives for iodinated contrast allergy and renal dysfunction: options and limitations. *J Vasc Surg.* 2013;57(2):593-598. PubMed
11. Amukotuwa SA, Jackson D, Bammer R. Impact of iodinated contrast media conserving interventions and lessons for the future. *J Med Imaging Radiat Oncol.* 2023;67(1):28-36. PubMed
12. American Society of Health-System Pharmacists. Considerations for imaging contrast shortage management and conservation. 2022 May 13: https://www.ashp.org/drug-shortages/shortage-resources/considerations-for-imaging-contrast-shortage-management?loginreturnUrl=SSOCheckOnly. Accessed 2023 May 12.
13. United States Pharmacopeia. Operational Considerations for Sterile Compounding During COVID-19 Pandemic. 2021 Aug 4: https://go.usp.org/l/323321/2020-04-11/345w2b. Accessed 2023 June 9.

Appendix 1: Average Dosing of ICM per CT Exam Before and After ICM Shortage (per Respondent)

Note that this appendix has not been copy-edited.

Table 6: ICM Dose Used Before and After the Shortage

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
Abdomen			
Omnipaque 300	**British Columbia**		
	No change	1.5 mL/kg	1.5 mL/kg ***Also used Isovue 300 1.5 mL/kg**
	All protocols	100 mL	83 mL
	Abdomen-pelvis, pancreas, liver, renal, IV pyelogram	100 mL	***Switched to Omnipaque 350 85 to 90 mL**
	Routine, non-angiography	100 mL	***Switched to Omnipaque 350 70 mL**
	Ontario		
	Not reported	100 mL	80 mL
	All abdomen except angiography	90 mL	70 mL
	No change	100 mL	100 mL
	Portal-venous phase abdomen-pelvis, arterial abdomen-pelvis	100 mL	75 to 80 mL
	Portal venous abdomen, CT angiogram abdomen, urogram	2 mL/kg max 120 mL	1.5 mL/kg max 120 mL
	Quebec		
	Not reported	2 mL/kg max 140 mL	2 mL/kg max 120 mL
	All protocols	100 mL	Weight-based dosing ***Also used Omnipaque 350 85 mL**
Omnipaque 350	**Alberta**		
	Portal venous abdomen pelvis studies, multiphasic abdomen pelvis, non-CT angiogram studies	Weight-based dosing 112 mL	Weight-based dosing 96 mL
	British Columbia		
	All protocols	87 mL	72 mL
	All abdominal exams	Weigh-based dosing	Weigh-based dosing decreased by 20% if above 85 mL

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	Renal mass	100 mL	80 to 95 mL
	Enterography	120 mL	100 mL
	GI bleed, liver, CT IV pyelogram	150 mL	120 mL
	Manitoba		
	All routine single-phase portal-phase examinations (except multiphasic exams)	100 mL	50 mL
	Northwest Territories		
	No change	100 mL	100 mL
	Nova Scotia		
	Not reported	Weight-based dosing 62 to 160 mL	Weight-based dosing 100 mL or less
	CT abdomen-pelvis, abdominal CT angiogram	Weight-based 160 lbs 100mL	***Switched to Omnipaque 300 weight-based 160 lbs 116 mL**
	Ontario		
	Routine abdomen-pelvis, liver, kidney	100 mL	70 mL
	Routine only excluding multiphase for liver-kidney-pancreas	90 mL	80 mL
	Routine abdomen-pelvis and chest-abdomen-pelvis, pancreas, liver, adrenals, enterography	100 mL	85 mL
	Quebec		
	CT coronary angiogram	120 to 140 mL	2 mL/kg max 120 mL
Visipaque 270	**Quebec**		
	All protocols	70 mL	70 mL ***Also used Visipaque 320 65 mL**
Visipaque 320	**British Columbia**		
	Portal venous phase abdomen	100 mL	90 mL
	New Brunswick		
	All protocols except CT angiogram	100 mL	80 mL
	Ontario		
	All protocols	2 mL/kg max 100 mL if more than 50 kg	1.6 mL/kg max 100 mL
	No change	100 mL	100 mL

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	Portal venous abdomen, CT angiogram abdomen, urogram	2 mL/kg max 120 mL	1.5 mL/kg max 120 mL
	Portal-venous phase abdomen-pelvis, arterial abdomen-pelvis	100 mL	75 to 80 mL
Isovue 300	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Saskatchewan		
	No change	115 mL	115 mL
Isovue 370	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Ontario		
	No change	100 mL	100 mL
	CT abdomen-pelvis, CT abdomen-pelvis—cancer diagnosis, staging, CT for abdominal aortic aneurysm protocol, CT aortic dissection protocol, multiphasic studies	100 mL	80 mL
Extremity			
Omnipaque 300	**British Columbia**		
	No change	1.5 mL/kg	1.5 mL/kg ***Also used Isovue 300 1.5 mL/kg**
	All protocols	100 mL	83 mL
	Not reported	100 mL	***Switched to Omnipaque 350 90 mL**
	Routine, non-angiography	100 mL	***Switched to Omnipaque 350 70 mL**
	Ontario		
	Rare to do extremities with contrast	100 mL	80 mL
	All extremities except CT angiogram	90 mL	70 mL
	CT lower extremity with runoffs	100 mL	80 mL
	No change	80 mL	80 mL
	CT lower extremity with runoffs	2 mL/kg max 120 mL	1.5 mL/kg max 120 mL
	No change	70 mL	70 mL
	Quebec		
	Not reported	120 mL	100 mL
	No change	100 mL	100 mL

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
Omnipaque 350	**Alberta**		
	Enhanced extremities, non-angiographic studies	Weight-based dosing 112 mL	Weight-based dosing 96 mL
	British Columbia		
	All protocols	87 mL	72 mL
	Lower extremity contrast exams	85 mL	70 mL
	Not reported	100 mL	80 mL
	No change	86 mL	86 mL
	Manitoba		
	Rule out infection	100 mL	50 mL
	Nova Scotia		
	No change	Weight-based dosing 60 to 100 mL	Weight-based dosing 60 to 100 mL
	Ontario		
	Hand, foot	100 mL	70 mL
	No change	120 mL	120 mL
	No change	100 mL	100 mL
	Quebec		
	No change	125 mL	125 mL
Visipaque 320	**British Columbia**		
	No change	50 mL	50 mL
	Ontario		
	No change	2 mL/kg max 120 mL	2 mL/kg max 120 mL
Isovue 300	**Saskatchewan**		
	No change	115 mL	115 mL
Isovue 370	**Ontario**		
	No change	55 mL	55 mL
	No change	80 mL	80 mL
	Rare to do extremity with contrast	100 mL	80 mL
Head			
Omnipaque 300	**British Columbia**		
	No change	1.5 mL/kg	1.5 mL/kg ***Also used Isovue 300 1.5 mL/kg**
	All protocols	100 mL	83 mL

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	Head with contrast	100 mL	***Switched to Omnipaque 350 90 mL**
	Routine, non-angiogram	80 mL	***Switched to Omnipaque 350 60 mL**
	Ontario		
	Not reported	60 mL	50 mL
	All head protocols except CT angiogram and CT venograms	50 mL	30 mL
	Orbit and facial bones	50 mL	45 mL
	Rule out metastasis	80 mL	70 mL
	No change	90 mL	90 mL
	CT angiogram, CT venogram	1.5 mL/kg max 120 mL	1 mL/kg max 120 mL
	No change	70 mL	70 mL
	Quebec		
	No change	60 mL	60 mL
	CT cerebral angiogram	85 mL	85 mL ***Also used Omnipaque 350 68 mL**
Omnipaque 350	**Alberta**		
	Routine enhanced head	50 mL	45 mL
	British Columbia		
	All protocols	87 mL	72 mL
	CT head with contrast, CT cerebral angiogram (no reduction for stroke)	85 mL	70 mL
	CT venogram, sella	100 mL	80 mL
	Head, orbit, internal auditory canal, sinuses	90 mL	80 mL
	No change	86 mL	86 mL
	Manitoba		
	Routine contrast-enhanced brains	100 mL	80 mL
	Northwest Territories		
	No change	60 mL	60 mL
	Nova Scotia		
	No change	41 mL	41 mL
	CT head (no change for CT angiogram carotid-circle of willis-perfusion)	50 mL	***Switched to Omnipaque 300 50 mL**

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	Ontario		
	No change	40 mL	40 mL
	Not reported	50 mL	40 mL
	No change	60 mL	60 mL
	Quebec		
	CT angiography	80 mL	60 mL
Visipaque 270	**Quebec**		
	CT cerebral angiogram	85 mL	85 mL ***Also used Visipaque 320 70 mL**
Visipaque 320	**New Brunswick**		
	All protocols except CT angiogram	100 mL	80 mL
	Ontario		
	All protocols	2 mL/kg max 100 mL	1.5 mL/kg max 60 mL, 2 mL/kg max 75 mL
	CT angiogram, CT venogram	1.5 mL/kg max 120 mL	1 mL/kg max 120 mL
Isovue 300	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Saskatchewan		
	No change	100 mL	100 mL
Isovue 370	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Ontario		
	No change	60 mL	60 mL
	No change	45 mL	45 mL
Neck			
Omnipaque 300	**British Columbia**		
	No change	1.5 mL/kg	1.5 mL/kg ***Also used Isovue 300 1.5 mL/kg**
	All protocols	90 mL	75 mL
	Soft tissue neck	100 mL	***Switched to Omnipaque 350 90 mL**
	Routine, non-angiogram	130 mL	***Switched to Omnipaque 350 74 mL**

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	Ontario		
	Not reported	80 mL	70 mL
	Used single injection (except for CT angiograms)	125 mL	70 mL
	No change	105 mL	105 mL
	No change	60 mL	60 mL
	CT angiogram, CT venogram	1.5 mL/kg max 120 mL	1 mL/kg max 120 mL
	No change	70 mL	70 mL
	Quebec		
	Not reported	80 mL	60 mL
	Cervical spine - neck	80 mL	80 mL ***Also used Omnipaque 350 75 mL**
Omnipaque 350	**Alberta**		
	Soft tissue neck Altered double bolus bi-phase protocol to a single-phase neck	125 mL	75 mL
	British Columbia		
	All protocols	75 mL	64 mL
	Neck with contrast	Weight-based or 85 mL	Weight-based or 70 mL
	No change	60 mL	60 mL
	No change	86 mL	86 mL
	Manitoba		
	All routine contrast-enhanced necks that were not for head and neck cancer (those were exempted and used full dose)	100 mL	80 mL
	Northwest Territories		
	No change	85 mL	85 mL
	Nova Scotia		
	Not reported	70 to 90 mL	50 mL
	CT neck	70 mL	55 mL
	Ontario		
	Routine neck	100 mL	70 mL
	No change	70 mL	70 mL

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	Quebec		
	CT angiography	80 mL	60 mL
Visipaque 270	**Quebec**		
	Cervical spine- neck	80 mL	80 mL ***Also used Visipaque 320 70 mL**
Visipaque 320 **Isovue 300**	**British Columbia**		
	No change	70 mL	70 mL
	New Brunswick		
	All protocols except CT angiogram	100 mL	80 mL
	Ontario		
	All protocols	2 mL/kg max 100 mL	1.5 mL/kg max 60 mL, 2 mL/kg max 75 mL
	CT angiogram, CT venogram	1.5 mL/kg max 120 mL	1.0 mL/kg max 120 mL
Isovue 300	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Saskatchewan		
	No change	100 mL	100 mL
Isovue 370	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Ontario		
	No change	100 mL	100 mL
	No change	60 mL	60 mL
	Routine neck	85 mL	70 mL
Pelvis			
Omnipaque 300	**British Columbia**		
	No change	1.5 mL/kg	1.5 mL/kg ***Also used Isovue 300 1.5 mL/kg**
	All protocols	100 mL	83 mL
	Pelvis with contrast	100 mL	***Switched to Omnipaque 350 90 mL**
	Routine, non-angiogram	80 mL	***Switched to Omnipaque 350 70 mL**
	Ontario		

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	Not reported	100 mL	80 mL
	All pelvis	90 mL	70 mL
	No change	2 mL/kg max 120 mL	2 mL/kg max 120 mL
	Part of CT abdomen portal venous and part of CT angiogram abdomen-pelvis	100 mL	75 to 80 mL
	Quebec		
	All protocols	100 mL	Weight-based dosing ***Also used Omnipaque 350 85 mL**
Omnipaque 350	**Alberta**		
	Weight-based dosing for enhanced pelvis, non-angiographic studies	Weight-based dosing 112 mL	Weight-based dosing 96 mL
	British Columbia		
	All protocols	87 mL	72 mL
	Pelvis with contrast	Weight-based dosing	Weight-based dosing but decreased by 20% if more than 85 mL
	No change	86 mL	86 mL
	Manitoba		
	Rarely done but a routine contrast-enhanced pelvis for abscess could have received half-dose contrast	100 mL	50 mL
	Northwest Territories		
	No change	80 mL	80 mL
	Nova Scotia		
	No change	80 to 100 mL	80 to 100 mL
	Ontario		
	Routine pelvis	100 mL	70 mL
	Not reported	90 mL	80 mL
	Routine pelvic venous studies (typically combined with abdomen)	100 mL	85 mL
Visipaque 270	**Quebec**		
	All protocols	70 mL	70 mL ***Also used Visipaque 320 65 mL**
Visipaque 320	**British Columbia**		

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	CT abdo portal venous phase	100 mL	90 mL
	New Brunswick		
	All protocols except CT angiogram	100 mL	80 mL
	Ontario		
	All protocols	2 mL/kg max 100 mL if more than 50 kg	1.6 mL/kg max 100 mL
	Not reported	2 mL/kg max 120 mL	1.5 mL/kg max 120 mL
Isovue 300	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Saskatchewan		
	No change	115 mL	115 mL
Isovue 370	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Ontario		
	No change	100 mL	100 mL
	Soft tissue pelvis for abscess, fistula, connected with abdomen scans	100 mL	80 mL
Spine			
Omnipaque 300	**British Columbia**		
	No change	1.5 mL/kg	1.5 mL/kg ***Also used Isovue 300 1.5 mL/kg**
	All protocols	100 mL	83 mL
	Spine with contrast	100 mL	***Switched to Omnipaque 350 90 mL**
	Routine	100 mL	***Switched to Omnipaque 350 70 mL**
	Ontario		
	All contrast spine	90 mL	70 mL
	Not reported	100 mL	80 mL
	No change	70 mL	70 mL
	Quebec		
	Not reported	120 mL	100 mL
Omnipaque 350	**Alberta**		
	Routine enhanced studies, non-angiographic	Weight-based dosing 112 mL	Weight-based dosing 96 mL

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	British Columbia		
	All protocols	87 mL	72 mL
	Any spine imaging with contrast	85 mL	70 mL
	Lumbar spine	120 mL	80 mL
	Cervical spine	100 mL	80 mL
	No change	86 mL	86 mL
	Manitoba		
	Rarely for paraspinal infection	100 mL	80 mL
	Northwest Territories		
	No change	80 mL	80 mL
	Nova Scotia		
	No change	80 to 100 mL	80 to 100 mL
	Ontario		
	Routine spine venous studies (not performed often)	100 mL	85 mL
Visipaque 320	**British Columbia**		
	Not reported	100 mL	90 mL
	Ontario		
	Not reported	2 mL/kg max 100 mL	1.5 mL/kg max 60 mL, 2 mL/kg max 75 mL
Isovue 300	**Saskatchewan**		
	No change	115 mL	115 mL
Isovue 370	**Ontario**		
	No change	65 mL	65 mL
	No change	100 mL	100 mL
Chest			
Omnipaque 300	**British Columbia**		
	No change	1.5 mL/kg	1.5 mL/kg ***Also used Isovue 300 1.5 mL/kg**
	Not reported	90 mL	75 mL
	Chest with contrast, PE protocol	70 mL	***Switched to Omnipaque 350 65 mL**

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	Routine, non-angiogram	80 mL	***Switched to Omnipaque 350 65 mL**
	Ontario		
	Not reported	80 mL	70 mL
	All chests	80 mL	60 mL
	CT chest PE protocol	70 mL	55 mL
	Not reported	70 mL	60 mL
	CT angiogram, CT venogram	1.5 mL/kg max 120 mL	1 mL/kg max 120 mL
	No change	70 mL	70 mL
	Quebec		
	Not reported	70 mL	60 mL
	CT chest	75 mL	75 mL ***Also used Omnipaque 350 68 mL**
Omnipaque 350	**Alberta**		
	CT chest	70 mL	60 mL
	British Columbia		
	Not reported	75 mL	64 mL
	CT chest	Weight-based or 70 mL	Weight-based but decreased 20% if more than 70 mL
	Not reported	70 mL	60 mL
	Manitoba		
	CT chest	80 mL	40 mL
	Northwest Territories		
	No change	70 mL	70 mL
	Nova Scotia		
	No change	80 to 100 mL	80 to 100 mL
	CT chest PE protocol	70 mL	***Switched to Omnipaque 300 70 mL**
	Ontario		
	Dual phase chest, CT chest PE protocol	100 mL	70 mL
	Not reported	50 mL	40 mL
	No change	70 mL	70 mL

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	Quebec		
	No change	80 mL	80 mL
Visipaque 270	**Quebec**		
	CT chest	75 mL	75 mL ***Also used Visipaque 320 65 mL**
Visipaque 320	**British Columbia**		
	No change	50 mL	50 mL
	New Brunswick		
	All protocols except CT angiogram	100 mL	80 mL
	Ontario		
	All protocols	1.5 mL/kg max 60 mL if more than 50 kg	1.2 mL/kg max 60 mL
	CT angiogram, CT venogram	1.5 mL/kg max 120 mL	1 mL/kg max 120 mL
Isovue 300	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Saskatchewan		
	No change	90 mL	90 mL
Isovue 370	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Ontario		
	No change	100 mL	100 mL
	No change	80 mL	80 mL
	CT chest	75 mL	65 mL
	CT chest-abdomen	100 mL	80 mL
Cardiac			
Omnipaque 300	**British Columbia**		
	No change	2 mL/kg	2 mL/kg ***Also used Isovue 300 2.0 mL/kg**
Omnipaque 350	**Alberta**		
	No change	Dose not specified	Dose not specified
	British Columbia		
	No change	96 mL	96 mL
	Manitoba		

Drug name	Modified CT protocol(s)	Average dose before ICM shortage	Average dose after ICM shortage
	No change	80 mL	80 mL
	Nova Scotia		
	No change	105 mL	105 mL
	No change	Dose not specified	Dose not specified
	Ontario		
	CT aorta, pulmonary venous angiogram	80 mL	70 mL
	No change	115 mL	115 mL
	No change	124 mL	124 mL
	No change	75 mL	75 mL
	Not reported	2 mL/kg max 120 mL	1.5 mL/kg max 120 mL
Visipaque 320	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Ontario		
	Not reported	2 mL/kg max 120 mL	1.5 mL/kg max 120 mL
Isovue 300	**Saskatchewan**		
	No change	115 mL	115 mL
Isovue 370	**New Brunswick**		
	No change	Dose not specified	Dose not specified
	Quebec		
	No change	70 to 105 mL	70 to 105 mL
Ultravist 370	**Ontario**		
	Not reported	90 mL	***Switched to Omnipaque 300 80 mL**

ICM = iodinated contrast media.

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Questions or requests for information about this report can be directed to **Requests@CADTH.ca**