CASCADES

Environmentally Sustainable Opportunities for Health Systems Primer Series

State of Hazardous Medical Waste Management in Canada

Overview of the Issue

Executive Summary

There is a lack of clear and comprehensive guidelines and regulations addressing hazardous medical waste management in Canada. As a result, incineration and sterilization processes are overutilized, contributing to environmental pollution and high waste disposal costs for healthcare institutions. This primer provides an overview of this issue and outlines three main opportunities for change to improve the environmental sustainability of hazardous medical waste management: 1) updated regulations and guidance (including blood–saturated items, sharps waste, and empty drug containers), 2) practice change, and 3) waste reduction. Intended for healthcare policymakers looking for opportunities for change and better regulations and individual changemakers wishing to work in compliance with their local, provincial, or national regulations, this primer concludes with an overview of Canadian federal and provincial regulations and guidance related to hazardous medical waste management.

Context

There is a need for robust and clear guidance on hazardous medical waste generated in healthcare facilities in Canada that reduces unnecessary incineration and sterilization. For example, depending on the institutions, waste from operating rooms (ORs) is estimated to contribute to over 30% of all hospital waste (1–4) , of which a large volume is unnecessarily discarded as hazardous medical waste requiring incineration or sterilization before disposal in municipal solid waste landfills (5). Incineration and sterilization are expensive and polluting processes that increase both the disposal costs for healthcare institutions and greenhouse gas emissions and toxins (5–9). To address this challenge, this primer provides an overview of three opportunities for change (updated regulations and guidance, practice change, and waste reduction), to help mitigate the environmental and financial implications for healthcare facilities resulting from the unnecessary incineration and sterilization of medical waste. Waste haulers and vendors vary in their practices and the types of waste they accept; provincial, municipal and institutional regulations and guidelines must be reviewed before implementing any waste–related program.

In Canada, healthcare facilities have on–site sterilizing equipment and/or contract third–party vendors to collect, handle, and transport their hazardous waste to centralized, off–site facilities (10,11). Waste is sterilized using methods such as autoclaving or incineration (12,13)

Incineration involves burning waste at high temperatures to produce residual ash, which can then be disposed of in a municipal solid waste landfill (6). Although incineration decreases the volume of waste and ensures sterilization it releases carbon dioxide and toxins such as dioxins, furans, and mercury into the atmosphere (6,8). These atmospheric toxins are harmful to human health and the environment; for example, atmospheric mercury poses a risk to the health of human nervous, excretory, and reproductive systems and the environment. (6).

Autoclaving refers to the sterilization of hazardous medical waste using dry heat or steam to kill microbial contamination. After sterilization, waste can be disposed of in a municipal solid waste landfill (14,6). Compared to incineration, autoclaving does not release dioxins, furans, and mercury into the atmosphere, making it a more suitable method to decrease emissions (15). However, unlike incineration, autoclaving does not reduce the volume or alter the appearance of the waste and can contribute to the formation of leachate, which can lead to waste being re–treated through incineration as some communities are reluctant to allow non–incinerated hazardous

medical waste to be landfilled. It is also not an acceptable means of sterilization for Creutzfeldt–Jacob Disease infected waste or cytotoxic material (6,16).

Key Definitions

Although many countries have medical waste legislation, a review by Windfeld & Brooks (2015) found that there are inconsistent definitions of what constitutes 'hazardous' waste requiring incineration or sterilization. Additionally, there is no universally agreed–upon definition of medical waste, which is also referred to as biomedical waste, hospital waste, regulated medical waste, and infectious medical waste (17). In this primer, the term hazardous medical waste will be used to describe any biomedical, infectious, cytotoxic, pharmaceutical, radioactive, anatomical, or microbiological waste that is classified as hazardous requiring incineration or sterilization before disposal.

This primer uses definitions from the Canadian Standards Association, **CSA Z317.10:21 Handling of Healthcare Waste Materials (2021)** to define the following terms:

Biomedical Waste: "waste that requires special handling and disposal because it presents a particular risk of disease transmission (pg. 17)"
Note: "1) Biomedical waste can include used needles and syringes due to the possibility of there being blood–borne pathogens (such as HIV, Hepatitis B or C) present, and the risk of transmission if the used needle is not properly contained and disposed of. 2) 'Biohazard' and 'biomedical waste' are often used interchangeably (pg. 17)."

General Waste: "material that does not pose a disease–related risk or threat to people or the environment when managed in accordance with appropriate practices and applicable regulations (pg. 17)."

Hazardous Waste: "a material or substance that, if handled improperly, has the potential to harm people, property, or the environment (pg.18)."

Sharps: "items used in medical care diagnosis or research that can be contaminated with biohazardous or cytotoxic agents and that are capable of causing punctures, cuts, or tears in skin or mucous membranes (pg. 20)"
Note: "Sharps include hypodermic, surgical, suture, or intravenous (IV) needles, syringes with needles, Pasteur pipettes, lancets, scalpels, blades, and laboratory glass (pg. 20)."

Pharmaceutical Waste: "includes drugs and medicinal chemicals that a) are no longer usable; b) have become outdated or contaminated; c) have been stored improperly; or d) are no longer required (pg. 34)."

Note: "Empty vials, etc., are considered as general waste. If they are not empty, they are considered as pharmaceutical waste (pg. 34)."

Cytotoxic waste: "waste associated with cytotoxic agents. There are two types of cytotoxic waste:

a) pharmaceutical cytotoxic waste, which consists of waste cytotoxic agents or any material that has been in direct contact with or is contaminated with cytotoxic agents.

b) biomedical cytotoxic waste, which consists of biomedical waste (including sharps) that have also been in contact or is contaminated with cytotoxic agents."

Note: "It includes waste generated from patients, outer packaging, sharps, personal protective equipment, tubing, etc. that has been in contact with cytotoxic agents." (pg. 17)

Opportunities for change

Below is a list of opportunities that may be used to decrease the volume of medical waste classified as hazardous, and consequently incinerated and/or sterilized, mitigating the broader environmental and financial implications for healthcare facilities.

1. Updated Regulations and Guidance
2. Practice Change
3. Waste Reduction

1. Updated Regulations and Guidance

Regulations and guidance for hazardous medical waste management are variable across Canadian jurisdictions, and many do not maximize opportunities for environmental sustainability.

This section provides three examples where there is inconsistency across Canadian jurisdictions regarding hazardous medical waste management policies that could, but tend not to, support environmental sustainability:

a) Blood–Saturated Items
b) Sharps Waste
c) Empty Drug Containers

a) Blood–Saturated Items

Opportunity: If not pathogenic, blood–saturated items could be disposed as general waste as opposed to hazardous waste.

Residential waste which is saturated with blood (dripping or releasing blood when compressed) does not require any treatment and is disposed of in municipal solid waste landfills. Similarly, waste saturated with blood from hospitals may also be able to go straight to the landfill rather than wasting resources on incineration or autoclaving treatment (5).

CASE EXAMPLE

Public Health Ontario's Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings (2018) and Alberta Health Services (AHS) Procedure on Biomedical Waste (2015) state that material that is not saturated, dripping or releasing blood when compressed can be sent to general waste stream as long as it's not pathogenic. However, AHS do mention that "due to the sensitivities surrounding health care waste, consideration should be given to items which are especially soiled or unsightly as to whether they should be disposed of in general waste or another more appropriate waste stream" (pg. 17).

b) Sharps waste

Opportunity: When not contaminated with blood or cytotoxic/hazardous pharmaceuticals, capped needles can be removed from the syringes. Needles can go into sharps, any unused medication in a pharmaceutical waste bin and the empty syringe in general waste or recycling, depending on the vendor.

The Canadian Standards Association, **CSA Z317.10:21 Handling of Healthcare Waste Materials (2021)** defines sharps as " items used in medical care diagnosis or research that can be contaminated with biohazardous or cytotoxic agents and that are capable of causing punctures, cuts, or tears in skin or mucous membranes", including "hypodermic, surgical, suture, or IV (intravenous) needles, syringes with needles, Pasteur pipettes, lancets, scalpels, blades, and laboratory glass ".

According to this definition, syringes and vials shouldn't go into sharps waste.

CASE EXAMPLES

-The Ontario Environmental Protection Act, Regulation 298 – Collection of Pharmaceuticals and Sharps – Responsibilities of Producers is not pro-environmental because it defines a sharp as "a needle, safety engineered needle, lancet or other similar instrument that is designed to puncture the skin of individuals or companion animals for medical purposes and that is sold to consumers in Ontario, whether it is sold by the producer of the sharp or by another person, and **includes anything affixed to the sharp, including a syringe**" (bold emphasis added). A more sustainable approach would allow empty syringes to be separated from needles which could be disposed of as general waste.

-AHS Procedure on Biomedical Waste (2015) and Newfoundland & Labrador's Department of Environment and Climate Change – Guidance Document (2016) are pro-environmental and indicate that non-contaminated "syringes without needles" can be disposed of as general waste. In Alberta, drug vials are also not considered contaminated sharps and can be disposed of as general waste.

-The UK Department of Health, Environment and Sustainability Health Technical Memorandum 07-01: Safe Management of Healthcare Waste (2013) is pro-environmental and indicates that "sharps waste does not include syringe bodies (other than the needle) and the residual medicine they contain" (pg. 38), and sharps not contaminated with body fluids or medicines are not considered hazardous.

-The United States EPA - 266.507 Residues of Hazardous Waste Pharmaceuticals in Empty Containers (2019) is also pro-environmental and does not regulate residues in empty syringes, meaning that empty syringes can be disposed of in the general waste stream, as long as the plunger has been fully pressed.

c) Empty Drug Containers

Opportunity : Empty drug containers can be disposed as general waste or recycled.

Neither the British Columbia **Environmental Management Act**– **Hazardous Waste Regulation (B.C. Reg. 63/88) (1988)** nor the Ontario **C–4: The Management of Biomedical Waste in Ontario (2016)** explicitly mention empty drug containers. This gap provides an opportunity to implement a more pro–environmental approach that would allow empty drug containers to be disposed of in the general waste stream or recycled, depending on the container type and the provider.

CASE EXAMPLES

-AHS Procedure on Biomedical Waste (2015) and the Newfoundland & Labrador Department of Environment and Climate Change – Guidance Document (2016) are pro-environmental and indicate that empty medication containers or vials can be disposed of in the general waste stream or recycling, depending on the vendors and the material.

-The Australian, Victoria Framework for Handling and Disposal of Pharmaceutical Waste (2020) is pro-environmental and indicates that empty drug containers and empty PVC bags that have not contained cytotoxic, S8 or S4D medicines can be recycled or disposed of as general waste or recycling, depending on the vendors and the material.

-The United States EPA - 266.507 Residues of Hazardous Waste Pharmaceuticals in Empty Containers (2019) is also pro-environmental and does not regulate residues in stock bottles, dispensing bottles, vials, or ampoules as hazardous waste. Therefore, empty stock, dispensing, and unit-dose containers can be disposed of as general waste or recycling, depending on the vendors and the material.

2. Practice Change

Staff education on sorting biomedical waste is required to efficiently manage waste in healthcare settings, specifically operating rooms (6). According to Canadian hospital administrators, the increased volume of medical waste that is disposed of as hazardous is due to poorly understood definitions of hazardous waste categories; improper segregation of hazardous waste from non–hazardous waste; and inadequate staff training on how to handle and dispose of biomedical and pharmaceutical waste (5). For these reasons, healthcare providers tend to err on the side of caution when deciding how to dispose of hospital waste, which increases the volume of general waste disposed of as hazardous (18). Effective sorting is advantageous for both cost savings and emissions reduction associated with incineration and sterilization processes.

Opportunity: Practice change can start by educating staff involved in every stage, from procurement to waste supplies, that certain items can be disposed of in general waste and recycling.

CASE EXAMPLES

Pro-environmental policies include the AHS' Procedure on Biomedical Waste (2015), Newfoundland & Labrador's Department of Environment and Climate Change – Guidance Document (2016), Public Health Ontario's Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings (2018), and the United States' EPA - 266.507 Residues of Hazardous Waste Pharmaceuticals in Empty Containers (2019) which indicate that the following items can be disposed of in the general waste streams.

- IV bags and tubing (empty or with residual blood)
- Dialysis tubing and filters
- Soiled dressings
- Diapers
- Sponges
- Personal protective equipment
- Disposable drapes
- Catheters
- Empty specimen containers

-Examples of pro-environmental practice change resources can be found at BC GreenCare. In collaboration with Stericycle, BCGreenCare created a series of posters to enable proper biomedical waste segregation through staff education. These posters are available for free on their website and include documentation on anatomical and non-anatomical waste, sharps waste, cytotoxic waste, pharmaceutical waste, and general waste.

Note: Before implementing staff education or a recycling program, it is important to review your provincial waste management regulations/guidelines, and identify what the waste hauler serving your facility accepts. Waste haulers vary in their practices and the types of waste, specifically recycling, they accept. In support of these policies, recycling programs such as the medical PVC recycling initiative **PVC 1,2,3** can be available. For example, IV bags can be recycled through this program.

3. Waste Reduction

Medical waste reduction strategies are beyond the scope of this primer; however, it is an important area to address. All waste reduction starts with reducing unnecessary use; therefore, healthcare staff should prioritize choosing appropriate procedures and stewarding resources well (19)For additional examples of environmentally sustainable

opportunities for healthcare institutions, including waste reduction strategies, see the **CASCADES Sustainable Operating Room Primer**, Weiss et al. (2016) article **"Environmentalism in Surgical Practice"**, as well as other resources on the **CASCADES website.**

CASE EXAMPLES

A good example of waste reduction strategies can be found at Synergie Santé Environnement, who created a micro-website dedicated to waste management in institutions. The information sheets for biomedical and pharmaceutical waste (2019) raise awareness on waste management practices in accordance with the 3RV-E principles (source reduction, reuse, recycling, valorization, and elimination).

The Choosing Wisely initiative reconsiders the need for certain procedures to allow for more appropriate use of resources and reduce waste at the source. Clinicians and patients alike are encouraged to assess the value of using certain tests and care.

Canadian Regulations and Guidance

The Canadian federal government does not take a prescriptive role in its regulatory approach toward biomedical waste management. Most provinces rely on umbrella legislation governing all waste material to regulate the handling of hazardous medical waste. In this primer, 'regulation' is used to express a requirement, while 'guidance' is used to express a recommendation.

Regulations

Transportation of Dangerous Goods Act (1992): regulates the transportation of biohazardous materials, including biomedical waste.

Guidance

Guidelines for the Management of Biomedical Waste in Canada (1992): created by the *Canadian Council of Ministers of the Environment (CCME)* provides guidance to provinces on the definition, treatment, and disposal of biomedical waste in an effort to standardize the process. The guidelines outline the minimum practices to be followed by hospitals, long–term care facilities, public health units, and dentists for the management of biomedical waste. These guidelines are meant to act as a framework for the provinces when creating their own policies, therefore provincial regulatory agencies may specify more stringent regulations. The guidelines do not specifically address pharmaceutical waste in hospital settings; however, pharmacies and pharmaceutical suppliers are encouraged to use these guidelines.

Destruction of narcotic, controlled and restricted substances by licensed dealers (2018): provides guidance specifically applying to licensed dealers intending to destroy controlled substances in their possession. Informs generally on the method of destruction required, including requirement for incineration, when chemical destruction (denaturation) can be used and acceptable methods of denaturation.

Guidance Document for Pharmacists, Practitioners and Persons in Charge of Hospitals: Handling and Destruction of Unserviceable Stock, Containing Narcotics, Controlled Drugs or Targeted Substances (2018): provides guidance for practitioners, pharmacists, and persons in charge of a hospital involved in the handling and destruction of unserviceable stock (drug product containing a narcotic, controlled drug or targeted substance that is unusable, expired and/or that cannot be dispensed).

Canadian Biosafety Handbook, Second Edition (2016): provides national guidance for the safe handling and storing of human and terrestrial animal pathogens and toxins in Canada.

Canadian Standards Association: CSA Z317.10:21 (2021): provides guidance for handling health care waste materials, including requirements for the packaging, collection, storage, handling, treatment, and disposal of waste materials within health care facilities and veterinary health care facilities.

Provincial Regulations and Guidance

Provinces establish their own regulatory framework for handling and transporting biohazardous materials, which must be based on the *Transportation of Dangerous Goods Act* and *Guidelines for Biomedical Waste Management in Canada* set by the CCME. Because the provincial regulations are based on these federal guidelines, there is consistency amongst the guidelines set across the provinces.

British Columbia

Regulations

Environmental Management Act– Hazardous Waste Regulation (B.C. Reg. 63/88) (1988)

Guidance

BC GreenCare– Sustainability Resources: provides guidance for what can and cannot be recycled in BC Lower Mainland hospitals and provides guidance for staff education on biomedical waste management.

Alberta

Regulations

Biomedical waste is managed according to regional infection control procedures developed by institutions responsible for the waste and in compliance with the requirements of Alberta Health Services (AHS).

Guidance

Disposal of Biomedical Waste: Acceptable Industry Practices (2019): describes acceptable industry practices for the disposal of biomedical waste in Alberta, in alignment with the CCME *Guidelines for the Management of Biomedical Waste.*

AHS Procedure on Biomedical Waste (2015): outlines AHS procedures for handling, transporting, and disposing biomedical waste.

Saskatchewan

Regulations

N/A

Guidance

Saskatchewan Biomedical Waste Management Guidelines (2008): outlines procedures for the classifying, handling, storage, transportation, and disposal of biomedical waste in Saskatchewan.

Manitoba

Regulations

The Dangerous Goods Handling and Transportation Act– Hazardous Waste Regulation (R. 195/2015): regulates biomedical waste from hospitals.

Guidance

N/A

Ontario

Regulations

The Ontario Ministry of the Environment and Climate Change regulates biomedical waste through the Environmental Protection Act and C–4.

Environmental Protection Act (EPA) (1990): The EPA is the Ontario regulation for the management of industrial waste. Part V governs waste management generally, but does not provide much guidance on the disposal of biomedical waste specifically.

> **Regulation 347 – General Waste Management:** defines types of waste, but it does not define biomedical waste. It includes schedules to categorize specific substances as types of waste and lists land disposal treatment requirements for specific substances, and describes treatment methods. While a few hazardous

waste chemicals exist as pharmaceuticals, most medications are not on these schedules.

Regulation 298 – Collection of Pharmaceuticals and Sharps – Responsibilities of Producers: outlines responsibilities of producers and defines "pharmaceutical" and "sharp".

C–4: The Management of Biomedical Waste in Ontario (2016): C–4 describes best management practices to be followed to minimize the impact of biomedical waste on the environment through appropriate packaging, segregation, treatment, storage and disposal methods with the aim of preserving the integrity of the environment and reducing potential public health risk through proper management of biomedical waste.

The guideline is primarily directed at two main audiences: (1) generators of biomedical waste; and (2) carriers and receivers who are responsible for treatment, transportation and disposal of biomedical waste. Although not specifically listed, other generators and handlers of biomedical waste, such as police, fire, and ambulance services, and pharmacies are encouraged to use these guidelines when formulating their best management practices.

The recommendations set out in this guideline are in addition to any requirements under Part V of the EPA, Regulation 347 General – Waste Management, and any other statutory or legal requirements.

Guidance

Public Health Ontario, Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings (2018): includes guidelines on the management of biomedical and pharmaceutical waste (pg. 72–78).

Quebec

Regulations

Règlement sur les déchets biomédicaux (2021): under the *Loi sur la qualité de l'environnement*, this regulation defines the categories and sub–categories of biomedical waste, management methods, external storage, shipping and management requirements. It also details the record keeping requirements and preparation of annual reports. Once disinfected, biomedical waste can be taken to the landfill or incinerated under the **Règlement sur l'enfouissement et l'incinération des matières résiduelles (2006)**.

Règlement sur les matières dangereuses (2021): defines and describes the management methods of hazardous materials that are not managed by the *Règlement sur les déchets biomédicaux* (ex: residues of drugs and expired drugs that are toxic or

cytotoxic, including toxic products and drugs containing mineral oils or fats, containers or residual materials that contain or have come into contact with a hazardous drug product during preparation or administration).

Guidance

Guide de gestion des déchets du Réseau de la santé et des services sociaux (2017):

Document from the Ministry of Health and Social Services, defines the different types of waste created in the health network. For each type, this guide details the actors, risks, management principles and occupational health and safety rules related to it and offers summary sheets.

Nova Scotia

Regulations

Nova Scotia health Waste Management Policy provides the overall framework for general waste management in health care facilities.

In general, hazardous biomedical waste is taken to a third–party vendor or disposed of at a centralized facility.

Guidance

N/A

New Brunswick

Regulations

Clean Environment Act– Water Quality Regulation (NB 82–126) (2018): The New Brunswick Department of Environment and Local Government manages hazardous waste (including biomedical waste) through the Clean Environment Act.

Guidance

N/A

Newfoundland & Labrador

Regulations

N/A

Guidance

Management of Biomedical and Pharmaceutical Waste (2016): provides guidance and describes best management practices for the disposal of biomedical and pharmaceutical waste.

Prince Edward Island

Regulations

Environmental Protection Act– Waste Resource Management Regulations (2019): biomedical waste is classified as a 'special waste' under the *Waste Resource Management Regulations.*

Guidance

N/A

Yukon

Regulations

N/A

Guidance

Guidelines for the Management of Biomedical Waste in Yukon (2018): provides guidance for the disposal of biomedical waste.

Biomedical Waste Facts Sheet (2011): provides a brief overview of how to dispose biomedical waste.

Northwest Territories

Regulations

N/A

Guidance

Guidelines for the Management of Biomedical Waste in the Northwest Territories (2005): provides guidelines for the reduction, segregation, packaging, and treatment of biomedical waste.

Nunavut

Regulations

N/A

Guidance

Environmental guidelines for Biomedical and pharmaceutical waste (2014): defines and explains the management of both biomedical and pharmaceutical waste in healthcare settings. Defines biomedical waste as "any solid or liquid waste that may present a threat of infection to humans".

Methods Statement

This document provides a snapshot of the state of hazardous medical waste management in Canada. It is the result of a rapid literature review and related desk research with review by content experts where possible. The information in this document is provided for general information purposes only and is not intended to provide legal advice; please consult with a professional lawyer for legal advice. This is the first version of this document, and while it is not intended to be comprehensive nor exhaustive, we welcome comments and feedback. Updates to this document and any comprehensive reviews will be posted on the CASCADES website.

Version History

Version No.	Date	Contributors
1	March 2023	***Research and writing:*** Lihani Du Plessis Vivian Tseng Sarah Machane ***External Review:*** Dr. Syed Ali Abbas, Jérôme Ribesse, Edward Rubinstein

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This project was undertaken with the financial support of the Government of Canada.

Ce projet a été réalisé avec l'appui financier du gouvernement du Canada.

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