SUSTAINABLE PERIOPERATIVE CARE

Why • The Case for Change
What • The Tools for Change
How • The Strategy for Change

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.

Canada

CASCADES

NAVIGATION

Click on a topic on the table found on the right to navigate the document

INTRODUCTION

This Playbook provides background information and implementation resources designed to address environmental sustainability in perioperative care

There are numerous reports and guides that have addressed sustainability opportunities in the operating room. This playbook contributes to this field by:

1. Going beyond the operating room to consider perioperative care more broadly, including the ways in which upstream decisions impact the environmental footprint of care
2. Engaging an array of stakeholders in addition to surgeons and anesthesiologists, including nurses; OR managers; custodial, informatics, procurement, and QI staff; and many others
3. Exploring change ideas that specifically address perioperative care in the Canadian context. The playbook features videos of Canadian healthcare professionals describing their efforts to improve sustainability at their hospitals, as well as implementation resources that have been created by, developed in collaboration with, and/or reviewed by these sustainability champions.

While the lead collaborator on this project is the Ontario Surgical Quality Improvement Network (ON-SQIN), the resources contained herein have been developed in several stages, and in collaboration with various groups. These are summarized in the "Playbook Development Stages" section, but individual contributors to specific resources are listed in the playbook sidebars and in the resources. A full list of acknowledgments is included at the end of the playbook.

Suggested citation

Simms N, Devitt K, Irani C, Khan N, Meng F. Sustainable Perioperative Care version 3.0 (2026) [Internet]. CASCADES (Creating a Sustainable Canadian Health System in a Climate Crisis). [Cited DATE]. Available from https://cascadescanada.ca/resources/sustainable-perioperative-care-playbook/

PLAYBOOK DEVELOPMENT STAGES

STAGE 1:
Identification of sustainability opportunities and development of the Sustainable OR Scorecard (led by the Centre for Sustainable Health Systems)

Collaborators:

- TAHSN-CHS Sustainable Health Systems Community of Practice
- University of Toronto Best Practice in Surgery

STAGE 2:
Drafting of project charters by CASCADES team; Drafts informed by interviews with sites that scored well on the scorecard to better understand the necessary ingredients for change

New Collaborators:

- Individual contributors from TAHSN sites and beyond
- Ontario Surgical Quality Improvement Network (ON-SQIN)

STAGE 3:
Review of project charter drafts via workshop session, focus groups, and interviews; Implementation resources created/collected

New Collaborators:

- Ontario's Anesthesiologists Environmental Sustainability Working Group (OA-ESWG)
- Choosing Wisely Canada (CWC)

Current stage

STAGE 4:
Prototype playbook and associated resources finalized (to be expanded and/or adapted based on community feedback)

Spread and scale across Ontario and the rest of Canada via the ON-SQIN Cut the Carbon Campaign and other initiatives.

Get in touch to get involved in our spread efforts!

Environmental Sustainability Working Group

PLAYBOOK STRUCTURE

WHY
The Case for Change

An exploration of the problem, including the importance of acting now to address it

WHAT
The Tools for Change

A change package containing information and resources designed to facilitate sustainability interventions

HOW
The Strategy for Change

An overview of key approaches to generating support and buy-in from colleagues and leadership

WHY

The Case for Change

Perioperative care is important and necessary to the healthcare system

Unnecessary care, the use of certain anesthetic gases, reliance on single-use devices, and improper waste disposal contribute to the carbon intensity of perioperative care

Addressing these issues can make perioperative care more environmentally sustainable without compromising the quality of care

Climate Impacts on Health

The Canadian healthcare system accounts for an estimated 4.6% of national greenhouse gas emissions.(1) As the effects of climate change continue to intensify, all sectors are charged with reducing carbon, and the healthcare sector is no exception. Health care has a dual interest in addressing its contributions to climate change given that: a) the very sector tasked with protecting human health should not be contributing to a phenomenon that threatens it, and b) healthcare services will be increasingly burdened by the health threats posed by increasing temperatures and extreme weather events.(2) It is therefore imperative that the health sector reduce its environmental impacts while prioritizing human health and wellbeing.(3)

The operating room (OR) has long been recognized as a significant area of opportunity for reducing healthcare emissions. While ORs are key sites for patient care, these energy and waste-intensive spaces also have a negative impact on the environment and consequently, human health.(4,5)

The annual climate impact of an operating surgical suite has been estimated at between 3,200,000 and 5,200,000 kg CO_2e (6) – the equivalent of providing energy to between 718 and 1,218 Canadian homes for a year.(7) The OR and perioperative care more broadly contribute to environmental degradation in several ways. ORs are estimated to generate up to a third of hospital waste; this includes waste from disposable materials and single-use surgical devices, biohazardous medical waste such as fluids and contaminated materials, and pharmaceutical waste.(5,8,9) Other major sources of OR emissions are energy used for heating, ventilation, and air conditioning; and anesthetic gases.(8,10)

Addressing these environmental concerns can often have financial benefits, as ORs represent a major financial cost to hospitals, accounting for 6% of Canadian hospital budgets.(11) Minimizing wasteful practices has the potential to reduce some of that spending. Implementing strategies to support environmental sustainability in the OR and in perioperative care more broadly therefore presents an opportunity to reduce waste and expenditure, while ensuring sterility and patient safety.(9,12,13)

RESOURCES:

In addition to a growing body of literature (see, for example [12,13,25], there are several excellent open-access resources on greening the operating room and/or perioperative services, including:

In Canada:

- CASCADES Perioperative Care Resources
- Greening ORs: A guidance document for improving the environmental sustainability of operating rooms, Best Practice in Surgery, University of Toronto
- Sustainable Operating Rooms Scorecard, TAHSN-CHS Sustainable Health System Community of Practice
- Ontario's Anesthesiologists Environmental Sustainability Working Group, OA-ESWG

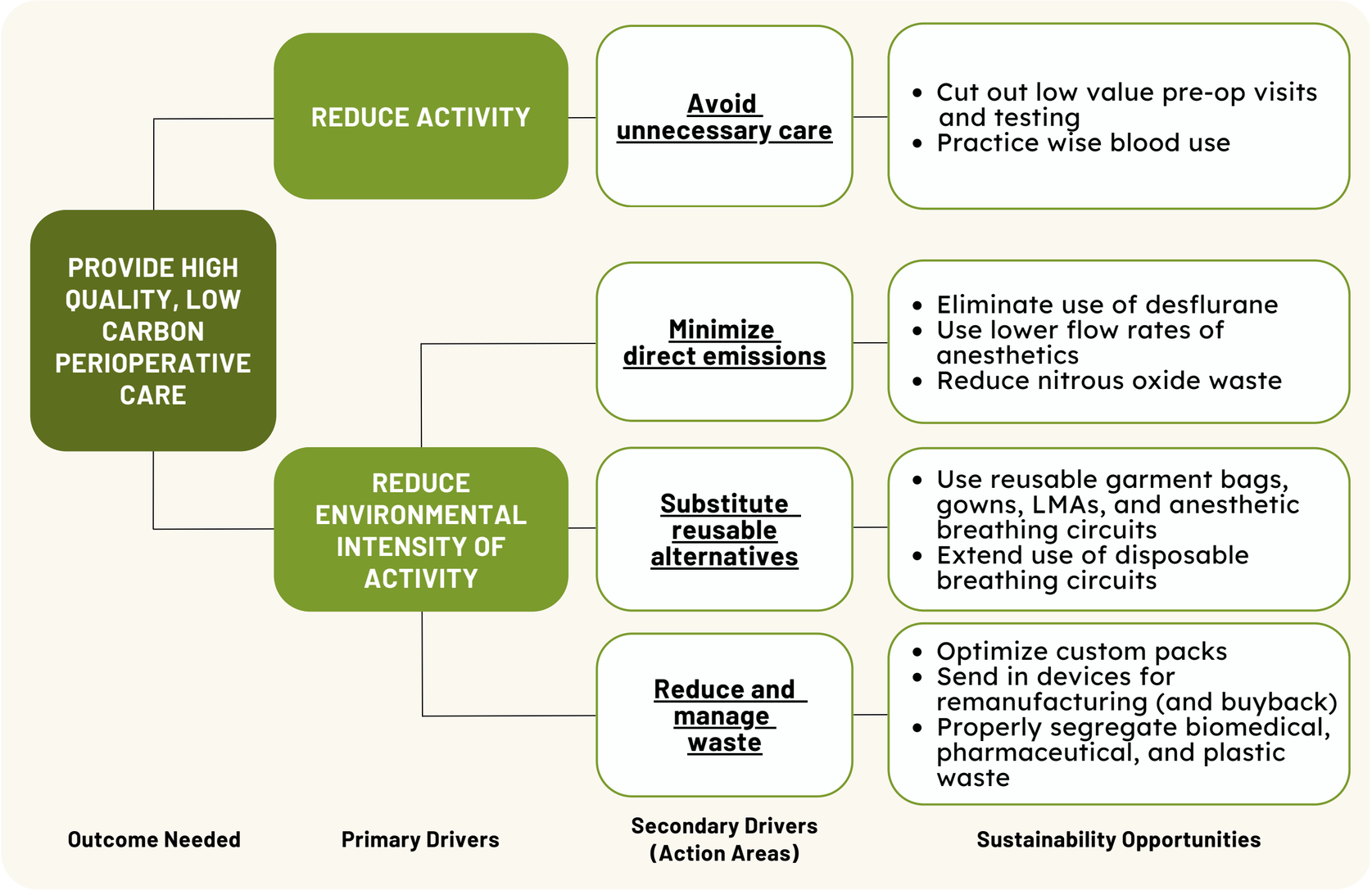
Internationally:

- Greener Healthcare and Sustainability project (GHASP) (UK)
- Greener Operations: Sustainable Peri-Operative Practice, James Lind Alliance (UK)
- Intercollegiate Green Theatre Checklist, Royal College of Surgeons of Edinburgh (UK)
- AST Guidelines for Environmental Practices in the Operating Room, Association of Surgical Technologists (USA)
- Greening the Operating Room and Perioperative Arena: Environmental Sustainability for Anesthesia Practice, American Society of Anesthesiologists (USA)
- Green Theatres Network (AUS)

Opportunities for Change

As presented in "Figure 1: Pathways to Carbon Reduction in Perioperative Care" (see right), there are two primary drivers that contribute to the provision of high-quality, low-carbon perioperative care: reduction of unnecessary activity, and reduction of the carbon intensity of necessary activity.(14) For this playbook, the following secondary drivers (or "action areas") have been identified as components of these primary drivers: reduction of unnecessary care, reduction of direct emissions, adoption of reusables, and reduction and proper management of waste. Within each of these action areas, there are multiple opportunities for perioperative teams to improve sustainability.

FIGURE 1: Pathways to carbon reduction in perioperative care



Timely Incentives to Consider and Advocate for More Sustainable Perioperative Care

Growing focus on the health sector's climate footprint

The health sector contributes significantly to global emissions; if it were a country, it would be the fifth largest emitter on the planet.(15) It is becoming increasingly accepted that the health sector, with its mission to help and heal, should be front and center in the fight to safeguard the planet and human health from climate change. At COP26, the Government of Canada signed on to a commitment with 49 other countries to address health sector emissions. Therefore, there is both an ethical and reputational incentive to improve the sustainability of healthcare activities, including in perioperative care.

Sustainability is now recognized as central to Quality

QI and sustainable healthcare have become part of the core curriculum at all UK medical schools in response to the National Health Service's (NHS) commitment to reach carbon neutrality by 2040.(16) **Sustainable Quality Improvement ("SusQI") positions QI as a strategic tool in improving the triple bottom line of social, financial, and environmental outcomes.** For more information on the relationship between sustainability and quality, check out the CASCADES Playbook: Training for Better Health Outcomes: Integrating Sustainability into Quality Improvement Programs.

Importance of resilience in the face of climate change is increasingly apparent to Canadians

In addition to minimizing emissions and waste, sustainable healthcare aims to be climate resilient, anticipating and responding to climate-related shocks and stress.(17) In 2021, British Columbia experienced a heat dome with devastating impacts, resulting in hundreds of lives lost and substantial increases in emergency department visits requiring immediate and complex care.(18) Climate change is estimated to increase surgical burden through the rise in injuries, traumas, and diseases, all while potential supply chain disruptions mount. **Building resilience in and around the operating room is a crucial component of insulating healthcare systems from the damaging effects of climate change.(19)**

Potential cost savings

Sustainable perioperative care can result in cost-savings and efficiencies, such as the purchase of reusable devices with lower costs per use, the reduction of patient travel associated with unnecessary pre-op visits, and other practice changes that streamline care delivery.(20)

WHAT

The Tools for Change

Consider quality improvement (QI) as a mechanism for change

Review sustainability opportunities in perioperative care

Use the resources provided to plan, implement, and evaluate sustainable QI projects

How to Navigate the Change Package and Project Charters

SUMMARY OF CHANGE PACKAGE

PURPOSE

This section of the playbook contains a “change package” – it offers information and resources related to several sustainability opportunities in the OR. These sustainability opportunities have been grouped into the action areas listed to the right.

Each sustainability opportunity that has been identified is accompanied by a project charter and, where available, implementation resources. These items have been developed by, or in collaboration with, healthcare professionals and teams working in or adjacent to perioperative care. They are designed to facilitate the planning and implementation of projects that will improve the environmental sustainability of such care. Additional resources of interest have also been provided.

The change package will be expanded and adapted based on community feedback.

ACTION AREAS

The sustainability opportunities presented here have been organized into four broad action areas:

- **1. Unnecessary care**
- **2. Direct Emissions**
- **3. Reusable Alternatives**
- **4. Waste Reduction & Management**

An overview of the sustainability opportunities within each action area can be found here.

SUSTAINABILITY OPPORTUNITIES

For each action area, you will find:

- An overview of the action area
- An overview of each sustainability opportunity within that action area, including links to CASCADES project charters, CASCADES implementation resources, and additional resources

RESOURCES

The project charters and implementation resources themselves are not contained in this playbook, but can be accessed via the links provided.

Instructional slides on how to use the project charters precede the change package.

Note that project charters are provided for each of the sustainability opportunities except those related to unnecessary care (existing content from Choosing Wisely Canada is linked).

CASCADES PROJECT CHARTERS

Each sustainability opportunity is accompanied by a completed CASCADES project charter.

The CASCADES project charter is a sustainability-focused adaptation of the IHI model for improvement (Plan-Do-Study-Act), Sustainable Quality Improvement Framework (SusQI), and Lean Continuous Improvement approaches

- It is a structured problem-solving approach to improving the quality of care
- To learn more about the relationship between sustainability and quality, check out the CASCADES QI Playbook

VIDEO: CASCADES Project Charter with Ernest Byers

Click here to find a blank fillable version of the charter

NAVIGATING THE CASCADES PROJECT CHARTERS

The charters prepared for this playbook have been prepared in consultation with healthcare professionals who have tackled projects like these head-on.

They have been designed with the following elements to help you and your team get started on a sustainability project:

- They are **general and can be adapted** to any setting, but they also contain accounts of specific ideas and projects to help inspire and guide implementation
  - See the following slides for guidance on how to read and adapt the charters to your needs
- They are available as **PowerPoint files** that can be easily amended and shared with your team and other stakeholders
- They contain a variety of **change ideas at various levels** – pick the one(s) that apply best to your setting
- Where available, **additional implementation resources** are listed in section 6 of each charter (“Design the improvement and define change ideas”)

HOW TO READ AND ADAPT THE CHARTERS

PURPOSE	SECTION	SUMMARY	ADAPTATION GUIDANCE
Introduce the project	Title Slide	Project title and contributors	Modify to suit your needs! Feel free to remove any attributions to authors, reviewers, and/or collaborators, and to replace the logos with your own. A list of suggested collaborators has been provided – replace these with the names of project participants. Finding an executive sponsor for your project will increase your chances of success – include their name on the title slide as well.
Establish the problem	1. Goal	A brief note on what you are trying to achieve	You can modify this statement to specify quantitative targets, timelines, etc. (the SMARTer, the better!)
	2. Scope	A boundary around the project to denote what is being included/ excluded.	You may want to shrink the boundary (i.e. start by optimizing custom packs for one or two surgical services) or extend some of these initiatives beyond perioperative care (the BYORB project, for example, translates well to other hospital units)! The CASCADES charter also includes an environmental scope, indicating the type of greenhouse gas (GHG) emissions the project seeks to reduce; as per the GHG Protocol, these include: • Scope 1: Emissions that fall under the direct control of the healthcare facility (i.e. on-site fuel combustion, fleet vehicles, anesthetic gas use and leaks) • Scope 2: Emissions that derive from energy (mostly electricity) purchased by the facility • Scope 3: All other indirect emissions (i.e. embedded carbon in purchased supplies and equipment, employee commuting, waste disposal). You do not need to modify the scope, but it is worth noting that many sustainability opportunities involve environmental impacts beyond GHG emissions.
	3. Problem/ Opportunity Statement	A brief statement of the problem or opportunity you are trying to address or harness	Background information has been included in each charter to make the case for change. Augmenting this general information with site-specific data (for example, the number of disposable gowns your unit throws away on a monthly basis) will reinforce the need for action.

PURPOSE	SECTION	SUMMARY	ADAPTATION GUIDANCE
Identify factors contributing to the problem	4. Current state of the system	A depiction of the current process or system in question.	A list of general steps is included, but these may not capture your current state. By modifying the steps to reflect your workflow, you will be better able to identify pain points and opportunities for change. Depicting your workflow as a process map will allow you to better capture complexity.
	5. Root cause analysis	An overview of the factors contributing to the current state of the process or system as depicted in the previous step.	The root causes and change ideas presented in the charters have been grouped into the following four themes (see this slide for an overview of these themes): • Education and awareness • Clinical workflow • Infrastructure • Finances and procurement These themes may not work for you, and you may find some of the root causes more relevant than others – remove and add to this section as you see fit. Thoughtful identification of root causes is necessary to develop change ideas that will lead to improvement; tools such as the Cause & Effect Diagram and the 5Whys exercise can assist in this endeavour.
Explore opportunities to address the problem	6. Design the improvement and define change ideas	A list of change ideas that can be tested in an effort to address the barriers identified in the root cause analysis.	The root causes and change ideas presented in the charters have been grouped into the following four themes (see this slide for an overview of these themes): • Education and awareness • Clinical workflow • Infrastructure • Finances and procurement These themes may not work for you, and you may find some of change ideas more compelling and/or feasible than others – remove and add to this section as you see fit. Where available, implementation resources have been provided in association with change ideas. Please feel free to adapt these resources to your needs (the CASCADES team is available to assist). If you develop any new change ideas and/or resources and are open to sharing these, please contact CASCADES so they can be added to the playbook.

PURPOSE	SECTION	SUMMARY	ADAPTATION GUIDANCE
Devise strategies to assess and maximize these opportunities	7. Measure and test impact	A suggested methodology for estimating the environmental impacts of an intervention using activity data and environmental impact data.	There are two types of data you need to get a basic understanding of environmental impact: 1. Activity Data: Data associated with an activity that generates GHG emissions ◦ This type of data is referred to as “outcome measures” in QI ◦ A list of common sources of OR activity data is provided on the following slide 2. Environmental Impact Data: Quantity of a pollutant released to the atmosphere in association with the activity ◦ Short of conducting an LCA of your own, you will need to rely on published environmental impact data (look to the literature, reports, or the Healthcare LCA database) ◦ The project charters contain such data, but as it has been generated in other settings, it has limited applicability (limitations are detailed in each charter) While you will be able to generate reliable activity data, the limitations of the environmental impact data preclude exact calculations of environmental savings; the impact data and approach provided in this section are therefore for informational purposes only. Modify as you see fit to suit your project(s), but be sure to report any environmental savings indicated from calculations like these as estimates only. Changes in activity data are often enough to show you are improving sustainability! If you do present estimates of environmental savings arising from your interventions, it is advisable that you use equivalencies (such as km driven or homes powered) to demonstrate their significance using tools like the Natural Resources Canada GHG Equivalencies Calculator.
	8. Embed & spread	A list of ways to ensure lasting change at various levels.	In this section, you will find a list of recommendations to further embed and spread your sustainability efforts. Ideas have been offered for micro (individual/department), meso (institutional), and macro (system/policy) level change. Modify these lists based on your own sphere of influence and desired area(s) of focus.

WHERE TO GET OR ACTIVITY METRICS

DATA	SOURCE	PROS	CONS
Procurement data	• Pharmacy • Procurement • Facilities management	• Detailed, up to date information on what has been supplied • Easy to look at historical data	• Tells you what has been supplied, not used • Can be hard to track down • Can occasionally be complicated to interpret
Direct usage	• Anesthestic machine log • EMR e.g., EPIC • Spot audits • ON-SQIN custom fields	• Precise info on what has been used • Ability to track high flows – where, when	• Often manual data collection (time consuming) • Unlikely to get all data
Workforce survey	• OR team	Good way to: • Gauge opinion • Air concerns	• Bias • No actual data on usage

Adapted from GASP – Greener Anaesthesia & Sustainability Project, UK; https://www.gaspanaesthesia.com/how-to-improve

ROOT CAUSE AND CHANGE IDEAS - THEMES

Change ideas presented in the project charters are grouped in the following themes:

EDUCATION	• Many care providers are not aware of the sustainability implications of their practice; bringing attention to the problem and its possible solution(s) is often the first step in implementing change
CLINICAL WORKFLOW	• Striving to fit proposed sustainability interventions into current processes will minimize workflow disruption • Clinicians who have developed preferences for less sustainable processes or products need incentivization to trial and accept more sustainable alternatives • Planning, implementing, and evaluating sustainability efforts takes time; integrating sustainability into the portfolio of existing personnel, developing an OR green team, and/or leveraging or hiring hospital sustainability staff are a few of the ways this work can be supported • Proposed changes must be evidence-based in order to assuage quick-to-arise concerns that sustainability interventions will compromise the quality of care • Policy-review/changes may be required to embed sustainability efforts
INFRASTRUCTURE	• Changes to the physical environment are often required to support sustainability interventions • The strategic placement of both products and disposal receptacles can make doing the sustainable thing the easy thing
FINANCE & PROCUREMENT	• Demonstrating that sustainability interventions will be cost-neutral or result in savings (either immediately or over time) can be key to generating buy-in • Interventions that involve substituting products with more sustainable alternatives require new or amended purchasing practices/contracts

THE CHANGE PACKAGE: CONTENTS

ACTION AREA	SUSTAINABILITY OPPORTUNITIES	DESCRIPTION
Unnecessary care Eliminate low value, high carbon care in accordance with Choosing Wisely Canada guidelines	Preop visits and tests	Reduce unnecessary preop visits and testing
	Blood use	Reduce inappropriate red blood cell transfusion practices
Direct emissions Reduce direct emissions through more sustainable anesthesia practices	Eliminate desflurane	Eliminate the use of desflurane by substituting more environmentally friendly anesthetic gases/techniques
	Low flow anesthetic gases	Reduce the amount of waste anesthetic gas released during an operating room case by decreasing flow rate
	Nitrous Oxide Waste	Reduce anesthesia related GHGs by addressing nitrous oxide wastage
Reusable alternatives Consider alternatives to single use products and devices in an effort to minimize waste	Reusable garment bags	Request patients bring reusable garment bags, avoid plastic bags
	Reusable gowns	Use reusable surgical gowns (except in special circumstances) in order to reduce biohazardous and regular waste
	Extended breathing circuits	Extend the use of “single use” breathing circuits (purchase reusable breathing circuits when possible)
	Reusable LMAs	Replace all single use LMAs with reusable LMAs
Waste Reduce unnecessary waste and ensure necessary waste is managed appropriately to avoid unnecessarily intensive waste processing	Custom pack optimization	Optimize custom packs to reflect the needs of the different surgical services at a hospital (replace general packs)
	Device remanufacturing	Reduce waste generated from single-use medical devices by submitting these devices for remanufacturing and/or purchasing remanufactured single-use medical devices
	Proper waste segregation (pharma, biomedical, and plastic waste)	Reduce waste through proper management of pharmaceutical, biomedical, and plastic waste

Action Area 1: Avoid Unnecessary Care

The two cornerstones of sustainable healthcare are reducing activity and, where this is not possible, reducing the carbon intensity of activity.(21) Reducing activity by ensuring appropriateness of care is therefore a core component of environmentally sustainable healthcare.

The overuse of tests and treatments that offer little to no benefit to patients represents low-value health care. Such activity is not benign; it can "expose patients to potential harm, consume precious health care resources, and contribute to the climate crisis."(22) Indeed, insofar as each test and treatment comes at a carbon cost, finding ways to reduce their unnecessary implementation results in immediate environmental savings.

Choosing Wisely Canada, the national voice for reducing unnecessary tests and treatments in Canada, presents numerous recommendations regarding common tests and treatments that are not supported by evidence. These recommendations have been developed by professional societies representing different clinical specialties in Canada.

While providers are encouraged to consider any environmental benefits that may be associated with the recommendations specific to their specialty, the focus here is on low-value care that cuts across specialties, including preoperative visits and testing, and blood use.

ACTION AREA 1: OPPORTUNITIES TO AVOID UNNECESSARY CARE

- Reduce unnecessary preop visits and testing
- Reduce inappropriate red blood cell transfusion practices

APPROPRIATE PRE-OP VISITS AND TESTING

GOAL

Reduce unnecessary visits and investigations in pre-operative clinics in accordance with Choosing Wisely Canada recommendations to reduce the environmental impacts of care.

PROBLEM/OPPORTUNITY

Many pre-surgical assessments and investigations are medically unnecessary because they do not provide useful information for perioperative patient care or outcomes; research on routine laboratory testing before low-risk surgery has shown that the majority of results are normal, and less than 3% of abnormal results lead to a change in management.(23)

These preoperative clinic visits and tests represent a form of low-value care insofar as they may contribute to healthcare inefficiencies and costs, and negatively impact patients.(24) In addition to these issues, low-value tests and visits also contribute unnecessarily to the health sector's carbon footprint.(25) Testing produces emissions, primarily via energy intensive imaging and materials intensive bloodwork (26), while visits involve patient travel, with its associated carbon emissions.(27)

Opting not to schedule low-value pre-op tests and visits will therefore reduce unnecessary environmental impacts associated with perioperative care. In one QI project focused on de-adopting low-value routine bloodwork for elective bariatric surgery, for example, 512 test tubes were saved from landfill, with an annual extrapolation of 946 test tubes saved. (28)

If pre- and post-operative visits are deemed necessary, virtual appointments can help reduce their carbon intensity.(29) Similarly, some tests are less carbon intensive than others: there is evidence that MRI has the greatest environmental footprint, followed by CT, then US(29); the impact of echocardiography on human health, ecosystems, and resource use is 1-20% of other methods.(30) Thus, while "there are circumstances in which one imaging modality is preferred on clinical grounds, when everything else is equal," environmentally preferable tests can be selected.(30)

RESOURCES:

IMPLEMENTATION RESOURCES

- Estimating environmental impacts of unnecessary care (CASCADES)
- CASCADES Virtual Care Carbon Accounting Playbook and Calculator (CASCADES)

VIDEO: The Environmental Impacts of Unnecessary Blood Tests with Dr. Karina Spoyalo

ADDITIONAL RESOURCES

- Drop the Pre-Op (Choosing Wisely Canada)
  - A toolkit for reducing unnecessary visits and investigations in pre-operative clinics; Review with your team to develop consensus on clinical criteria for pre-operative assessments and investigations
- Seven Tests and Treatments to Question (Choosing Wisely Canada)
  - Recommendations for providers and patients
- Project Green Healthcare (UofT Medicine - CW Team)
- Medical Imaging Equipment Study: Assessing Opportunities to Reduce Energy Consumption in the Healthcare Sector (Canadian Coalition for Green Healthcare)

WISE BLOOD USE

GOAL

Reduce unnecessary red blood cell transfusion rate in accordance with Choosing Wisely Canada recommendations as blood transfusions have a significant environmental footprint.

PROBLEM/OPPORTUNITY

Blood and blood products play an important role in perioperative care. However, blood products are often overused in surgical (and other) settings: approximately 20% of all blood transfusions are unnecessary.(31) This overuse is not without consequence; beyond financial losses, transfusions contribute to increased risk of patient harm ranging from mild to life-threatening.(24,32) Underuse also poses a problem insofar as failing to use blood products in a timely manner leads to wastage. Reasons for underuse include expiration and failure to keep blood components at the required temperature.(33) In a recent study, the OR was found to be responsible for significantly higher rates of wastage than other patient care areas, likely because of “excessive ordering of blood and blood products by a specific provider or providers in the perioperative setting.”(34)

Reducing blood wastage from both over and underuse is important for patient outcomes and hospital budgets; it is also crucial given the scarcity of blood products in some contexts.(35) Yet there is another reason to properly manage blood products: the environmental costs associated with their use. Recent estimates of the carbon footprint of blood components in the National Health Service indicate that each blood product generates 6.5kg of CO_2.(36) Given the number of transfusions in 2019 and the 20% rate of inappropriate transfusion, an estimated 3,000 tonnes of CO_2 emissions were needlessly produced that year.(36) This is the equivalent of providing electricity to 1820 homes for a full year.(37)

With the guidance and encouragement of surgical societies and initiatives like Choosing Wisely Canada, many sites in Canada have made great strides toward wiser blood use in and beyond the OR.(24,38) Recognizing the environmental co-benefits of wise blood use heightens the positive impacts of these efforts.

RESOURCES:

IMPLEMENTATION RESOURCES

- Estimating environmental impacts of unnecessary care (CASCADES)

ADDITIONAL RESOURCES

- Using Blood Wisely (Choosing Wisely Canada)
  - Series of tools around wise blood use, including a benchmarking tool, a series of webinars, and a set of guidelines; Assess appropriateness of blood use against national benchmarks, and adopt evidence-based transfusion practices.
- Patient Blood Management (Sask Blood)
- Maximum Surgical Blood Ordering Schedule (MSBOS) (Government of Newfoundland and Labrador: Department of Health and Community Services Provincial Blood Coordinating Program)

Action Area 2: Minimize Direct Emissions

Anesthetic gases are essential to providing comfortable and safe surgery. Yet these agents are also recognized greenhouse gases (GHGs) and contribute to the environmental impact of healthcare.(39) A 2012 report from the English National Health Service in the United Kingdom found that anesthetic gases comprised 5% of the carbon footprint of acute care institutions.(40) At a global scale, these gases are accumulating in the atmosphere; estimates from 2014 found anesthetic gas release globally was equivalent to 3.1 million tons of carbon dioxide.(41)

How do anesthetic gases contribute to climate change? Halogenated anesthetic gases are liquid agents added to the anesthetic breathing circuit in a carrier gas mixture (which may include nitrous oxide) that the patient inhales. The majority of anesthetic gases used during surgery are ultimately exhaled, as they undergo minimal metabolism during respiration.(42) These exhaled excess gases are channeled out of the patient breathing circuit and collected by “scavenging” systems in anesthesia machines. These scavenging systems reduce operating room personnel exposure to anesthetic gases. Waste gases from scavenging are often vented as medical waste gas directly into the surrounding area.(43) Waste anesthetic gases remain in the lower atmosphere for years. However, some anesthetic gases have a larger environmental footprint than others. It is estimated that sevoflurane remains in the atmosphere for 1.4 years, desflurane for 21.4 years and nitrous oxide for up to 150 years.(39,44,45)

There are many clinically sound opportunities to address the environmental impact of anesthetic gases.

ACTION AREA 2: OPPORTUNITIES TO REDUCE DIRECT EMISSIONS

- Eliminate desflurane
- Use low flow anesthesia
- Reduce nitrous oxide wastage

Check out the CASCADES primer and infographic on Sustainable Anesthesia for more background information.

ELIMINATE DESFLURANE

GOAL

Eliminate the use of desflurane as an anesthetic agent within the institution as soon as possible as it is significantly more environmentally harmful than many clinically sound alternatives.

PROBLEM/OPPORTUNITY

Inhaled anesthetic agents are responsible for approximately 50 percent of the carbon footprint of all perioperative services, and an estimated five percent of a hospital's total GHG emissions.(25) Yet not all anesthetic gases are created equal: desflurane has up to 20 times the environmental impact of other anesthetic gases.(46) For this reason, the Canadian Anesthesia Society has called for the elimination or minimization of desflurane (among other sustainability actions) in their 2023 Guidelines to Practice of Anesthesia (see Section 10), and many hospitals have already eliminated desflurane use.(47)

The impact of anesthetic gases is measured by assessing their Global Warming Potential over 100 years (GWP100). Gases with higher GWP100 trap more heat in the atmosphere over a 100-year time horizon and contribute to the greenhouse effect and climate change. Desflurane has a GWP100 of 2540, compared to a GWP100 of 130 for sevoflurane (25,48), and a GWP100 of 265 for nitrous oxide (N_2O). Desflurane persists for 10 years in the atmosphere, compared to 3.6 years for isoflurane and 1.2 years for sevoflurane.(49) As such, desflurane is regarded as the most environmentally harmful of the commonly used halogenated anesthetic gases.

To illustrate the impact of these gases in more familiar terms, the emissions released from 1 MAC-hour (1 minimum alveolar concentration-hour), with low or minimal fresh gas flow (FGF) 1 L/min is equivalent to driving 320 km in a car, compared to only 6.5 km for sevoflurane, 14 km for ISO, and 95 km for nitrous oxide*.(50)

Best practice guidelines in Canada and internationally recommend eliminating or minimizing desflurane use because of its high environmental burden. It is imperative that "informed anesthesiologists[…]manage choices to safely minimize their carbon footprint"; choosing gases with lower GWP100 values, such as sevoflurane, over those with high values, such as desflurane or nitrous oxide, is a key step in mitigating the environmental impacts of anesthetic practice.(25)

RESOURCES:

PROJECT CHARTER

- Contributors: OA-ESWG
- Reviewers: Dr. Connor Brenna, Dr. Sanjiv Mathur, Dr. Peter Menikefs, Dr. Anita Rao

IMPLEMENTATION RESOURCES

- CASCADES Regional Anesthesia in Breast Surgery Playbook (CASCADES)
- Volatile Anesthetic Gases Survey (Melissa Ho, NYGH)

VIDEO: Eliminating Desflurane at NYGH with Dr. Melissa Ho

VIDEO: Sustainable Anesthetic Practices with Dr. Anita Rao & Dr. Peter Menikefs

ADDITIONAL RESOURCES

- Guidelines to the Practice of Anesthesia: Revised Edition 2023 (see Section 10: Guidelines for Environmental Sustainability; p. 20) (Canadian Anesthesiologists' Society)
- Ontario's Anesthesiologists Position Statement on Reporting Anesthetic Gases in the Ontario Hospitals Greenhouse Gas Inventory (OA)
- Ontario Hospitals That Have Banned Desflurane (PEACH)
- Reduce Your Contribution to Climate Change with Dr. Sanjiv Mathur (CCL)
- Mitigating the environmental impacts of anesthetic gases in healthcare (Alpamys Issanov, UBC Sustainability Scholar)
- ASA Green Anesthesia Speaker Session (March 24, 2022)

USE LOW FLOW

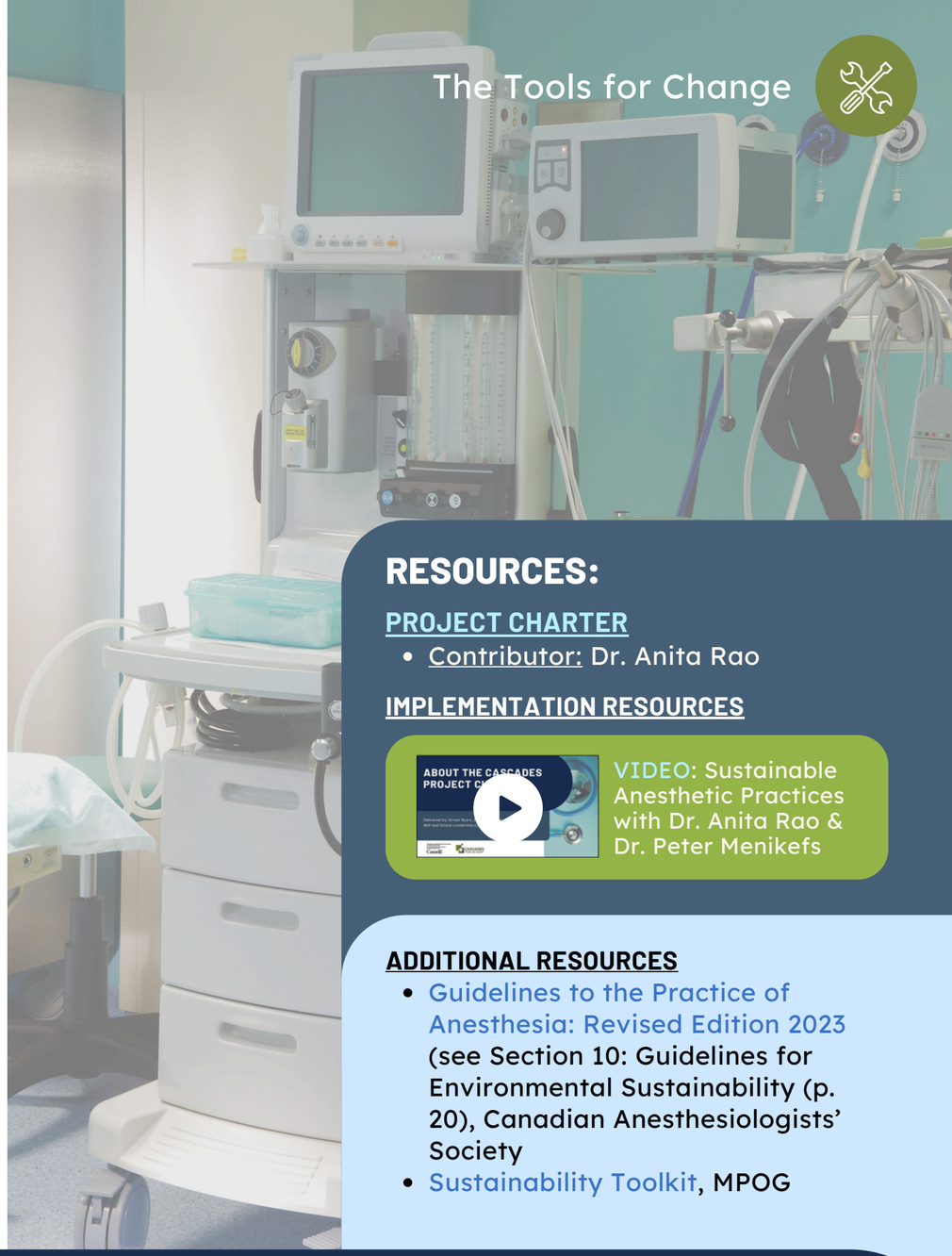
GOAL

Standardize a fresh gas flow (FGF) rate of ≤ 1 L/min (ideally 0.5 L/min) across the institution to reduce the environmental impact of anesthetic gases.

PROBLEM/OPPORTUNITY

Inhalational anesthetic agents are all potent GHGs with global warming potentials hundreds to thousands of times that of CO_2. The volume of inhalational anesthetic agent used during surgery and released into the atmosphere decreases by lowering the fresh gas flow.(25,49) Sevoflurane is the least environmentally toxic inhalational anesthetic and is the preferred choice for sustainable anesthetic delivery. In the past, minimal flow anesthesia with sevoflurane was controversial because of concerns of production and accumulation of Compound A in the breathing circuit, and its potential association with renal damage. However, many studies have shown that sevoflurane is safe to use with minimal flows negating the need for higher (i.e., 2L/min) FGF. Minimal flow anesthesia is endorsed by the Canadian Anesthesia Society which recommends FGF ≤1 and ideally 0.5L/min in their 2023 Revised Guidelines to the Practice of Anesthesia (see Section 10).(47)

Low flow anesthesia with sevoflurane is common in many jurisdictions.(51) In addition to the environmental savings associated with lowering FGF, additional benefits include enhanced temperature and humidity preservation, as well as cost savings through more efficient use of anesthetic gases.(52)



RESOURCES:

PROJECT CHARTER

- Contributor: Dr. Anita Rao

IMPLEMENTATION RESOURCES

VIDEO: Sustainable Anesthetic Practices with Dr. Anita Rao & Dr. Peter Menikefs

ADDITIONAL RESOURCES

- Guidelines to the Practice of Anesthesia: Revised Edition 2023 (see Section 10: Guidelines for Environmental Sustainability (p. 20), Canadian Anesthesiologists' Society
- Sustainability Toolkit, MPOG

REDUCE NITROUS OXIDE WASTAGE

GOAL

Reduce nitrous oxide wastage by addressing sources of consumption beyond clinical use

PROBLEM/OPPORTUNITY

Nitrous oxide (N_2O) as a greenhouse gas is almost 300 times as toxic as carbon dioxide (CO_2), and it contributes 75% of global medical gas greenhouse (GHG) emissions. It remains in the atmosphere for up to 150 years, and has ozone depleting properties.(53) Along with eliminating desflurane from formulary, addressing high N_2O emissions is a key component of addressing anesthesia related GHGs in perioperative care and beyond.

While N_2O poses environmental problems, the principal issue associated with its use in health care is not the administration of the gas itself, but rather its wastage – specifically via leaks at the manifold, outlets with Schrader valves, leaks in operating rooms (OR) and leaking in aging piped infrastructure, as well as poor stock management and flaws in system design.(53) A series of micro-leaks can result in huge wastage over time. Indeed, wastage is suspected to be the principle source of N_2O consumption in the hospital environment; this damages the environment unnecessarily and wastes money.(54) There are also potential exposure risks to staff and patients that may be mitigated by reducing N_2O wastage.(55)

Several efforts to address this issue are already underway in the United Kingdom as part of the Nitrous Oxide Project. Participating sites have uncovered huge wastage; at National Health Service (NHS) Lothian, for example, they were able to reduce N_2O consumption by 75-100% per institution through addressing infrastructure and leakage.(56) Similar initiatives are now in the planning or implementation stages at some Canadian hospitals, including Vancouver General Hospital within Vancouver Coastal Health, and Sunnybrook Health Sciences Centre in Toronto, Ontario. Initial enquiries with clinicians at Sunnybrook suggest – anecdotally – that current clinical use is low, indicating tremendous opportunity to reduce N_2O use by uncovering and addressing leaks.

RESOURCES:

PROJECT CHARTER

- Authors: Dannette Beechinor, Eric Cohen, SusanDeering, Barbara McArthur, Martin Van der Vyer (Sunnybrook Health Sciences Centre); CASCADES Team

IMPLEMENTATION RESOURCES

- Nitrous Oxide Briefing Note (Sunnybrook Team)
- Sunnybrook Nitrous Oxide Project Charter (Sunnybrook Team)
- Blank Sunnybrook Nitrous Oxide Charter (Sunnybrook Team)

VIDEO: Reducing N_2O Wastage with the Sunnybrook team

ADDITIONAL RESOURCES

- Guidelines to the Practice of Anesthesia: Revised Edition 2023 (see Section 10: Guidelines for Environmental Sustainability (p. 20) (Canadian Anesthesiologists' Society)
- Video: Nitrous Oxide Mitigation: Launching the UK and ROI National Audit (NHS)
- Piped Nitrous Oxide Waste Reduction Strategy (Chakera, Fennell-Wells & Allen)
- Nitrous Oxide Mitigation Implementation Plan (Health Finance, Corporate Governance & Value, Directorate, Scottish Government)
- Nitrous Oxide Project (NHS Association of Anaesthetists)
- Collaborating to Prevent Nitrous Oxide Waste in Medical Gas Systems, Practice Greenhealth

Action Area 3: Substitute Reusable Alternatives

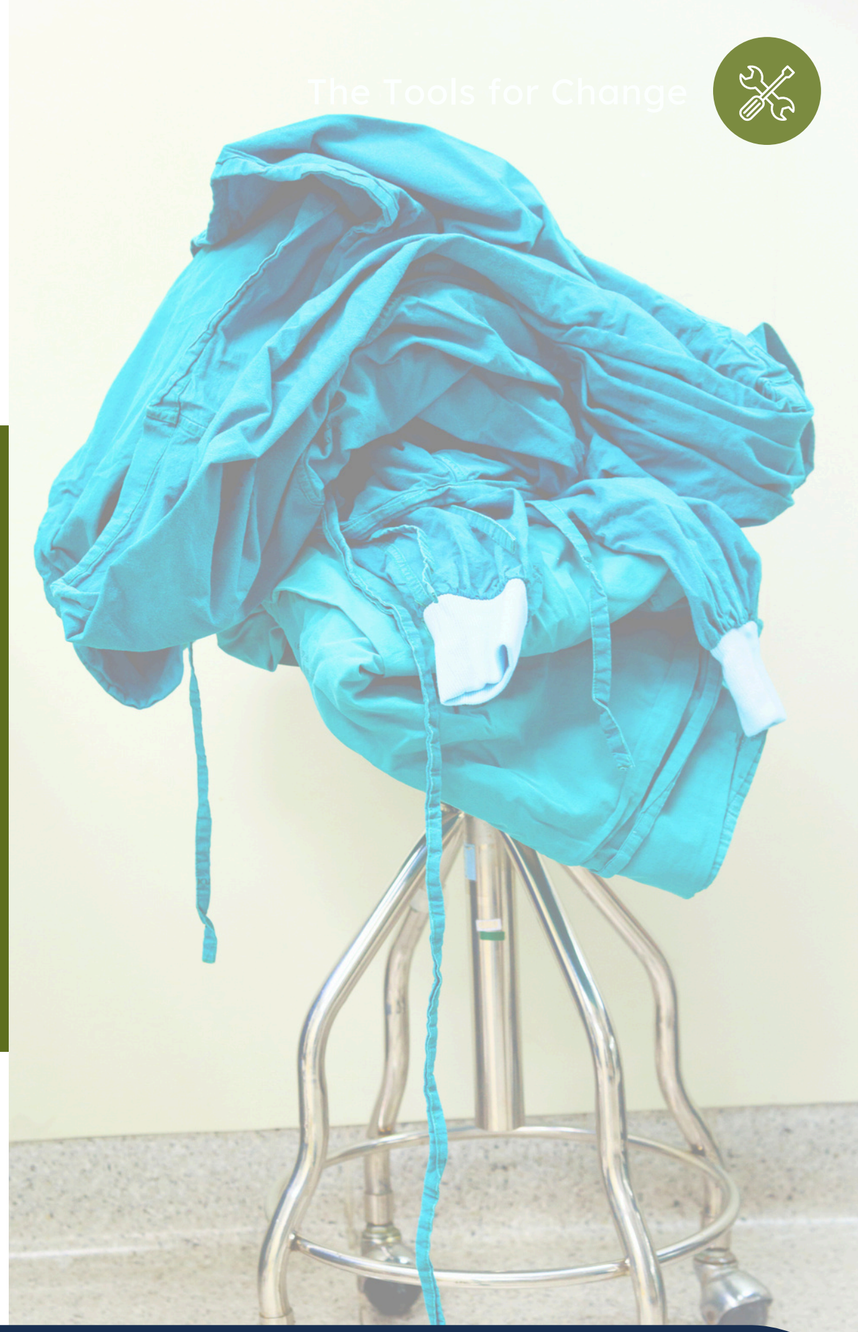
Historically, most medical devices were made of stainless steel and sanitized in-house at healthcare facilities for repeated use. As medical device manufacturing moved to plastic, concerns about healthcare-associated infections prompted questions about the effectiveness and standardization of in-house processing.(57) Manufacturers thus began to label an increasing number of products as single-use (SUD), and in- house processing was discouraged.(58)

However, the shift to SUDs has resulted in the creation of exponentially more waste, and the soundness of the notion that SUDs offer better infection control than reusables has begun to be questioned.

Studies comparing SUDs and reusables identify opportunity for both environmental and cost savings by using reusable devices.(59) For some products, options exist to use a reusable device rather than a single use device (e.g., laryngoscopes). However, reusable devices require reprocessing to ensure adequate infection control.(60) Reprocessing can also enable products labeled as single-use devices to be reused multiple times, either for the same or a different purpose.

ACTION AREA 3: OPPORTUNITIES TO SUBSTITUTE REUSABLES

- Reusable garment bags
- Reusable gowns
- Reusable/extended breathing circuits
- Reusable LMAs



REUSABLE GARMENT BAGS

GOAL

Encourage patients to bring reusable bags to hold their belongings during surgery in an effort to reduce the use of plastic patient belonging bags.

PROBLEM/OPPORTUNITY

Within the health sector, plastics account for approximately 30% of waste.(60) Operating rooms are a significant source of plastic waste, with the bulk of plastic waste generated during the pre- and post-operative phases of surgery.(61) One source of pre-operative plastic waste that is relatively simple to address is patient belonging bags.

On average, thousands of these bags are given out to patients on a monthly basis*; they are used to store patient belongings, such as clothing and shoes, during surgery. These bags, which are thicker and larger than regular single use plastic bags, end up in landfills, where they break down very slowly into toxins that pollute the soil and water, damaging the environment and, subsequently, animal and human health.(62)

Surgical departments should transition away from handing out plastic personal belonging bags and encourage patients to bring their own reusable bag(s) from home. People have become increasingly familiar with this practice in their every day lives, and many now use reusable bags on a regular basis; Canada's ban on single-use plastic bags in December 2022 will further reinforce this behavior. Patients should therefore be receptive to requests to bring a reusable bag with them to the hospital.

RESOURCES:

PROJECT CHARTER

- Authors: Ashmina Damani, Dr. Melissa Ho, Christina Hollingshead, & Dr. David Smith of North York General Hospital

IMPLEMENTATION RESOURCES

Implementation Guide for BYORB (NYGH + CASCADES)

- Implementation Guidance Videos:
  - Project Overview
  - Team Presentation
- Patient Communication Tools:
  - Email Script
  - Phone Script
  - Day Surgery Information
  - Infographic
- Data Collection Tools:
  - Pre-Procedure Checklist
  - EMR Documentation
  - Workflow Survey
  - Patient Survey
- Implementation Guide for Other Reusables (NYGH + CASCADES)

VIDEO: BYORB with Dr. David Smith

VIDEO: BYORB with Dr. David Smith & team

REUSABLE GOWNS

GOAL

Replace disposable surgical gowns with reusable gowns to reduce OR waste.

PROBLEM/OPPORTUNITY

Surgical linens, including gowns, towels, table and stand covers, are a major source of OR waste. Linens have been estimated to account for 2% of total hospital waste.(63) Unused single use gowns that are on sterile fields during surgery are indicated for disposal at the end of the procedure, resulting in large amounts of waste depending on the number of surgeries performed and surgical staff involved. Compared to disposable linens that are used only once and then discarded, reusable gowns can be washed and sterilized for multiple uses, reducing energy use by 64% and greenhouse gas emissions by 66%.(64)

A 2021 analysis done in the UK on the switch from single-use to reusable personal protective equipment (PPE) estimated that six months of disposable gown use resulted in emissions of 5,419,004 kg CO_2e.(65) In comparison, reusable gowns that were laundered and re-used 75 times prior to disposal were shown to decrease greenhouse gas emissions by two-thirds.

Although the upfront cost of reusable gowns may be higher, they are a more cost-effective option in the long run as they can be used multiple times, reducing the need for frequent replacement. The comfort and protection offered by reusable gowns have been found to be similar or even superior to disposable gowns, and their use can reduce the amount of surgical waste that is sent to landfill.(66,67)

RESOURCES:

PROJECT CHARTER

- Contributors: Angelina Lomoro, Ed Rubinstein and Dr. Laura Donahoe

IMPLEMENTATION RESOURCES

- Reusable Gowns Briefing Note (CASCADES)
- The Ottawa Hospital Reusable Gowns Evaluation (TOH)
  - VIDEO: Reusable Gowns with Nieve Sequin and Husein Moloo

VIDEO: Reusable Gowns with Angelina Lomoro

ADDITIONAL RESOURCES

- A circular economy model for hospital generated PPE and medical single use plastic waste: Demonstrating opportunities for reduction and reuse (Canadian Coalition for Green Health Care)
- Implementation Module: Moving (Back) to Reusables in the OR (Practice Greenhealth)
- Sustainable Procurement Criteria - Reusable Textiles (Healthcare Without Harm Europe)
- Life Cycle Assessment of Surgical Gowns (EcoTex)
- Reusable Surgical Linens (EcoTex)

EXTENDED/REUSABLE BREATHING CIRCUITS

GOAL

Reduce waste associated with anesthetic breathing circuits by: a) extending the use of disposable breathing circuits to seven days, or; b) switching from disposable to reusable breathing circuits, and c) where reusable circuits are already in use, extending the time between washes to seven days

PROBLEM/OPPORTUNITY

Anesthetic breathing circuits are an essential component of anesthetic airway management, yet disposable breathing circuits are a source of plastic waste that contributes to the OR's sizable environmental footprint.(5) While reusable breathing circuits offer a more sustainable alternative, these devices are often sterilized more frequently than necessary, wasting water and electricity. At most institutions, breathing circuits are customarily removed for decontamination at the end of a day/24 hour period. However, when breathing circuit use is extended to seven days (with circuit condensate emptied and patient-filters discarded after each case), there is no observed increase in bacterial contamination.(59,68)

Replacing disposable breathing circuits with reusable ones, which can be used for approximately 12 months, is the next step toward improving their environmental performance.(69) A life cycle assessment (LCA) comparing single-use and reusable anesthetic equipment, including breathing circuits, found that in countries with renewable electricity generation (such as Canada), using reusable devices could lead to more than an 80% reduction in emissions.(59) Ensuring that reusable breathing circuits are sterilized at appropriate intervals is also key. Extending use from 24 hours to seven days decreases electricity and water usage by over 50%.(59) Furthermore, as in the case of extending the use of disposable breathing circuits, the ability to keep reusable breathing circuits in rotation for a longer period of time means fewer need to be purchased to be on hand, resulting in cost savings and increased resilience against supply chain shortages.

RESOURCES:

PROJECT CHARTER

- Contributors: OA-ESWG
- Reviewers: Dr. Shalini Dhir, Dr. Melissa Ho, Dr. Martin van der Vyver

IMPLEMENTATION RESOURCES

- Letter from vendor testifying to safety of extended use (Ali Abbass)

VIDEO: Breathing Circuits with Dr. Melissa Ho

VIDEO: The Reprocessing Pathway at NYGH

ADDITIONAL RESOURCES

- Reusable Breathing Circuits: Background and information sheet (Ontario's Anesthesiologists Environmental Sustainability Working Group)
- Guidelines to the Practice of Anesthesia: Revised Edition 2023 (see Section 10: Guidelines for Environmental Sustainability; p. 20) (Canadian Anesthesiologists' Society)

REUSABLE LARYNGEAL MASK AIRWAYS

GOAL

Transition from single-use laryngeal mask airways (LMAs) to reusable LMAs in order to reduce environmental impacts, costs, and potential supply chain interruptions.

PROBLEM/OPPORTUNITY

LMAs are used to facilitate airway management during general anesthesia, but these essential, commonly used medical devices are a source of operating room waste. Reusable LMAs can be reprocessed and reused multiple times, thereby reducing the negative environmental impacts as compared to single-use LMAs.

A life cycle assessment (LCA) found that a reusable LMA, which is commonly recommended for 40 use cycles, produces 7.4 kg CO_2e, while the equivalent 40 single-use LMAs produce 11.3 kg CO_2e (70), and a Swedish study found disposable LMAs had higher impacts across all three major environmental impact categories: human health, ecosystems, and resources.(71) The environmental impacts associated with the reusable LMA stem from washing and sterilization, but these are outweighed by the environmental impacts associated with the single-use LMAs, which derive from the production of polymers, packaging, and waste management. Moreover, the LCA cited above considered the autoclaving of a single reusable LMA; sterilizing multiple LMAs at once would result in further environmental savings,(70) as would optimizing the washing and sterilization process itself.(72)

In addition to the environmental savings associated with a switch from single-use to reusable LMAs, the latter can also make hospitals less vulnerable to supply chain shortages, and result in cost-savings over time. (70,72,73)

RESOURCES:

PROJECT CHARTER

- Contributors: OA-ESWG
- Reviewers: Dr. Gail Hirano, Dr. David Ohrling, Dr. Anita Rao

IMPLEMENTATION RESOURCES

- Reusable LMA processing and documentation at Collingwood General and Marine Hospital (CGMH) (Dave Ohrling, Becky Desroches, Shannon Foster and Jonalyn Andaya)

VIDEO: Reusable LMAs with Dr. Melissa Ho

ADDITIONAL RESOURCES

- Reusable LMAs: Background and presentation (Ontario's Anesthesiologists Environmental Sustainability Working Group)
- Guidelines to the Practice of Anesthesia: Revised Edition 2023 (see Section 10: Guidelines for Environmental Sustainability; p. 20), (Canadian Anesthesiologists' Society)

Action Area 4: Reduce & Manage Waste

Operating rooms are highly intense areas of waste production, generating up to 1/3 of total hospital waste.(74,75) Much of this waste is avoidable; by following the ten "R-strategies" (which include refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recover), smarter product development and use can reduce the number of products we use unnecessarily, and increase the sustainability of those we do need.(76) Two opportunities to avoid the production of waste in the OR include optimizing custom packs by removing infrequently used items, and participating in device remanufacturing programs, which extend the life of single-use devices (SUDs).

However, while the integration of the ten "R strategies" into OR supply chain management via initiatives like these will lead to a reduction in the amount of waste produced, we do not yet have a circular economy, and some OR waste is unavoidable. The many categories of waste produced in the OR include general, pharmaceutical, biohazardous, plastic and PVC waste, all of which require proper segregation and disposal in order to minimize environmental impacts.

There are environmental impacts associated with every form of waste management, including the greenhouse gases emitted during the transportation of waste to landfills and treatment facilities. Landfilled waste releases methane as it decomposes, while the high energy requirements of incineration produce significant GHGs, and the burning of waste releases toxins such as dioxins, furans, and mercury, in addition to carbon dioxide.(12) As much of the waste generated in the OR is inappropriately segregated as biohazardous waste, the carbon intensity of OR waste management is needlessly high.

Up to 90% of OR waste has been estimated to be non-hazardous and potentially recyclable.(12) Recycling can be less energy intensive than other forms of waste management, but it requires energy to convert old products to new ones, and the quality of the raw material is often reduced (or "downcycled") in the process.(77)

ACTION AREA 4: OPPORTUNITIES TO REDUCE & MANAGE WASTE

- Optimize custom packs
- Collect SUDs for device remanufacturing and/or purchase remanufactured SUDs
- Properly manage pharmaceutical waste
- Properly manage biomedical waste
- Properly manage plastic waste

CUSTOM PACK OPTIMIZATION

GOAL

Optimize the custom packs used in the OR to more closely reflect the actual needs of a given procedure, thereby reducing custom pack waste (or “overage”).

PROBLEM/OPPORTUNITY

Custom packs are industry-prepared, pre-packaged, sterile bundles used for surgeries. Although initially prepared with the aim to reduce time, error and contamination risk, they have become costly, wasteful, and unnecessary.(76) Custom packs often contain items that are not routinely used due to surgeon preference or change in practice. This leads to “overage” – equipment/supplies that are readied ahead of a surgery but remain unused. At the end of surgery, the unused items are discarded due to their potential exposure to biohazardous materials.(79)

Optimizing custom packs has been shown to generate both environmental and cost savings. In one study, a redesign of the surgeons’ “pick lists,” in-service education, and custom packs led to a 45% reduction in mean-per-case costs associated with unused custom pack contents.(79) In a related case, the reformulation of thoracotomy kits led to a reduction of 5,332 pounds (2419 kgs) of waste and cost savings of $81,278 USD annually for the hospital.(80) Notably, not all overage is equal in terms of its environmental impacts, and targeting particular types of products (such as those made of cotton) can enhance the environmental benefits of custom pack optimization.(78)

Beyond reformulation, other approaches to reduce overage is to adopt the “just-in-time” model, in which items are available in the operating theatre but only opened when required,(81) and reusing single-use items where appropriate.(78)

RESOURCES:

PROJECT CHARTER

- Contributors: Ed Rubinstein, Irina Baranova

VIDEO: Custom Pack Optimization with Cameron Irani

ADDITIONAL RESOURCES

- Implementation Module: OR Kit Reformulation (Practice Greenhealth)

SURGICAL TRAY OPTIMIZATION

GOAL

Optimize surgical instrument trays to reduce the number of items that must undergo reprocessing despite going unused, without compromising patient safety or surgeon satisfaction.

PROBLEM/OPPORTUNITY

A surgical pick-list (or “preference list”) describes the full suite of equipment made available for a given procedure. Pick-lists can vary dramatically between surgeons across or even within institutions, (82) and standardization has been shown to significantly reduce wasted materials.(83) While disposable items are often the most visible source of waste because unused disposables are discarded at the end of a case (see “Custom Pack Optimization”), surgical instrument trays also represent a significant source of environmental and financial waste.(84)

Surgical instrument trays are standardized groups of reusable items that are prepared in a hospital’s medical device reprocessing department (MDRD), comprising one part of the pick-list. Unfortunately, these trays typically contain items which are routinely prepared but seldom used: one 2021 study in a North American vascular surgery department audited instrument usage on two types of trays, finding that on average only 22.9% and 12.5% of packaged instruments were used.(84) This is consequential because once a tray is opened, it is considered contaminated in its entirety. Single-use items are discarded, and reusable instruments (whether used or unused) are reprocessed in MDRD. Reprocessing most commonly features steam sterilization, which is both energy- and water-intensive,(85) and in some settings also requires the use of detergents. As a result, it accounts for approximately 20% of the carbon footprint of typical surgical operations.(86,87) Repeated washing and sterilization also causes wear and tear on instruments such that they can require repair or replacement even after minimal use. (88)

Optimizing surgical trays can eliminate the waste and reprocessing of unused items. Several North American studies have reported that either surveying practice patterns or performing mathematical modelling can support the elimination of approximately 50% of instruments from surgical trays.(89,90) Optimized trays take half as long to assemble and can be processed with half of the associated carbon emissions.(89) Furthermore, the optimization of a single type of surgical tray can save an institution between $32,000 CAD and $76,000 CAD per year.(89,90) Finally, one study performed a post-optimization audit after removing 45.8% and 62.5% of instruments from two surgical trays, and found that no instrument required reinstatement.(84)

RESOURCES:

PROJECT CHARTER

- Contributors: Dr. Julie Strychowsky, Jimmy Wang, Jenna Vandenheuvel, Alina Zgardau, Dale Mardlin and Mac Barry
- Audit Result Example: Orthopedic Dissecting Tray
- Basic Laparotomy Tray: Instrument Utilization Survey
- Images of Basic Laparotomy Instruments
- Basic Laparotomy Tray Audit Form
- Before vs After Optimization: ENT Minor Dissecting Tray
- Surgical Tray Optimization FAQs

ADDITIONAL RESOURCES

- Reducing Unnecessary Instruments in Tonsil Hemorrhage Trays at a Canadian Tertiary Care Center: A Quality Improvement Project, Osch et al. (2024)
- Optimization of orthopedic surgical instrument trays: lean principles to reduce fixed operating room expenses, Cichos KH et al. (2019)
- Implementing a perioperative efficiency initiative for orthopedic surgery instrumentation at an academic center: a comparative before-and-after study, Capra R et al. (2019)

DEVICE REMANUFACTURING

GOAL

Address waste from single-use devices by: a) submitting eligible single-use devices for reprocessing, and/or b) purchasing reprocessed devices instead of new devices

PROBLEM/OPPORTUNITY

Although many medical devices were once made of stainless steel and sterilized for reuse in-house, concerns around convenience, cost, infection prevention, and the efficacy of in-house processing prompted a shift to single-use devices (SUDs) (78,91,92), such that in the past thirty years, the healthcare sector has become reliant on single-use materials.(93)

SUDs represent a linear supply chain in which products are manufactured, used once, then discarded.(91) This type of arrangement is unsustainable on a number of fronts. Not only are single-use devices vulnerable to supply chain disruptions; they also contribute to environmental degradation by depleting natural resources and generating solid waste, greenhouse gases, and other harmful emissions.(91)

In an attempt to disrupt this linear model, efforts have been made to increase the number of times a single-use device can be used, thereby keeping products in circulation for as long as possible (in accordance with a “circular economy” model). Through a highly regulated process called device reprocessing (or “remanufacturing”), single-use devices that have been used are taken apart, rebuilt, then used again. As of September 2017, Health Canada approves commercially remanufactured devices according to the same standards by which it assesses virgin devices.(94)

The Stryker 2022 Comprehensive Report (pg. 52) offers LCA data for five of its most popular remanufactured devices; the reduced carbon footprint of reprocessed devices is largely attributable to their not requiring the production and manufacturing of new virgin plastic and metal material.

RESOURCES:

PROJECT CHARTER

- Contributors: Laurie Thomas, David Brown, Ed Rubinstein, Dr. Laura Donahoe

IMPLEMENTATION RESOURCES

- Stryker infographic (Stryker)

VIDEO: Device Remanufacturing with Laurie Thomas

VIDEO: Device Remanufacturing with Dr. Laura Donahoe

ADDITIONAL RESOURCES

- Device Remanufacture "How To" Guide: Medical Devices (NHS)
- The Stryker 2022 Comprehensive Report (pg. 52) offers LCA data for five of its most popular remanufactured devices.
- Stryker Sustainability Program Proposal, outlines opportunity for partnering with Stryker for device remanufacturing

PHARMACEUTICAL WASTE MANAGEMENT

GOAL

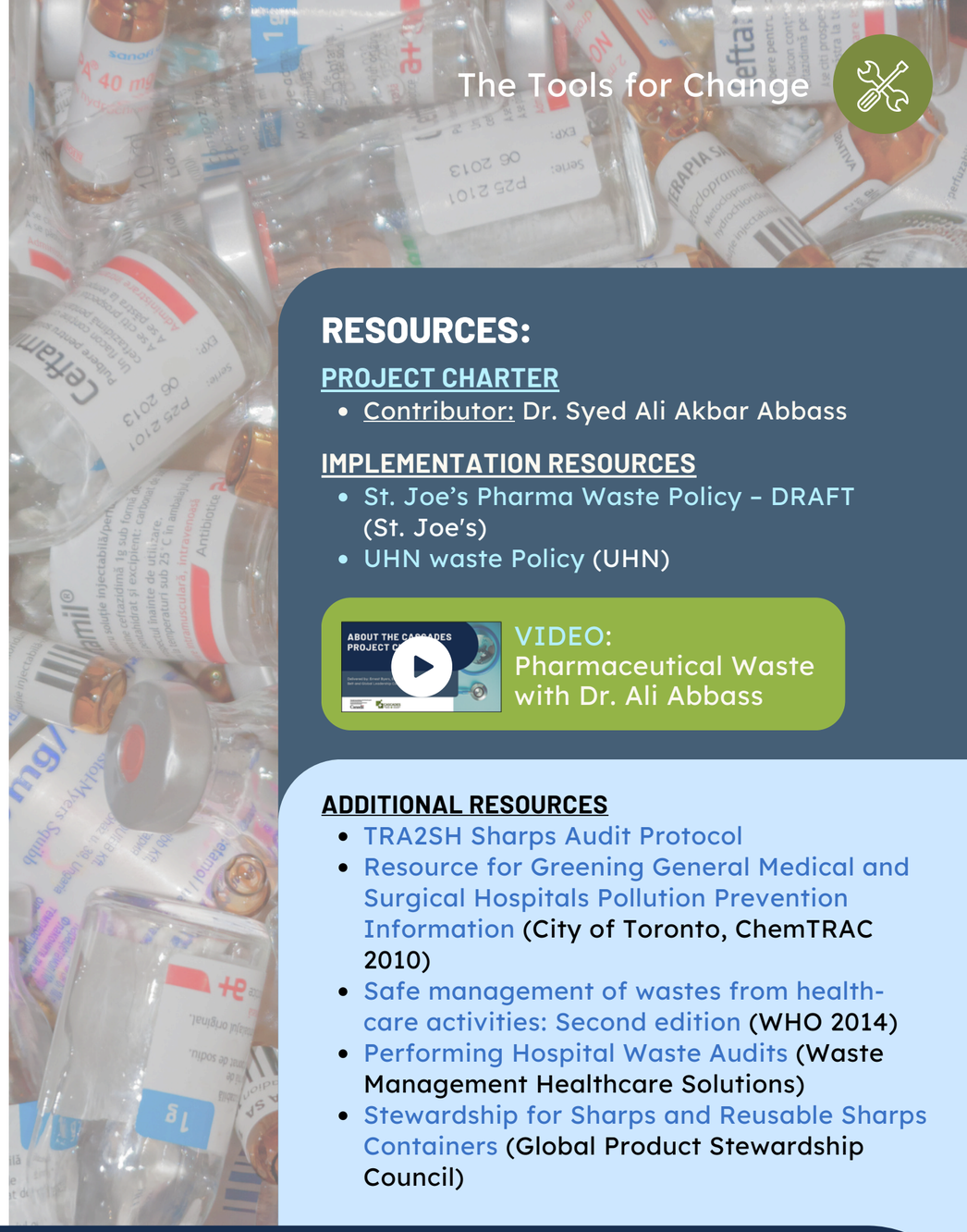
Reduce the environmental impact of pharmaceutical waste by implementing processes to ensure appropriate disposal.

PROBLEM/OPPORTUNITY

There is a lack of legislation or guidance on the management of pharmaceutical waste; as a result, staff may dispose of unused pharmaceuticals in a variety of improper ways, including: in the drain, where they enter the water ecosystem; in garbage bins, where they end up in landfill; or in the sharps container, which is sent for autoclaving before disposal in landfill. None of these are acceptable means of disposal for pharmaceutical waste, which must be incinerated.(95)

Improper disposal is dangerous to the environment and to human health.(96,97) Many commonly used anesthetic drugs are harmful to groundwater. Propofol, the most widely dispensed and wasted drug, is very toxic to aquatic organisms, does not degrade, and accumulates in fat.(98) Bupivacaine and ephedrine are both toxic to aquatic organisms such as plants and fish. Other pharmaceuticals may be endocrine disruptors, carcinogenic, mutagenic, and destructive to all forms of life.(99) It is therefore imperative that pharmaceutical waste be properly segregated so that it is appropriately disposed of through incineration.(100)

At the same time, it is also important to keep non-pharmaceutical waste (such as empty syringes or vials) out of the pharmaceutical waste bin. This results in unnecessary incineration of that waste, which, if plastic, will release harmful toxic chemicals, such as dioxins and furans, into the atmosphere.(100)



RESOURCES:

PROJECT CHARTER

- Contributor: Dr. Syed Ali Akbar Abbass

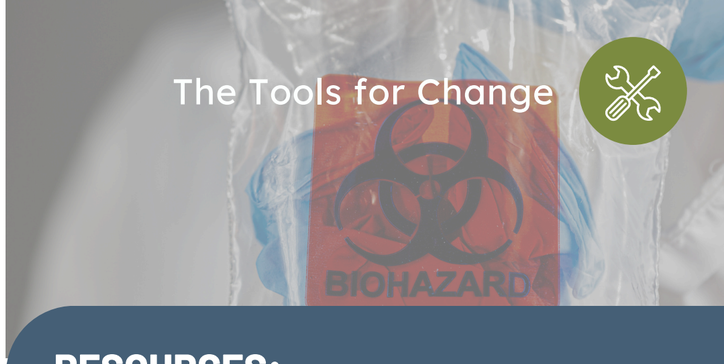
IMPLEMENTATION RESOURCES

- St. Joe's Pharma Waste Policy – DRAFT (St. Joe's)
- UHN waste Policy (UHN)

VIDEO: Pharmaceutical Waste with Dr. Ali Abbass

ADDITIONAL RESOURCES

- TRA2SH Sharps Audit Protocol
- Resource for Greening General Medical and Surgical Hospitals Pollution Prevention Information (City of Toronto, ChemTRAC 2010)
- Safe management of wastes from health-care activities: Second edition (WHO 2014)
- Performing Hospital Waste Audits (Waste Management Healthcare Solutions)
- Stewardship for Sharps and Reusable Sharps Containers (Global Product Stewardship Council)



BIOMEDICAL WASTE MANAGEMENT

GOAL

Reduce the volume of biomedical waste produced in the operating room (OR) to reduce the need for carbon-intensive incineration or sterilization.

PROBLEM/OPPORTUNITY

Waste generated in healthcare facilities in Canada is commonly misclassified or incorrectly disposed of as biomedical waste; this type of waste must be treated using incineration or sterilization. Incineration is only required for the treatment of certain biomedical wastes, such as pharmaceutical, cytotoxic and pathological waste. Sterilization, most commonly autoclave steam sterilization, may be used to dispose of all other biomedical waste.(101) Improper waste segregation results in the overutilization of these carbon intensive processes. Moreover, the mixing of general waste into biomedical waste unnecessarily increases waste hauling fees.(8)

This is an issue with particular significance for ORs, which generate up to 30% of all hospital waste. Within the OR, waste must be segregated into waste streams for appropriate disposal.(8,74) Unfortunately, a large volume of OR non-hazardous waste is unnecessarily discarded into the biomedical waste stream.(13) For example, a team of perioperative nurses in a large urban hospital in the United States conducted a “Red Bag Receptacle” content evaluation following one day of surgery for abdominal aortic aneurysm endograft procedures and found that, by weight, up to 92% of discarded biomedical waste was non-hazardous.(13)

The large volume of waste that is incorrectly disposed of in the biomedical waste stream in healthcare facilities has been attributed to several factors, including poorly understood definitions of waste categories, improper segregation of waste, and inadequate staff training on how to handle and dispose of biomedical waste.(8) Disposing of biomedical waste is an expensive and polluting process.(101-104) Therefore, implementing proper waste segregation measures can reduce both the fiscal and environmental impacts of hospital waste.

RESOURCES:

PROJECT CHARTER

- Contributor: Dr. Syed Ali Akbar Abbass

IMPLEMENTATION RESOURCES

- CASCADES Hazardous Medical Waste Primer (CASCADES)
- St. Michael's Hospital Biohazardous Waste Poster (St. Mike's)

VIDEO: Waste Segregation with Dr. Ali Abbass

VIDEO: Follow the Waste with Dr. Ali Abbass

ADDITIONAL RESOURCES

- Safe management of wastes from health-care activities: Second edition (WHO 2014)
- Daniels Biomedical Waste Poster
- Performing Hospital Waste Audits (Waste Management Healthcare Solutions)

PLASTIC WASTE MANAGEMENT

GOAL

Reduce the environmental impact of plastic waste by correctly segregating plastic waste for recycling.

PROBLEM/OPPORTUNITY

Surgical departments favour plastics for their convenience, sterility, and single-use quality assurance.(61) Approximately 20-25% of total OR waste by weight is plastics, including single-use devices and packaging.(12) However, although up to 90% of OR waste has been estimated to be non-hazardous and potentially recyclable (12), there are multiple barriers to recycling, including a lack of awareness of what can be recycled (105); and improper waste segregation, contamination, and recycling procedures.

In the OR, all types of plastic (resin codes 1-7) are generated. These come in rigid, semi-rigid and flexible forms, such as irrigation bottles, intravenous (IV) fluid bags, and soft-edged flexible plastic packaging, respectively. Some are labeled and others are not.(106) Not all plastic waste can be recycled depending on the locale-specific markets for medical plastics, but plastics that CAN be recycled are often incorrectly disposed of in the regular or biomedical waste streams. Implementing an effective recycling program in the OR can drastically reduce the amount of plastic being sent to landfills and reduce waste processing costs for the hospital.

In Toronto, the PVC 123 recycling program started at St. Joseph's Health Centre and Humber River Hospital in partnership with the Canadian Vinyl Institute has created a pathway to divert the notoriously difficult-to-recycle polyvinyl-chloride (PVC) from landfill. PVC waste generated in the OR includes intravenous (IV) bags, oxygen masks, and oxygen tubing waste, which can now be remanufactured and "upcycled" into useful materials such as hoses, tubing, automotive supplies, and sound-dampening products.(12)

RESOURCES:

PROJECT CHARTER

- Contributor: Dr. Syed Ali Akbar Abbass

IMPLEMENTATION RESOURCES

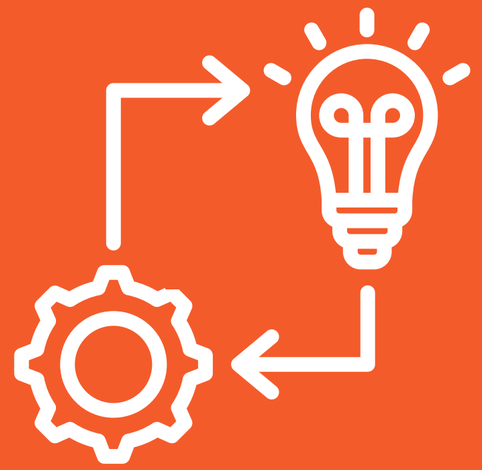
- Waste and Recycling Segregation Guide (SickKids)
- Managing Non-Cytotoxic IV/Fluid Line & Bag Waste (Ali Abbass)

VIDEO: PVC 123 Recycling Program with Dr. Ali Abbass

VIDEO: OR Recycling at UHN with Ed Rubenstein

ADDITIONAL RESOURCES

- Clinical Recycling Trainer Program Guide (BC GreenCare)
- Performing Hospital Waste Audits (Waste Management Healthcare Solutions)
- PVC 123 Program Details (The Vinyl Institute of Canada)
- PVC Recycling Vinyl Council of Australia
- Recycling Streams in Theatre (Green Theatres Network)



HOW

The Strategy for Change

Set your sustainability projects up for success by building a culture of sustainability

Review tools and tips to generate buy-in on sustainability efforts

Identify relevant internal and external stakeholders who can help make your project(s) successful

A Culture of Sustainability

Leading environmental change from the ground up can seem like a daunting task. However, small steps can quickly lead to significant shifts in practice – especially when there is an appetite for change. Health professionals across the spectrum indicate concern about climate change (107,108), and a growing number of professional associations are emphasizing the importance of environmentally sustainable practice in statements and guidelines. Recent surveys of perioperative care providers also indicate strong support for considering sustainability in the delivery of care; for example:

- In a survey of South African anesthesia providers, 92% agreed that environmental impact is an important factor to take into account when conducting anesthesia practice.(107)
- In a survey of surgeons in the UK and Ireland, 82% of respondents stated a willingness to make changes to their clinical practice, 91% welcomed greater leadership and guidance from national bodies, and 87% welcomed more monitoring and regulation, all in the interest of sustainability. (109)

Despite the clear desire to address the environmental footprint of perioperative care, many providers feel uncertain about how to get started, with perceived barriers including lack of knowledge, time, and/or support from leadership.(109,110)The resources introduced in the previous section of the playbook help address the knowledge gap and explore change ideas related to building capacity and buy-in around specific sustainability opportunities.

However, creating a culture of sustainability in which these specific sustainability opportunities are pursued is key to long-term success. Approaches to fostering such an environment are explored in this final section of the playbook.

RESOURCES:

Check out UHN's Environmental Management Policy

HOW TO GET YOUR GREEN BALL ROLLING

Here are some relatively low barrier ways to begin to embed sustainability in your department and institution:

- Send an email to your hospital leadership and/or OR manager urging use of the Sustainable OR Scorecard
- Rally your colleagues to start a Green OR Team
- Implement the "Sustainability Moment," in which a brief overview of green initiatives is provided to all team members immediately following completion of the first phase of the Surgical Safety Checklist (111)
- Mobilize existing QI infrastructure to start a project
  - Projects can be small to start - repeated small-scale actions build momentum and generate buy-in from your institution
  - Consider conducting a one-week trial of a sustainability initiative before launching a full-scale project
- Start a conversation with one internal stakeholder (such as procurement or facilities) and one external stakeholder (such as a vendor or professional association)
- Leverage your institution's sustainability office, if it has one!

RESOURCES:

VIDEO:
Sustainability Offices with Ed Rubenstein of UHN

Use the Sustainable Perioperative Care Scorecard

The CASCADES Sustainable Perioperative Care Scorecard was developed based on the TAHSN-CSHS Sustainable Health System Community of Practice Sustainable OR Scorecard.

It is a useful tool for organizations that need assistance in identifying priorities for sustainability interventions in perioperative care, and for individuals or teams seeking to encourage their organization to focus on environmental sustainability efforts. Help CASCADES evaluate and improve this tool by completing this survey

Why use a Scorecard?

- Allows for benchmarking across multiple sites or between organizations
- Easy to understand
- Gives steps to improve over time
- Can be adapted to be simple (for directors, executives, and CEOs) or detailed (for frontline clinicians, educators, and quality improvement staff)

How do I use this Scorecard?

1. Pick a specific initiative
2. Use the grading criteria to place your organization on the Red, Amber, and Green scale (include a reason for your score and how other organizations are doing if you have this knowledge)
3. Repeat until entire scorecard has been completed
4. Bring forward to green team and/or leadership for strategizing next steps
5. Share your baseline and ongoing results here

ORGANIZATION: DATE:

CASCADES

CASCADES SUSTAINABLE PERIOPERATIVE CARE SCORECARD

The CASCADES Sustainable Perioperative Care Scorecard helps perioperative teams:
- Identify sustainability opportunities and access related implementation resources
- Establish a baseline and track progress on sustainability goals
- Share these metrics with the broader community to track collective progress
- Fill in elements of the Canadian Coalition for Green Health Care's Green Hospital Scorecard

This scorecard is currently being piloted at sites across Canada. CASCADES is seeking input from the broader community. Share your feedback and areas of focus by completing this survey. Some of these responses will be used to populate the Scorecard Dashboard to showcase all the great work sites are doing across Canada to improve the sustainability and environmental impact of perioperative care.

Feedback survey

CASCADES is also seeking opportunities for networking and mentorship from sites utilizing the Scorecard. Contact us at CASCADES@utoronto.ca to learn more.

This version of the tool has been adapted from an earlier scorecard developed in a local context (see below for further details).

SUSTAINABLE PERIOPERATIVE CARE

Background information and implementation resources related to most of the sustainability opportunities presented below can be found in the CASCADES Sustainable Perioperative Care Playbook (linked throughout).

To access the full playbook, go to: cascadescanada.ca/resources/sustainable-perioperative-care-playbook/

Status Options: NOT WORKING ON | WORKING ON (NOT YET PARTIALLY ACHIEVED/ACHIEVED) | PARTIALLY ACHIEVED | ACHIEVED

OPPORTUNITIES	STATUS	GOALS
SUSTAINABILITY LEADERSHIP		→ See The Strategy for Change in the CASCADES SPC Playbook
Implement leadership structure to support perioperative environmental sustainability		• Formalized Environmental Sustainability Perioperative Committee in place with broad representation that reports at perioperative meetings and has an executive sponsor, AND • Committee structure allows for protected time for clinical staff to participate in regular meetings and implementations
		• A green team of volunteers who engage in activities to improve sustainability of the OR has been established
LOW-VALUE CARE		→ See Avoiding Unnecessary Care in the CASCADES SPC Playbook
Reduce low-value pre- and post-op visits and testing		• Low-value pre- and post-op testing is eliminated • Lower-carbon test options are considered when testing is necessary • Virtual visits are offered when appropriate
Playbook: Tests & Visits		• Decision-tool to aid in consensus around necessity of specific tests in place
Reduce unnecessary blood product wastage		• Transfusions only done when clinically indicated • Blood products are ordered in accordance with use (avoid excessive overordering; monitor expiration dates)
Playbook: Wise Blood Use		• Delivered education around wise blood use • Stock of blood products audited to determine proper ordering frequency/volume
ANESTHETIC GASES		→ See Minimize Direct Emissions in the CASCADES SPC Playbook
Eliminate desflurane for surgical procedures requiring general anesthesia		• Desflurane removed from formulary, or • Desflurane eliminated from use
		• Provided education on environmentally friendly gases, AND • Implementation of one of the following strategies to reduce desflurane use: ◦ Carbon intensity warning stickers placed on desflurane vaporizers, or ◦ Sevoflurane is the default gas on the vaporizer, or ◦ Desflurane vaporizers removed from anesthetic machine, or ◦ Desflurane not available in operating rooms, but can still be accessed from automated medication dispensing system (i.e., Omnicell, Pyxis MedStation)
Playbook: Desflurane		

VIDEO:
The OR Scorecard with Dr. Fiona Miller

VIDEO:
The OR Scorecard with Cameron Irani

Start an OR Green Team

WHAT IS A GREEN TEAM?

A green team is generally “a grassroots organization that advocates for environmental sustainability through awareness, education, and specific initiatives.”(112) Health care green teams can take many forms,(113) and in addition to improving sustainability, they can produce a number of co-benefits, including enhanced employee satisfaction and interdepartmental coordination, cost savings, public image enhancement, regulatory compliance, and improved quality and safety, among others.(114)

WHY MAKE A GREEN TEAM?

Finding the time, energy, and expertise to make change alone is very challenging. Forming an OR green team can ensure that sustainability initiatives are pursued in a coordinated and supported fashion.(115) Moreover, given the collaborative nature of perioperative practice, many perioperative greening interventions require engagement across disciplines, which an interprofessional green team can facilitate.

WHO SHOULD BE PART OF YOUR GREEN TEAM?

Aim for interprofessional membership, including:

- Project Manager or Program Manager for environmental sustainability
- OR Nurses
- Anesthesiologists
- Anesthetic Assistants / Respiratory Therapists
- Surgeons
- Cardiac Perfusionists
- Attendants/custodial staff
- MDRD staff
- Education specialists (OR educator)
- Leadership team members (OR manager, Attendant manager, MDRD)

HOW TO MAKE A GREEN TEAM?

- Gather representatives from across perioperative service
- Establish terms of reference (TOR)*
- Identify a chair or co-chairs to lead the group (can be from any discipline)
- Pick a meeting time that works for most people (usually during day shift work hours)
- Identify a pathway to include the ideas and concerns of team members that cannot make meetings

*Check out the SickKids Green Team TOR

RESOURCES:

VIDEO: London Health Sciences Centre's Green Team with Julie Strychowsky

VIDEO: SickKids' Green Team with Cameron Irani

LEVERAGE QI INFRASTRUCTURE/RESOURCES

Sustainability and quality of care in health systems are intricately linked. If health systems fail to address the environmental dimensions of health and healthcare, they can limit improvements in the health outcomes of the individuals and populations they serve, now and in and future.(116) In order to truly achieve high-quality healthcare, climate action must be embedded within quality improvement efforts.

This can be accomplished in two ways:

1. SUSTAINABILITY AS A COMPONENT OF A QI PROJECT: Apply a green lens to past or current QI projects without an explicit sustainability component to consider their environmental implications

- For example, the Ontario Surgical Quality Improvement Network (ON-SQIN) committed to reducing surgical site infections (SSIs) for their 2018-2019 “Committed to Better: Reducing Infections After Surgery” provincial campaign.(117)
- SSIs have a carbon footprint: according to one analysis from the UK, each SSI produces 0.58 tCO_2e.(118)
- The campaign resulted in a significant decrease in SSIs in participating hospitals (117); putting this activity data in conversation with the environmental data on SSIs can produce an estimate of the environmental savings related to the initiative. Note that infection prevention measures also come at a carbon cost that must be taken into consideration.(119)

2. SUSTAINABILITY AS THE FOCUS OF A QI PROJECT: Initiate QI projects with an explicit sustainability mandate, such as the ones described in the previous section of this playbook

RESOURCES:

- For more information on the relationship between sustainability and quality, check out the **CASCADES Playbook: Training for Better Health Outcomes: Integrating Sustainability into Quality Improvement Programs**

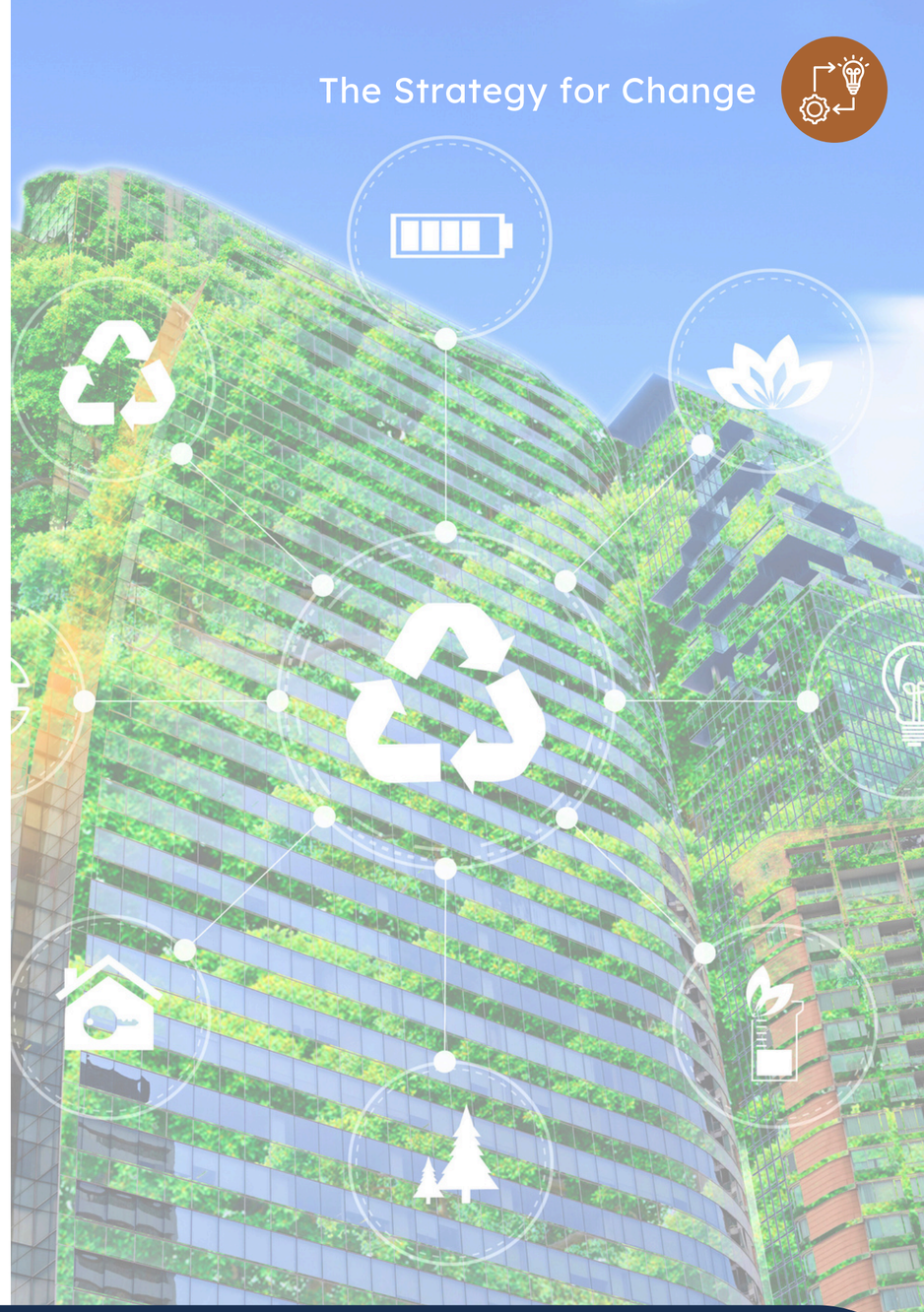
VIDEO: Leveraging QI for Change with Dr. Husein Moloo

QI methodology offers an established pathway for implementing and testing change. Be sure to mobilize internal as well as external QI resources and capacity in your change efforts:

This can be accomplished in two ways:

- **INTERNAL QI RESOURCES** can support the planning and implementation of projects with a sustainability component or focus.

- **EXTERNAL QI CAPACITY** can help spread and scale QI projects with a sustainability component or focus. Regional or provincial quality reporting networks, such as the Ontario Surgical Quality Improvement Network (ON-SQIN), have perioperative QI processes that can be used to track, measure, and compare sustainability initiatives within and across sites.
  - Several of the sustainability opportunities described in the change package portion of this playbook are featured in ON-SQIN's 2023-2024 "Cut the Carbon: Reducing Surgical Waste" Campaign.



Internal and External Stakeholder Engagement

ENGAGE DIVERSE INTERNAL STAKEHOLDERS

Perioperative care spans many practices and professions, with the patient at the center of any intervention. Interprofessional engagement is essential for coordinating effective initiatives in perioperative care, and sustainability initiatives are no different. The collaboration of many stakeholders is required to promote change and create a culture of continuous improvement in environmentally responsible practices.

See the next slide for a list of internal stakeholders and their possible roles in sustainability efforts.

INTERNAL STAKEHOLDERS

OR NURSES	• Sustainability planning for and integration into nursing-specific workflows
ANESTHESIOLOGISTS/ ANESTHETIC ASSISTANTS/ RESPIRATORY THERAPISTS	• Sustainability planning for and integration into anesthesiology and anesthetic equipment specific workflows
SURGEONS	• Sustainability planning for and integration into surgeon-specific workflows
CARDIAC PERFUSIONISTS	• Sustainability planning for and integration into perfusionist workflows within the OR
ATTENDANTS/ CUSTODIAL STAFF	• Sustainability planning for and integration into attendant/custodial workflows within the OR
LEADERSHIP TEAM MEMBERS (OR MANAGER, ATTENDANT MANAGER, MDRD)	• Approve and/or advise of changes to practice • Creation and maintenance of financial reports • Publicize initiatives throughout the hospital
HOSPITAL LEADERSHIP/EXECUTIVES	• Complete Green OR Scorecard • Promote a culture of sustainability throughout the organization • Allocate protected time and resources to sustainability projects
MDRD STAFF	• Sustainability planning for and integration into MDRD specific workflows (e.g. how much storage space is available, what cleaning solutions are used, what equipment is available for cleaning)
CLINICAL INFORMATICS & SURGICAL CLINICAL REVIEWERS	• Develop data plan and track and extract data
QI EXPERTS	• Assist in project planning and implementation
EDUCATION SPECIALISTS (OR EDUCATOR)	• Advise on, create, and/or disseminate educational material
PATIENTS AND PATIENT ADVISORS	• Participate in sustainability efforts (i.e. BYOGB) • Advise on patient-facing sustainability content • Engage in sustainability planning
PROCUREMENT*	• Advise on backorders • Assist in identifying green alternatives • Assist in contacting vendors
PLANT OPS/FACILITIES	• Provide expertise on hospital infrastructure • Provide consultation for changes involving hospital infrastructure
PROGRAM MANAGER FOR ENVIRONMENTAL SUSTAINABILITY	• Coordinate organization-wide greening strategies with perioperative services • Identify key metrics related to environmental sustainability

*Check out UHN's Green Procurement Policy

PURSUE PARTNERSHIPS WITH EXTERNAL STAKEHOLDERS

Partnerships with external stakeholders are crucial to the transition to environmentally sustainable perioperative care. External stakeholders can help you identify opportunities that were not previously considered, provide knowledge and expertise, and assist in project implementation. They can help you widen the impact of any project and contribute to a more climate-resilient and sustainable healthcare system.

External stakeholders and their possible roles in sustainability efforts include:

WASTE MANAGEMENT COMPANIES	• Conduct or assist with waste audits (weight and visual) • Identify relevant policies and regulations • Identify environmentally friendly waste handling products (e.g. garbage bins)
SUPPLIERS/PRODUCT REPRESENTATIVES	• Provide list of environmentally sustainable alternatives • Assist in identifying other organizations using similar products
GROUP PURCHASING ORGANIZATION	• Negotiate contracts with vendors offering environmentally sustainable products
GOVERNMENTS	• Set priorities for sustainable healthcare systems
PROFESSIONAL ASSOCIATIONS	• Develop statements, recommendations, and/or guidelines encouraging sustainable perioperative practice • Create space for sustainability at conferences and events
SUSTAINABILITY CHAMPIONS	• Mentor staff and sites seeking to implement sustainability interventions
THIRD PARTY INSTITUTIONS (i.e. CASCADES, Choosing Wisely; the Vinyl Institute of Canada)	• Offer support/guidance • Publicize efforts
MEDIA	• Publicize sustainability efforts

*Check out EyeSustain, a global coalition to make ophthalmic care and surgery more sustainable

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Numerous individuals kindly offered their expertise in the development of project charters and associated resources; their contributions are acknowledged throughout the playbook and in the resources. Additional thanks to attendees of the CASCADES-ONSQIN Sustainable Perioperative Care Workshop on November 25th, 2022 for their review of early versions of some of the project charters.

GRAPHIC DESIGN by Luz A. Paczka Giorgi

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Version 3.0 Published Jan 26, 2026.

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