



**LOW CARBON
HIGH QUALITY CARE**

Change & Measurement Strategy

Sustainable Perioperative Practices



Territorial Acknowledgements

In doing work throughout the province, we at Health Quality BC (HQBC) would like to acknowledge that we are living and working with humility and respect on the traditional territories of the First Nations Peoples of British Columbia. We specifically acknowledge and express our gratitude to the keepers of the lands of the ancestral and unceded territory of the x^wməθk^wəyəm (Musqueam), Skwxwú7mesh (Squamish), and səłilwətaʔ (Tsleil-Waututh) Nations, where our head office is located on what is now colonially known as Vancouver. HQBC also recognizes Métis People and Métis Chartered Communities, as well as the Inuit and urban Indigenous Peoples living across the province on various traditional territories.

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Overview

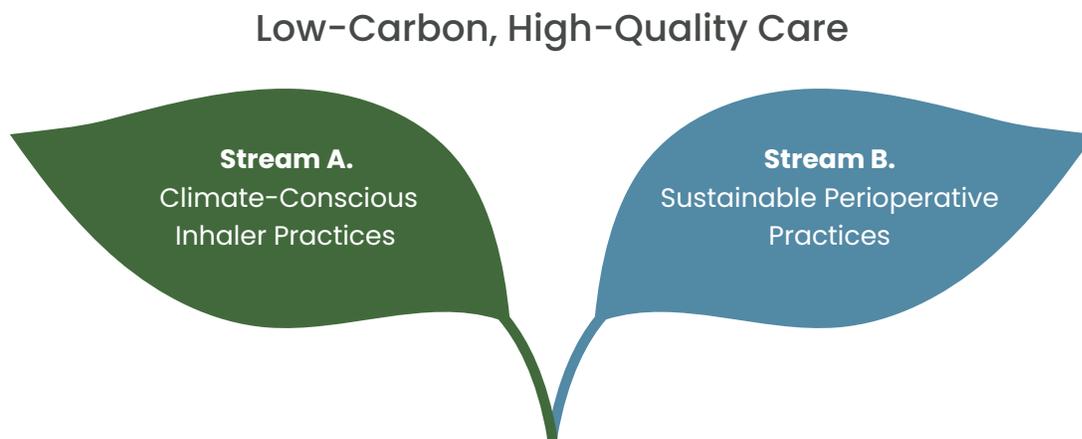
The Low-Carbon, High-Quality Care Collaborative (LCHQ) is a provincial quality improvement initiative, led by Health Quality BC (HQBC) in partnership with CASCADES Canada and Vancouver Coastal Health (VCH). The aim of the collaborative is to spread and scale up efforts across the province and share knowledge of low-carbon practices that improve the quality of care. We are very excited to have your team involved! Please refer to the [Welcome Package](#) you were sent for the information and resources you will need to get started on this journey.

The purpose of this document is to provide guidance for your LCHQ improvement journey through the **Change & Measurement Strategy**. This document is a core tool to help accelerate your work throughout the collaborative and outlines many of the low-carbon practices while providing useful tools to monitor their effectiveness in your care setting. It contains the:

- **Change Ideas** which are a collection actions your team can test, based on evidence and experiences of others in similar clinical settings; and
- **Measurement Strategy** to help identify and inform progress in the areas towards your aim.

While this document is comprehensive, it is not exhaustive. Teams are encouraged to tailor the change ideas and measurement strategy to their specific clinical setting and use the ideas that best align with their needs.

The LCHQ Collaborative features two streams which both contribute to the overall aim of reducing carbon emissions from clinical care of participating teams:



Please make sure you have the correct package as there are differences across the two streams. This document has been prepared for:

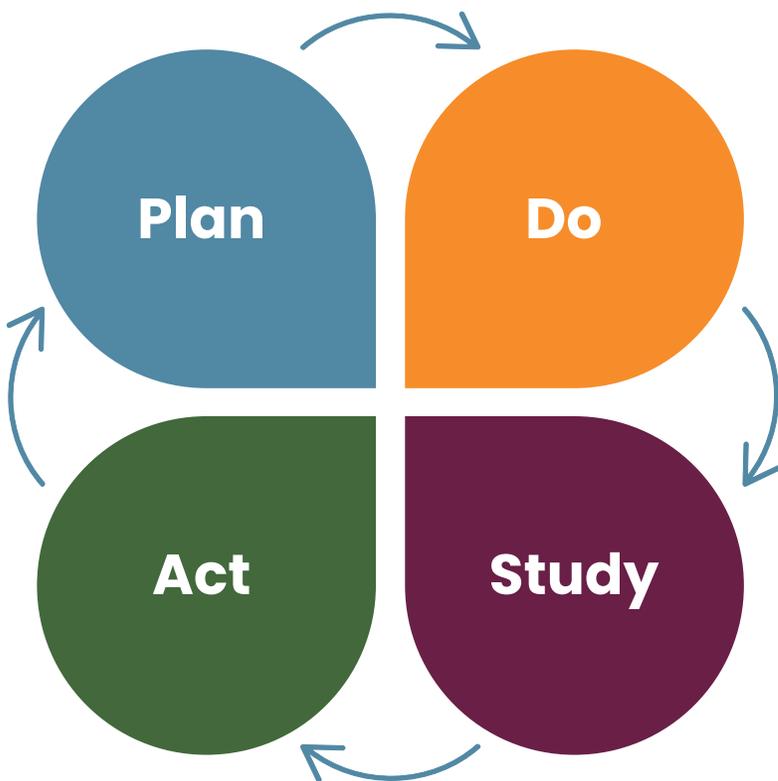
Stream B. Sustainable Perioperative Practices

How to Improve?

There are many approaches to drive quality improvement to achieve better quality of care. For the LCHQ Collaborative, we will use the Model for Improvement as the framework to guide improvement.

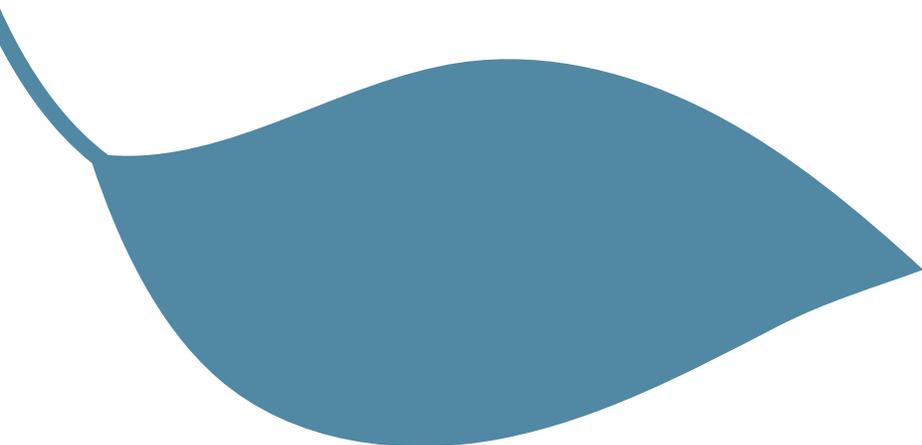
THE MODEL FOR IMPROVEMENT

The Model for Improvement is a framework used to guide and accelerate improvement work.¹ This model is used because it works well with other change models that your organization may already be using. It is designed to accelerate improvement work through incremental testing of small-scale change using Plan-Do-Study-Act (PDSA) Cycles.²



The Model for Improvement asks three basic questions:

- 1 What are we trying to accomplish?
- 2 How will we know that a change is an improvement?
- 3 What change can we make that will result in improvement?



STEP 1: WHAT ARE WE TRYING TO ACCOMPLISH?

Understanding your current state, defining the problem you seek to address, and developing your aim are the first steps in making positive changes. We will document this quality improvement journey through the development of an **Improvement Charter**. The Improvement Charter is a documented plan to guide the work of an improvement team. It outlines all the elements of the improvement process, including the overall purpose, expected outcomes, initial ideas for change, and team members' roles and responsibilities. Charters are an important tool at the beginning of a project.

Each team will be supported to create an Improvement Charter for their project. This is best done collaboratively with project team members.

What does this look like in practice?

Start by considering the focus of the work that your team would like to do. As a team, begin to define this work by completing the sections of the charter:

- Project name, sponsor, team leader and members
- Problem Statement - What is the gap in quality this work is addressing?
- Aim Statement - What will improve? By how much? By when? Where?
- Scope and Boundaries - What will the project include?
- How will you manage the project? (e.g., key dates, roles and responsibilities, engaging others)

The process of completing a charter brings awareness to everyone involved and confirms their commitment to participate and support the project. The dialogue in this process is as important as the charter itself.



The Problem Statement

The why. A brief description of the issue or problem the collaborative is seeking to address.

Clinical service delivery within the health system is a large consumer of energy and resources and a major producer of emissions and waste. These environmental impacts of care are substantial with up to 5% of global greenhouse gas emissions coming from health care systems.³ There are strong linkages between the carbon-impact of clinical activities and health care quality, as defined by the [BC Health Quality Matrix](#).⁴

Teams are encouraged to expand on this problem statement based on their setting and specific area of focus. Please complete the [Sustainable Operating Room Scorecard](#) as part of this initial assessment and planning process. It can be used to identify focus areas and opportunities for improvement.

The Aim Statement

A clear, explicit summary of what will be accomplished over the course of an improvement project.

This is the overall aim of the LCHQ Collaborative:

Decrease the carbon emissions by 10% from clinical practices of participating teams by November 1, 2024.

Each team will develop their own aim statement for their specific project – that includes what they will improve, where, by how much, and by when. ‘*How to develop an effective aim statement*’ will be introduced at the first learning session and teams will be supported with this process by the HQBC team.

STEP 2: HOW WILL WE KNOW THAT A CHANGE IS AN IMPROVEMENT?

Measurement is essential to understand and improve the quality of care. Measurement for improvement helps us to:

- understand current performance;
- observe if the changes we are implementing are leading to the desired outcome;
- understand if the changes implemented have unintended consequences (positive, negative, or neutral);
- compare to similar sites to foster learning;
- communicate clearly about improvement efforts and outcomes; and
- know if we have reached our aims.⁵

To understand if changes have resulted in improvement, a few key indicators need to be selected to track progress over time. A team should choose 3 – 8 indicators that are useful, manageable, and provide a view of improvements being made relative to the aim of the project. Indicators can be classified as either outcome, process or balancing measures:

- 1 Outcome Measures:** Measures that are tied closely to the aim statement and will be improved after the project is complete. (e.g., carbon emissions from anesthetic gases)
- 2 Process Measures:** Measures the factors that directly impact the aim (usually tied to primary or secondary drivers – see pages 9-10). These measures are the voice of the system and often show change more quickly than the outcome measure they are connected to. (e.g., # of unnecessary pre-operative tests completed)
- 3 Balancing Measures:** Measures unintended consequences, both positive and negative, that may result from the changes being made. (e.g., # of patients who were satisfied or very satisfied with their surgical procedure)

The HQBC team will help you create a [Measurement Plan](#) for your project, including determining appropriate indicators, data collection and tracking strategies.

What does this look like in practice?

You will find sample measures in the Measurement Strategy on page 13. Take the time to explore what data is available and consider simple manual data collection to start. Remember, data is meant to speed up the improvement process, not slow it down! Measurement tips:⁵

- Start collecting data right away.
- Collect data as close to real time as possible to learn about current performance.
- Display data over time using a run chart to visually see changes in your measures.
- Use data as a communication tool, both within your improvement team and with external parties, so everyone knows how things are going.
- You don't need to measure everything! Sampling can be used as a great strategy to conserve time and resources, while focusing on testing, adapting, and actionable improvements.

STEP 3: WHAT CHANGES CAN WE MAKE THAT WILL RESULT IN AN IMPROVEMENT?

Driver Diagram – Perioperative Stream⁶

A driver diagram is a tool used during improvement projects to illustrate different theories of change and how they may lead to improvement.⁷ Driver diagrams help in answering the question, “What changes can we make that will result in an improvement?” They do this by mapping the logic of potential change ideas to the intended outcome. Change ideas can come from a variety of sources: research, best practices or other organizations that have achieved results. The majority of these change ideas are based off [CASCADES Playbooks](#)⁶ with input from our advisory group on how they apply in the British Columbia context.

Review the driver diagram on page 10 with your team and identify which primary and secondary drivers you will focus on. You can then look at the change ideas for suggestions, or come up with your own change ideas, to test in your own environment.



| COLLABORATIVE AIM | PRIMARY DRIVER | SECONDARY DRIVER | CHANGE IDEA |
|--|---|---|---|
| Decrease the carbon emissions by 10% from clinical practices of participating teams by November 1, 2024. | 1. Minimize Direct Emissions | Eliminate use of desflurane | 1. Take desflurane off the formulary |
| | | | 2. Restrict desflurane access – remove desflurane vaporizer, designate a locked storage space |
| | | | 3. Set machine to default to sevoflurane |
| | | | 4. Visual prompts to reinforce and encourage the selection of low-carbon gases |
| | | Use lower flow rates of anesthetics | 5. Lower fresh gas flow defaults |
| | | | 6. Use low flow induction |
| | | Abandon nitrous oxide infrastructure | 7. Change to smaller cylinders to reduce leakage |
| | | | 8. Explore leakage rates of cylinder banks |
| | 9. Complete process and workflow mapping | | |
| | 2. Explore Alternative Anesthetic Strategies | Increase uptake of regional and spinal anesthesia | 10. Develop staff scheduling and staffing models |
| | | | 11. Secure dedicated space and equipment for the procedure |
| | Use total intravenous anesthesia (TIVA) where appropriate | 12. Review provider practices and explore opportunities where TIVA could be used | |
| | | 3. Promote Appropriate Care | Use evidence-based guidelines to eliminate unnecessary care that is low-value, high-carbon |
| | 14. Practice wise blood use – reduce inappropriate red blood cell transfusion practices | | |
| | 15. Create dashboards or displays to make data-driven decisions on the need for certain tests | | |
| | 4. Implement Green Processes | Substitute reusable alternatives where applicable | 16. Encourage patients to bring reusable bags or use pillowcases to hold their belongings |
| | | | 17. Use reusable breathing circuits |
| | | Increase efficiency by reducing waste | 18. Purchase devices that can be reprocessed instead of single-use devices |
| | 19. Ensure appropriate waste management of non-cytotoxic pharmaceuticals | | |
| | 5. Spread Education & Awareness | Equip health care professionals with education to embed low-carbon clinical care into their daily practices | 20. Provide health care professionals with education about your change ideas |
| | | | Equip patients and families with education about sustainable perioperative options |

Change ideas #1-8, and #16-19 have examples of completed project charters which can be found in the [CASCADES Sustainable Perioperative Care Playbook](#).

Measurement Strategy For This Collaborative

Teams will be supported to create a [Measurement Plan](#) that will provide data to determine whether the changes you are making are moving you towards achieving your aim. This plan should include measures that cover at least one dimension of quality as defined in the [BC Health Quality Matrix](#). The seven dimensions of quality are: respect, safety, accessibility, appropriateness, effectiveness, equity and efficiency.

Measurement for the purposes of *improvement* is to learn what processes or change ideas are making a difference and to track progress relative to your aim over time. The goal is to gather *just enough* data to make informed decisions and guide your actions.

What will you measure?

A great way to approach your measures is to think about the following three domains and how they relate to a dimension of quality that you are focusing on in this project:

- 1 Sustainability:** Are we using resources in an optimal and environmentally sustainable way?
- 2 Clinical:** What is important to clinical teams to provide the best possible quality of care?
- 3 Experience:** What is important to our patients, families, residents, staff and clinicians?

How will you collect data?

Data collection planning involves determining what will be collected, who will collect it and how often it will be collected. In an ideal world, we would have the time and resources to measure everything! However, this is not necessary for the purposes of improvement.

Here are some tips for determining an appropriate sample size and frequency of data collection for your project:

- **Start measuring something:** The most important thing is to begin measuring. You can start with a small sample of data to gather initial insights and test your data collection strategy.
- **Determine the right indicator:** Look at the information collected from the small sample and assess if you have chosen the right measure. Refine and make adjustments as necessary based on the insights gained. It can be an iterative process, so be open to refining your approach.
- **Constructive sampling strategy:** Once you have identified the right indicators, you can move towards a more constructive sampling strategy. This strategy should balance getting an appropriate measure of information while considering the resources and time required. A good rule of thumb is to collect 10-20% of your overall denominator.

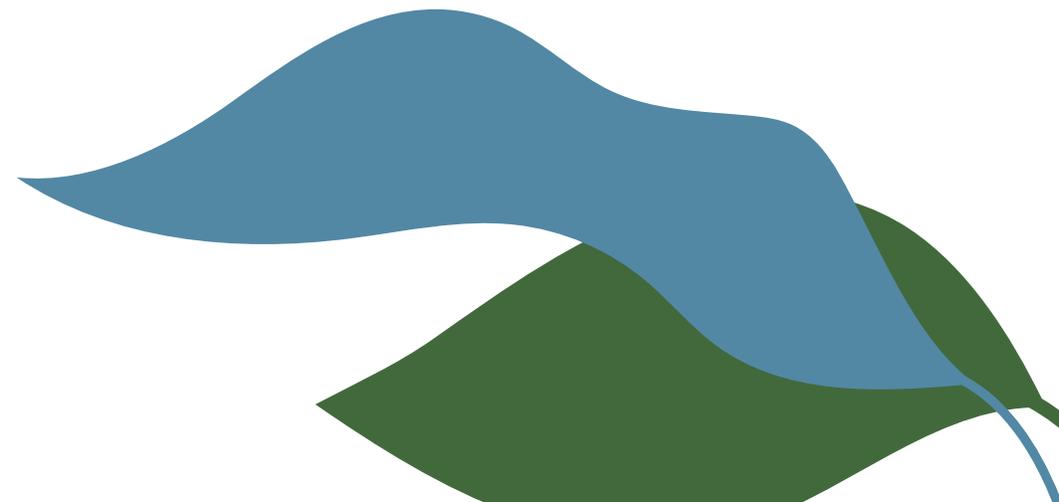
- **Balance data collection with informed decisions:** Collecting smaller, consistent samples can provide meaningful and useful information without overwhelming resources.
- **Frequency of data collection:** Measures should be collected frequently and consistently throughout your improvement project to track changes over time. For key indicators, weekly, bi-weekly or monthly data collection is generally recommended depending on context and volume of patients. However, during quick, time-limited PDSA cycles, you may need to measure daily or even hourly to assess the impact of specific changes.
- **Seek support from the HQBC team:** The HQBC team is available to provide support and guidance in refining your sampling strategy for your metrics. They can help you determine an appropriate sample size and provide additional information and resources.

Where will the data be shared?

Your project team will want to review data throughout the collaborative to help understand how you are performing and to guide your next steps. Are things getting better or worse? Is performance acceptable? Do we have more or less variability? Sharing this information with others in your clinical setting is a good way to build engagement and ownership around the changes you're making.

Each team is also asked to report on key indicators by submitting a **Monthly Team Progress Report** to the HQBC team starting in March 2024. You will be introduced to this template at the second learning session. These reports are designed to help you progress through the collaborative, inform supports provided to teams, and assess the collective impact of our efforts.

Teams will select indicators that are meaningful to their project that they are able to track, review and update on a monthly basis. Other measures will be useful during PDSA cycles and may only be collected for a short period during the duration of the cycle. These measures are typically specific to the changes being tested.



SELECTING INDICATORS

Domain 1: Sustainability Measures

Are we using resources in an optimal and environmentally sustainable way?

All teams must measure **estimated carbon emissions** in CO₂ equivalent (CO₂e) from a clinical practice to help them determine the impact they are having throughout the LCHQ Collaborative.

There are many ways to estimate carbon emissions from clinical practice. For the perioperative stream, teams are asked to focus on at least one of the following areas: anesthetic gases, unnecessary pre-op tests and interventions, and the uptake of regional and spinal anesthesia.

If you would like to look at other areas in addition to those listed above, we are open to exploring this through the collaborative. There are additional resources and supports available for any teams interested in exploring a more comprehensive life cycle analysis of their clinical practices.⁸

| TYPE OF MEASURE | MEASURE | DIMENSION OF QUALITY | OPERATIONAL DEFINITION | CALCULATION | POTENTIAL DATA SOURCES |
|-----------------|---|---|--|--|---|
| Outcome | O.1. Estimated Carbon Emissions | Efficiency, Appropriateness, Accessibility, Effectiveness | Estimated carbon emission from clinical practices, including: <ul style="list-style-type: none"> • Anesthetic gases • Unnecessary pre-op tests and interventions • Regional and spinal anesthesia | Monthly Team Progress Report provided by HQBC will include formulas to calculate: <ul style="list-style-type: none"> • CO₂e from desflurane • CO₂e from tests • CO₂e saved from regional and spinal anesthesia instead of general anesthesia | See process measures 1-3. |
| Process | P.1. Volume of Anesthetic Gases Purchased | Efficiency | The total volume of purchased gas (desflurane and sevoflurane) | Volume of each gas purchased | <ul style="list-style-type: none"> • Local hospital pharmacies |

Domain 2: Clinical Measures

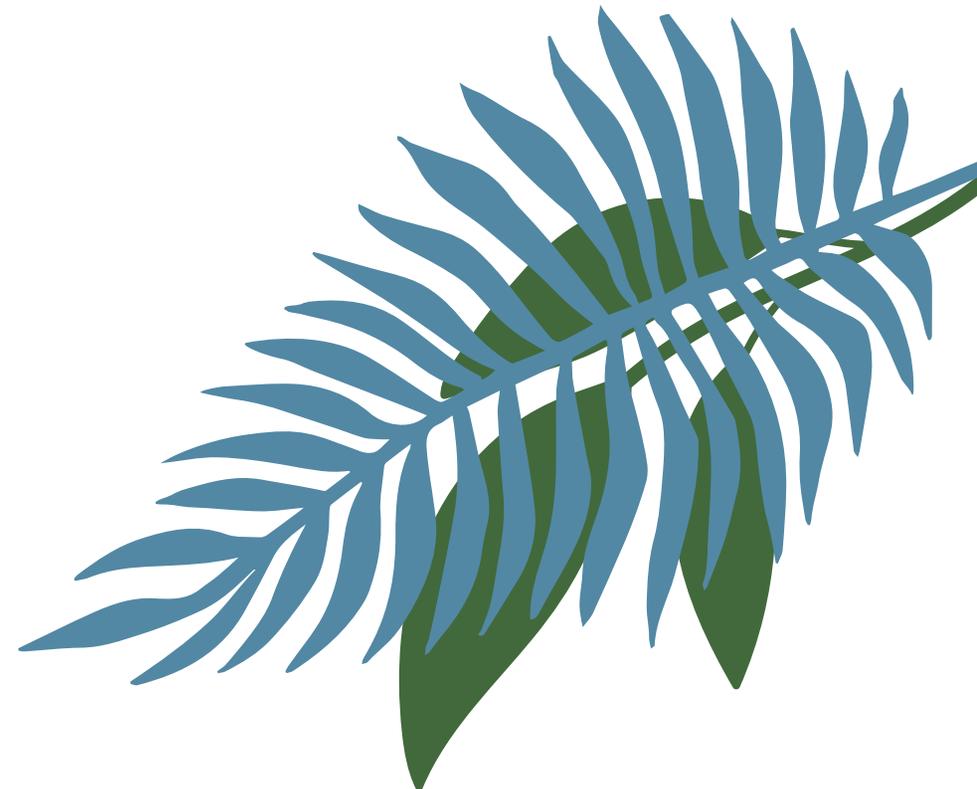
What is important to clinical teams to provide the best possible quality of care?

Teams should have at least one clinical measure focused on how care is being delivered. Depending on the specific aim of your project, choose from the measures below:

*Teams who are exploring shifting from general anesthesia to regional anesthesia for some procedures will need to develop a list of criteria for procedures that are candidates for this change. This list will be used in several of the measures. A recommended list of eligible procedures to consider will be provided to teams before Learning Session 2.

| TYPE OF MEASURE | MEASURE | DIMENSION OF QUALITY | OPERATIONAL DEFINITION | CALCULATION | POTENTIAL DATA SOURCES |
|-----------------|---|-----------------------------|---|---|--|
| Process | P.2. Number of Unnecessary Pre-operative, Intra-operative or Post-operative Tests | Appropriateness | The percentage of low-risk patients undergoing low-risk surgery who had pre-operative tests or interventions. ⁹ Example of test: • Group and screen Example of low-risk surgery: • Endoscopy | $\frac{\text{\# of low-risk surgical patients who had X pre-operative tests}}{\text{\# of low-risk surgical patients}}$ | <ul style="list-style-type: none"> • Chart review • Decision support |
| Process | P.3. Regional and Spinal Anesthesia | Appropriateness, Efficiency | The percentage of eligible procedures* completed under regional or spinal anesthetic. This measures a shift from the more carbon intensive approach of general anesthesia. | $\frac{\text{\# of eligible procedures completed under regional anesthesia}}{\text{\# of eligible procedures completed}}$ | <ul style="list-style-type: none"> • Chart review • Decision support |
| Balancing | B.1. Adverse events | Safety | The percentage of patients who experience an adverse event. | $\frac{\text{\# of patients who experienced an adverse event}}{\text{\# of surgical patients}}$ | <ul style="list-style-type: none"> • Patient Safety Learning System (PSLS) or internal reporting structures |

| TYPE OF MEASURE | MEASURE | DIMENSION OF QUALITY | OPERATIONAL DEFINITION | CALCULATION | POTENTIAL DATA SOURCES |
|------------------|-------------------------------------|----------------------|--|---|--|
| Balancing | B.2. PACU Usage | Efficiency | The percentage of patients who received regional or spinal anesthesia and bypassed PACU. | $\frac{\text{\# of patients who bypassed PACU}}{\text{\# of patients who underwent eligible procedures}}$ | <ul style="list-style-type: none"> • Chart review • Decision support |
| Balancing | B.3. Operating Room Usage | Efficiency | Average time spent in the OR by patients who underwent eligible procedures. | $\frac{\text{Sum of time spent in the OR for all patients who underwent eligible procedures}}{\text{\# of patients who underwent eligible procedures}}$ | <ul style="list-style-type: none"> • Chart review • Decision support |



Domain 3: Experience Measures

What is important to our patients, families, residents, staff and clinicians?

Teams should have at least one experience measure focused on how people are experiencing care. Depending on the specific aim of your project, choose from the measures below:

| TYPE OF MEASURE | MEASURE | DIMENSION OF QUALITY | OPERATIONAL DEFINITION | CALCULATION | POTENTIAL DATA SOURCES |
|-----------------|--|--------------------------------|--|---|---|
| Outcome | O.2. Post-operative pain control (Pain scale) | Respect, Safety, Effectiveness | Average patient self-reported pain using a pain scale after eligible procedures. | $\frac{\text{Sum of pain scales from patients receiving eligible procedures}}{\text{\# of patients receiving eligible procedures}}$ | <ul style="list-style-type: none"> • Chart review • Decision support • Survey administered by project team |
| Balancing | B.4. Patient Experience | Respect | The percentage of patients that indicate they experienced a high level of care. | $\frac{\text{\# of patients who report a 9 or 10 with their overall experience}}{\text{Total number of patients surveyed}}$ | <ul style="list-style-type: none"> • Provincial Experience Survey • Survey administered by project team |
| Balancing | B.5. Health Care Professional (HCP) Experience | Respect | The percentage of HCPs in your setting that are satisfied with the level of care they are able to provide. | $\frac{\text{\# of HCPs that indicate positive perceptions of care}}{\text{\# of HCPs surveyed}}$ | <ul style="list-style-type: none"> • Health and Wellness Survey results at facility |

What does this look like in practice?

Here is an example of how indicator selection might look for a project aimed at increasing uptake of regional or spinal anesthesia:

Although regional anesthesia is a common practice and a standard of care for certain surgical procedures, broadening its use for procedure groups that may not have been considered in the past is an effective way to reduce carbon emissions from inhaled anesthetics, and has the ability to improve patient quality of care.

You can measure this by considering the dimensions of quality most likely to be impacted.



DIMENSIONS OF QUALITY

RESPECT
Honouring a person's choices, needs and values

SAFETY
Avoiding harm and fostering security

ACCESSIBILITY
Ease with which health and wellness services are reached

APPROPRIATENESS
Care that is specific to a person's or community's context

EFFECTIVENESS
Care that is known to achieve intended outcomes

EQUITY
Fair distribution of services and benefits according to population need

EFFICIENCY
Optimal and sustainable use of resources to yield maximum value

INDIVIDUAL PERSPECTIVE

SYSTEM PERSPECTIVE

Average patient self-reported pain using a pain scale after eligible procedures (e.g., outcome measure O.2)

Percentage of patients who experience an adverse event (e.g., balancing measure B.1)

Percentage of eligible procedures completed under regional or spinal anesthesia (e.g, process measure P.3)

Estimated amount of carbon emissions saved by patients who underwent regional or spinal anesthesia (e.g., outcome measure O.1)

Percentage of eligible procedures completed under regional or spinal anesthesia (e.g, process measure P.3)

RETURNING TO HEALTH & WELLNESS

Getting better when faced with acute illness or injury

AREAS OF CARE

Appendices

APPENDIX 1: ABBREVIATIONS

CO₂e: Carbon Dioxide Equivalent

FGF: Fresh Gas Flow

HCP: Health Care Professional

HQBC: Health Quality BC

LCHQ: Low-Carbon High-Quality

LOS: Length of Stay

OR: Operating Room

PACU: Post-Anesthesia Care Unit

PDSA: Plan-Do-Study-Act

TIVA: Total Intravenous Anesthesia

VCH: Vancouver Coastal Health



APPENDIX 2: ESTIMATED CARBON EMISSIONS FROM COMMON ANESTHETIC GASES

This table estimates carbon emissions from anesthetic gases per hour.¹⁰

| SOURCE | GAS | CARBON FOOTPRINT PER HOUR (gCO ₂ e) |
|----------------------------|-------------|--|
| Set FiO ₂ + FGF | Isoflurane | 4,650 |
| | Sevoflurane | 2,580 |
| | Desflurane | 83,960 |

APPENDIX 3: ESTIMATED CARBON EMISSIONS FROM PRE-OPERATIVE TESTS

This table estimates carbon emissions per test.¹¹

| CATEGORY | TEST | CARBON FOOTPRINT PER TEST (gCO ₂ e) |
|---------------------------|--------------------------------|--|
| Baseline Laboratory Study | CBC/Diff | 116 |
| | INR/PTT | 82 |
| Electrocardiogram | Electrocardiogram patch | 6,800 |
| Chest X-ray | Chest x-ray | 800 |
| Echocardiography | Transthoracic echocardiography | 500 – 1000 |
| Cardiac Stress Testing | Stress-US | 2000 – 3000 |
| | Stress-MRI | 20,000 – 30,000 |

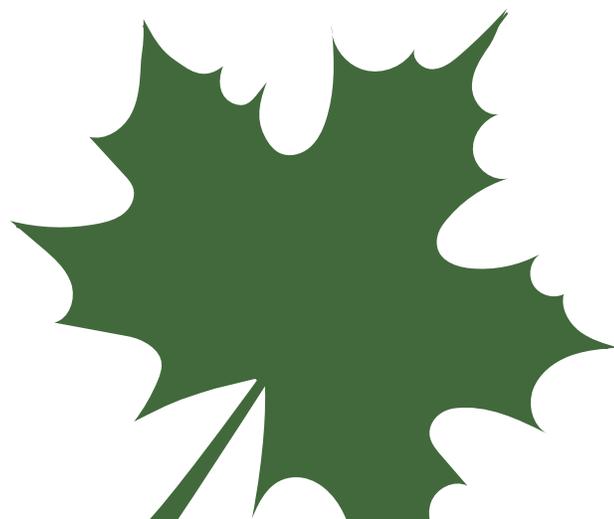
APPENDIX 4: ESTIMATED CARBON EMISSIONS PER BED DAY

This table estimates carbon emissions per bed day.¹²

| CATEGORY | HOW DATA WAS CALCULATED | CARBON FOOTPRINT PER BED DAY (gCO ₂ e) |
|---------------------------|-------------------------|---|
| Acute Care Unit | Floor area allocation | 55,400 |
| | Staff allocation | 45,500 |
| High Intensity Unit (ICU) | Floor area allocation | 120,800 |
| | Staff allocation | 137,500 |

References

1. How to improve: Model for improvement [Internet]. [Place unknown]: Institute for Healthcare Improvement; [date unknown]. [Cited 2024 Jan 18]. Available from: <https://www.ihl.org/resources/how-to-improve>
2. Langley GJ, Moen RD, Nolan KM, Nolan TW, Norman CL, Provost LP. The improvement guide: A practical approach to enhancing organizational performance. 2nd ed. San Francisco: Jossey-Bass; 2009.
3. Lenzen, M, Malik A, L, M, Fr, J, Weisz H, Pichler P-P, Suveges Moereira Chaves L, Capon A, Pencheon D. The environmental footprint of health care: a global assessment. *Lancet. Planet. Health* [Internet]. 2020 Jul [cited 2023 Dec 28];4(7):E271-E279. Available from: [https://www.thelancet.com/journals/lanph/article/PIIS2542-5196\(20\)30121-2/fulltext](https://www.thelancet.com/journals/lanph/article/PIIS2542-5196(20)30121-2/fulltext)
4. BC health quality matrix [Internet]. Vancouver: Health Quality BC; 2020. [Cited 2023 Dec 28]. Available from: <https://healthqualitybc.ca/resources/bc-health-quality-matrix>
5. Engaging people in improving quality (EPIQ) teaching toolkit [Internet]. Vancouver: Health Quality BC; [date unknown]. [Cited 2024 Jan 4] Available from: <https://healthqualitybc.ca/wp-content/uploads/TeachingToolkit-Full-revised.pdf>
6. Simms N, Devitt K, Irani C, Khan N, Meng F. Sustainable perioperative care playbook [Internet]. [Place unknown]: CASCADES; 2024 Jan 2 [cited 2024 Jan 8]. Available from: <https://cascadescanada.ca/resources/sustainable-perioperative-care-playbook/>
7. Driver diagram [Internet]. [Place unknown]: Institute for Healthcare Improvement; [date unknown]. [Cited 2024 Jan 18]. Available from: <https://www.ihl.org/resources/tools/driver-diagram>
8. Eckelman MJ, Sherman JD, MacNeill AJ. Life cycle environmental emissions and health damages from the Canadian healthcare system: An economic-environmental-epidemiological analysis. *PLoS Med* [Internet]. 2018 Jul [cited 2024 Jan 8];15(7): e1002623. Available from: <https://pubmed.ncbi.nlm.nih.gov/30063712/>
9. Drop the pre-op toolkit [Internet]. [Place unknown]: Choosing Wisely Canada; [date unknown]. [Cited 2024 Jan 18]. Available from: https://choosingwiselycanada.org/wp-content/uploads/2017/07/CWC_Pre-Op_Toolkit_v1.2_2017-07-12.pdf
10. Anesthetic gases calculator [Internet]. [Place unknown]: Association of Anesthetists; [date unknown]. [Cited 2023 Dec 22]. Available from: <https://anaesthetists.org/Home/Resources-publications/Environment/Guide-to-green-anesthesia/Anesthetic-gases-calculator>
11. Reducing unnecessary care: Estimating environmental impact [Internet]. [Place unknown]: CASCADES; [date unknown]. [Cited 2022 Dec 22]. Available from: https://view.publitas.com/5231e51e-4654-42c2-accd-b722e21f3093/perioperative_estimating-environmental-impacts-of-unnecessary-care/?_gl=1*1ldko38*_ga*Nzk00TY2NjM4LjE3MDIwNzUxMTE.*_ga_TRM5NF4JFC*MTcwMzI3NzkzNC4xMC4xLjE3MDMyNzg3OTguMC4wLjA
12. Prasad PA, Joshi D, Lighter J, Agins J, Allen R, Collins M, et al. Environmental footprint of regular and intensive inpatient care in a large US hospital. *J Life Cycle Assess* [Internet]. 2021 Dec 4 [cited 2024 Jan 8];27: 38-49. Available from: <https://doi.org/10.1007/s11367-021-01998-8>



About Health Quality BC

We are health quality leaders in BC.

For the last 15 years, Health Quality BC (HQBC) has delivered the latest knowledge from home and abroad to champion and support high-quality care for every person in BC. This system-wide impact requires creativity, innovative thinking, and evidence-informed strategies to shift culture, improve clinical practice and accelerate health care partners' improvement efforts.

We are uniquely positioned to build strong partnerships with patients and communities, care providers, health leaders, policymakers, senior executives, academics and others. These connections enable us to nurture networks, recognize the needs of BC's health care system and build capacity where it is needed the most. We provide advice and make recommendations to the health system, including the Minister of Health, on matters related to quality of care across the province.

Our work is to build a foundation of quality, and our impact means better health care for British Columbians. If you want to improve BC's health care system, visit www.healthqualitybc.ca access programs and resources that can help you start today.

Our Partners in Low-Carbon, High-Quality Care

CASCADES

CASCADES empowers the implementation of sustainable health care practices and policies in Canada. We leverage and strengthen capacity across the health care community. CASCADES is an initiative of four founding partners: the University of Toronto Collaborative Centre for Climate, Health & Sustainable Care, the Healthy Populations Institute at Dalhousie University, the Planetary Healthcare Lab at the University of British Columbia, and the Canadian Coalition for Green Health Care. In Quebec, CASCADES is a partner in the Réseau d'action pour la santé durable du Québec.

We work with and learn from many other organizations and individuals across the country. We are funded by Environment and Climate Change Canada.

Vancouver Coastal Health

Embedding planetary health principles in all that we do.

Vancouver Coastal Health (VCH) is committed to embedding planetary health principles of environmental sustainability and climate resilience in all that we do, from changing business practices, to managing our facilities and the medical supplies we use, to moving to low-carbon care delivery. Bringing together stakeholders and teams from sustainable clinical services, Public Health, and energy and environmental sustainability, we are facing these challenges head on and are committed to delivering resilient and environmentally sustainable care for the health of people, places and planet.





**LOW CARBON
HIGH QUALITY CARE**

Last Updated: January 2024

