

CLIMATE CONSCIOUS INHALER PRACTICES IN INPATIENT CARE

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

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of the Government of Canada.

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Canada

CASCADES

island health

The Critical Air Project





NAVIGATION



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INTRODUCTION

The Playbook provides background information and resources to guide more environmentally sustainable inhaler practices in inpatient settings.

The content of this playbook, including its associated resources, has been developed by the Critical Air Project (CAP) at the Royal Jubilee Hospital, part of Island Health in Victoria, British Columbia.

The Critical Air Project, which has been led by Dr. Valeria Stoyanova and Dr. Celia Culley, is a climate-conscious inhaler initiative aimed at decreasing Island Health's inhaler-related carbon footprint through changes in health policy, operational changes and a widespread educational campaign. The project, which is ongoing, was initiated in April 2022 with support from CASCADES.

Royal Jubilee hospital is part of Island Health – a healthcare authority providing care and support services to more than 860,000 people on the West Coast of British Columbia across 145 sites, including 11 hospitals providing acute inpatient care. (1, 2) Each month, acute care centres at Island Health dispense ~2930 inhalers which corresponds to ~50 tCO₂e, or the equivalent of driving around the circumference of the earth 4.5x in a standard gasoline powered vehicle. (3)

Island Health is committed to operational excellence and providing high quality care through climate change response. The organization's strategic framework includes active support of environmental sustainability best practices which include climate-conscious prescribing to minimize carbon footprint. (4)

Similar initiatives aimed at climate conscious prescribing are underway across Canada including Sunnybrook Hospital and The Ottawa Hospital in Ontario.

Suggested citation

Stoyanova V, Culley C. Climate Conscious Inhaler Practices in Inpatient Care version 1.1 (2024) [Internet]. CASCADES (Creating a Sustainable Canadian Health System in a Climate Crisis). [Cited DATE]. Available from <https://cascadescanada.ca/resources/climate-conscious-inhaler-practices-in-inpatient-care-playbook/>





PLAYBOOK STRUCTURE



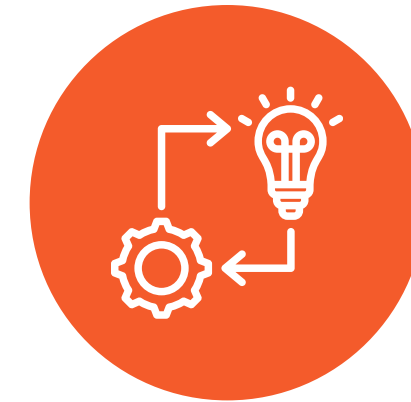
WHY

The Case for Change



WHAT

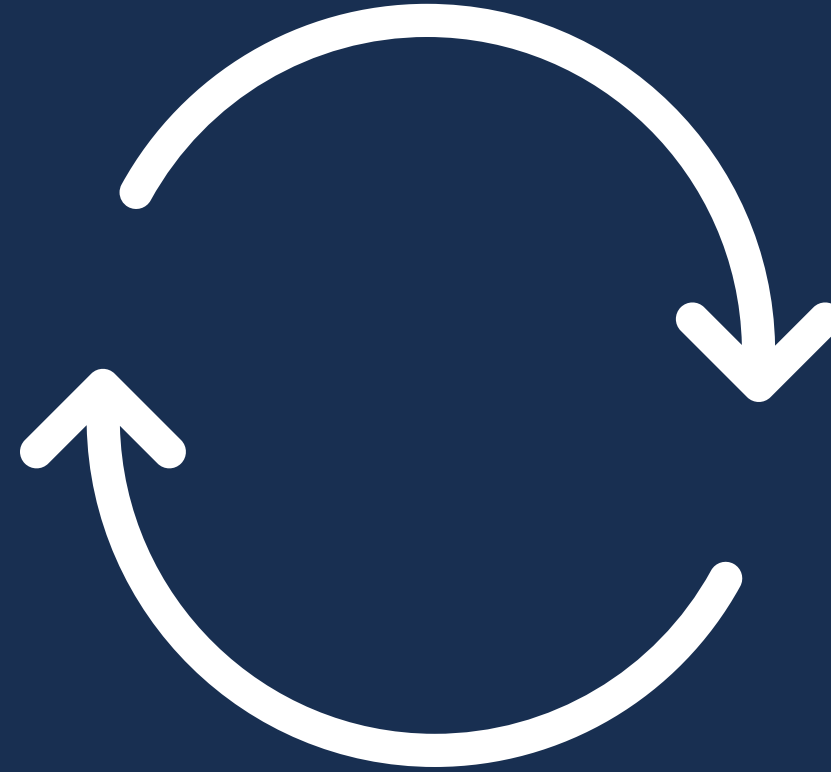
The Tools for Change



HOW

Strategy and Partnerships





WHY

The Case for Change



- 1 Inhaler Impacts on Climate
- 2 Inhalers in the Inpatient Setting
- 3 Identifying Action Opportunities





Inhaler Impacts on Climate



Climate change is the single greatest threat of the 21st century. (5) It is impacting the health of Canadians as part of an overall global trend towards adverse health outcomes. (6) The Canadian healthcare system accounts for 4.6% of Canada's total greenhouse gas (GHG) emissions. (7) Prescription and non-prescription drugs are the single largest carbon expenditure category, accounting for 25% of healthcare-related carbon emissions in Canada. (7)

Metered-dose inhalers (MDIs) are of particular concern. Studies from the UK show that 3.5% of the English National Health Service's (NHS) carbon footprint relates exclusively to MDI use. (8) Pressurized MDIs contain a hydrofluoroalkane (HFA) propellant, which provides the force to expel the medication from the cannister with each actuation. HFAs are potent greenhouse gases, the most common of which (HFA134a) is 1,300 times more potent than CO₂. (9) While each individual actuation is negligible in terms of GHG release, the cumulative effect is staggering. On a global level, 18 million MDIs are prescribed yearly releasing nearly 13 billion tons of CO₂ equivalents. (10)

For background information on the environmental impact of inhalers, please consult the [CASCADES primer](#) and [infographic](#)





INITIATIVES TO REDUCE EMISSIONS

The GHG impact of inhalers has not gone unnoticed.

The English NHS has targeted initiatives to reduce inhaler-related GHG emissions in primary care and hospital settings. (11) These include education campaigns for patients and prescribers, promoting a change to propellant-free inhalers where appropriate and integrating pharmacists into a supportive role to increase uptake in the community. (11)

In Canada, **CASCADES** has collaborated with primary care leaders from across the country to develop and refine resources to support change in that setting. (12)



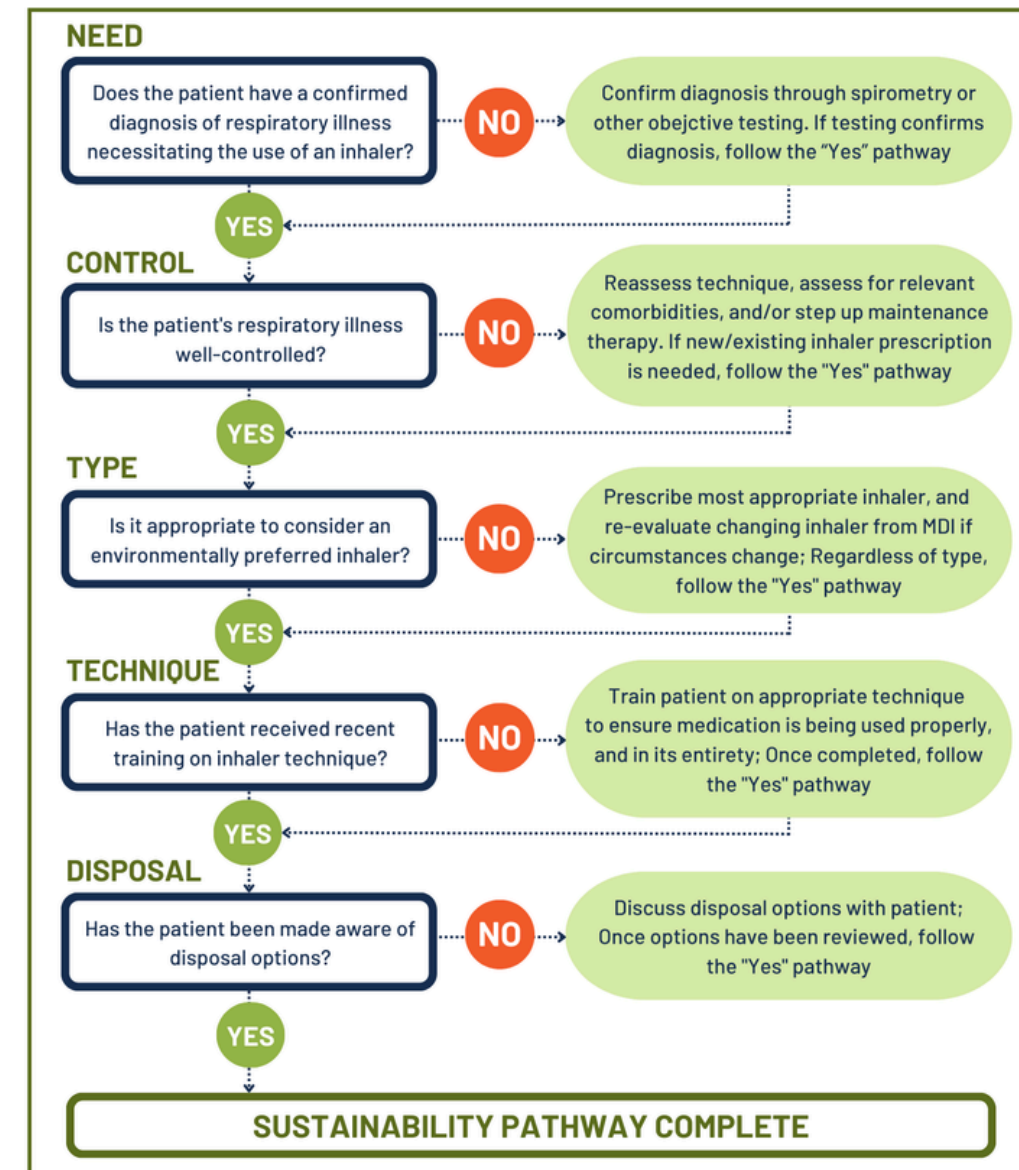
Read the full **Climate Conscious Inhaler Practices in Outpatient Care Playbook** to explore more opportunities

While MDIs are common in primary care, they are also ubiquitous in inpatient care.

Despite their frequent use in hospital, little is known about the processes and methods through which inhaler related GHG emissions in the inpatient setting can be appropriately reduced.

Primary care providers have identified 4 key steps in **climate conscious inhaler prescribing** (12) :

Climate Conscious Inhaler Prescribing Sustainability Pathway



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Inhalers in the Inpatient Setting

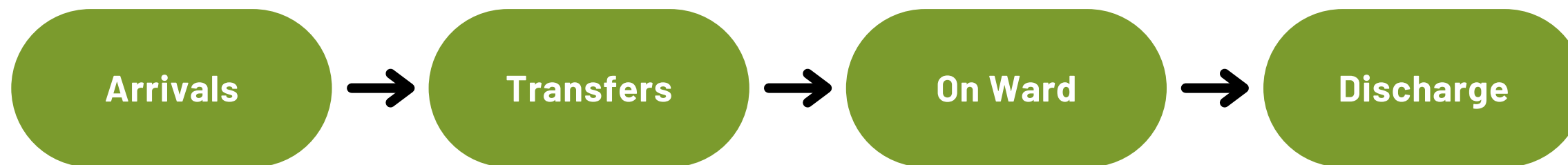


UNDERSTANDING THE INHALER JOURNEY IN THE INPATIENT SETTING

Inhaler practices in inpatient settings are not well documented.

CONTEXT:

- The Critical Air Project aimed to assess the pattern of inhaler use in the hospital
- The team tracked inhaler use across **4 stages of the patient journey** (see [How](#) section)



- The Critical Air Project team identified **3 areas in need of improvement:**

- 1 Challenges with **transitions in care** that led to significant inhaler **waste**
- 2 Opportunities to integrate **climate conscious inhaler prescribing** practices at several steps of the patient journey
- 3 Addressing **policy barriers** to operational and clinical improvement

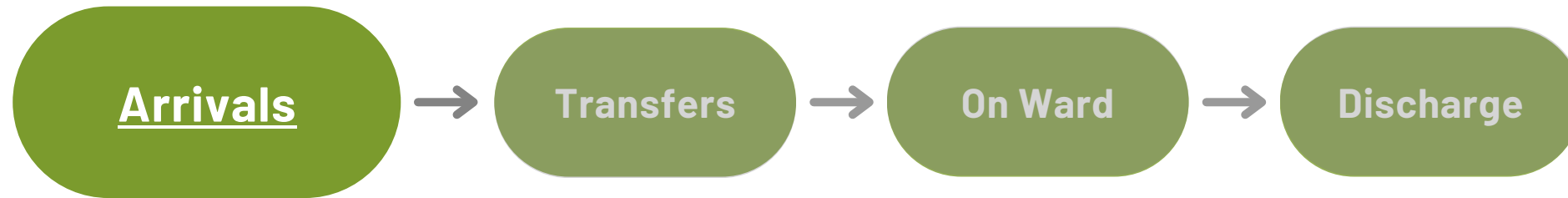




Identifying Action Opportunities



INPATIENT INHALER JOURNEY: ARRIVAL



When patients **arrive** at the hospital

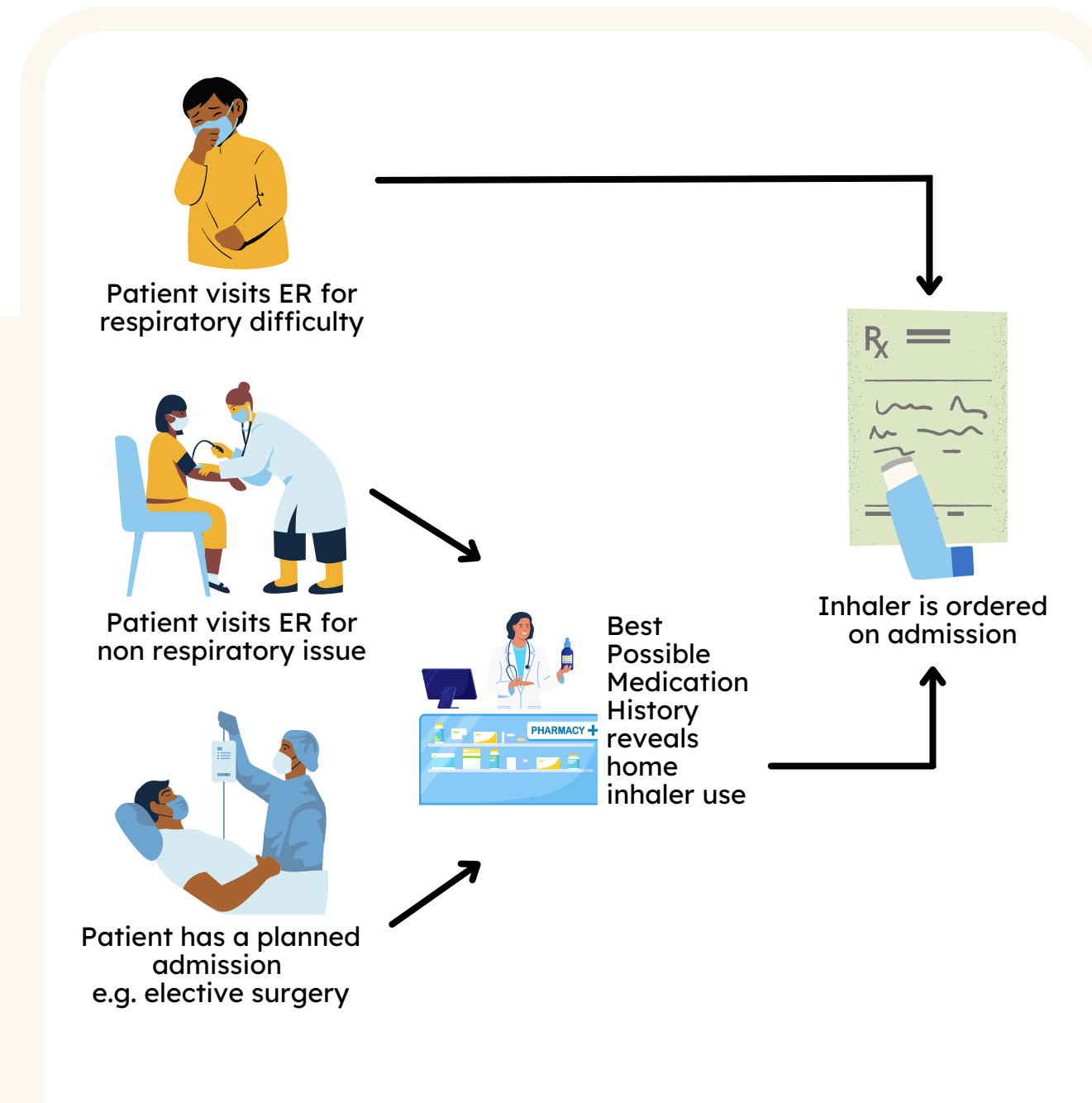
Inhaler waste occurs on arrival and during patient admission.

- Patients **do not often bring** their inhalers with them to the hospital, even for planned admissions
 - For patients who rarely use their inhalers, it may not be medically necessary to dispense a new inhaler upon admission
- When patients **do bring their inhalers**, they are often prescribed new inhalers regardless
 - Hospital-dispensed inhalers can be different from a patient’s usual device due to hospital formulary and policy, increasing the risk of ineffective technique

CONTEXT: How patients are prescribed inhalers on admission

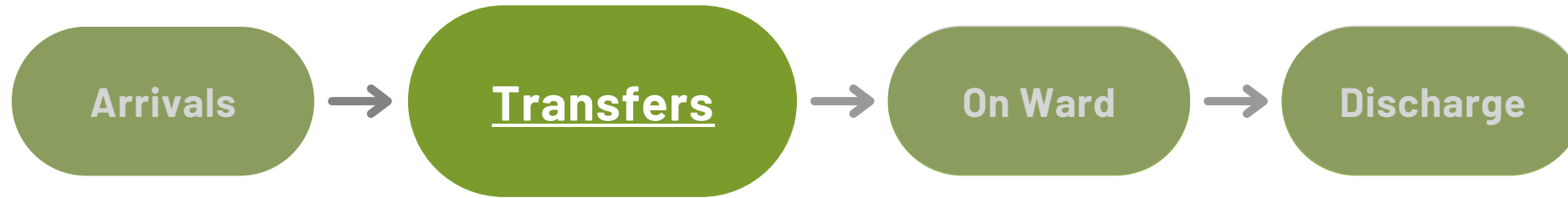
The Critical Air Project team found that:

1. Patients who present to the emergency department with respiratory difficulties have inhalers ordered as deemed appropriate by their treating physician.
2. All patients admitted to hospital should have a Best Possible Medication History (BPMH) completed by a care provider. Patients who use an inhaler at home will usually have their home inhalers re-prescribed in hospital as part of medication reconciliation (this applies to patients who present to the emergency department for an unrelated issue and those who present for a planned admission such as elective surgery).





INPATIENT INHALER JOURNEY: TRANSFERS



When patients are **transferred** around the hospital

Inhaler waste occurs during patient transfer.

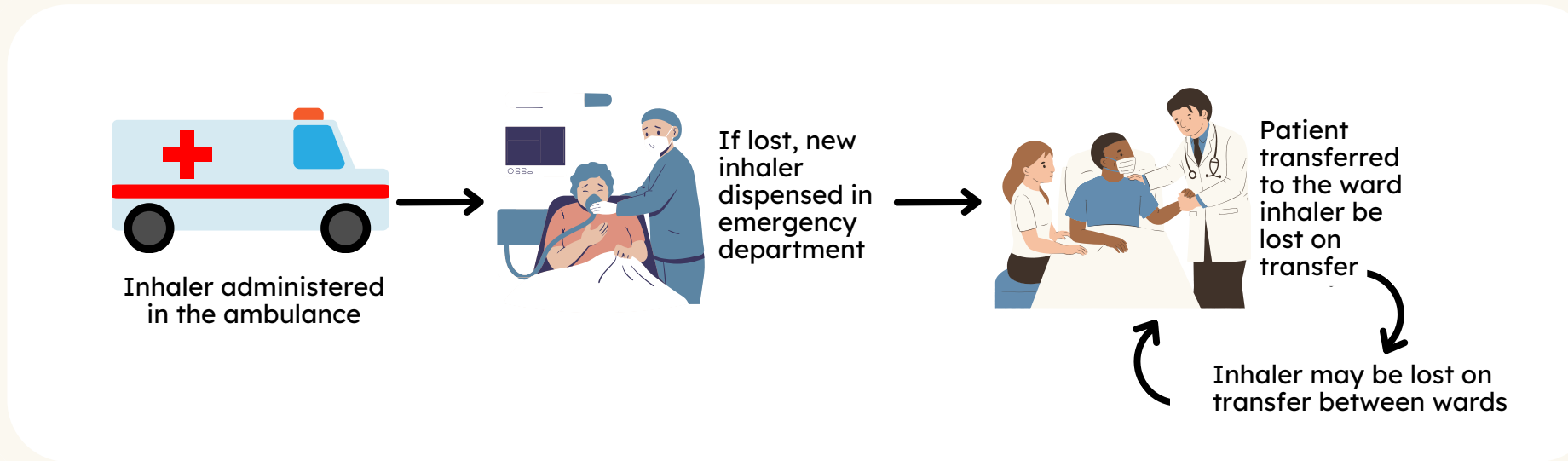
- **From ambulance to hospital:** When a patient presents in respiratory distress, an inhaler is often administered in the ambulance. This inhaler seldom makes it to the emergency department but is discarded on the patient’s arrival
- **From the emergency department to the ward:** Up to 1/5 of inhalers in acute hospitals are dispensed unnecessarily. (13) Inhalers dispensed in the emergency department can be lost during the transfer to the ward with the patient
- From ward to ward: Further inhaler wastage can occur when inhalers are not transferred with patients who move **From ward to ward:** other



CONTEXT:

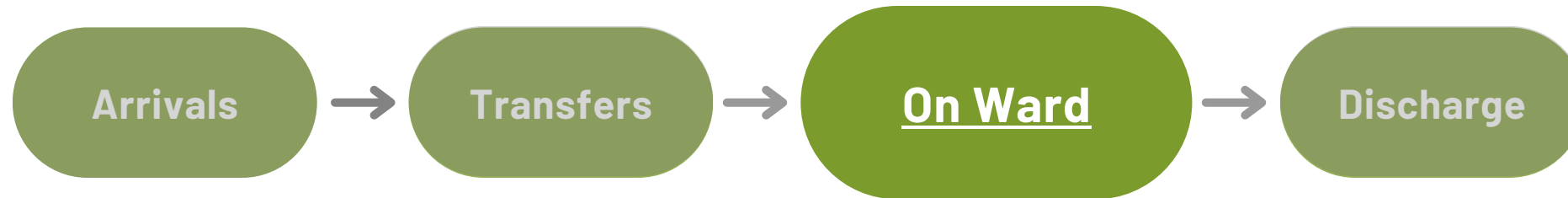
How inhalers are administered during patient transfer

The Critical Air Project team identified many points of inhaler “attrition” as patients and inhalers moved around the hospital





INPATIENT INHALER JOURNEY: ON WARD



When patients are **on the ward**

Inhaler waste occurs when patients are on the ward

- **When the inhaler’s tamper seal is broken unnecessarily.** Inhalers sent to the ward are potentially removed from the sealed bag they are dispensed, in order to be placed in the medication cart, thus breaking the tamper seal. Even if they never left the medication cart or were not used, they are considered contaminated and are discarded.
- **When an inhaler is not correctly labeled.** Patients may have multiple identical inhaler if their initially dispensed inhaler does not have a correct label (inhalers dispensed from wardstock do not automatically get a patient-specific label).
- **When a correctly labeled inhaler cannot be located.** Patients may have multiple identical inhalers at the bedside because their inhaler cannot be located when needed.
- **When duplicate dispensing occurs.** The pharmacy dispensary may not be able to determine whether an inhaler was taken from the night cupboard.
- **When non-urgent medicines are stored on the ward.** Storing maintenance inhalers unnecessarily in wardstock (i.e., medications stored in direct patient care areas for prompt access by front-line health care) leads to significant waste due to suboptimally labeled inhalers, loss, and duplicate dispenses.
- **When there are minor order changes.** The previous inhaler is discarded and a new inhaler is obtained even for minor order changes, such as dose changes (e.g., , fluticasone 125mg BID to fluticasone 250mg BID) or simple changes in instruction (e.g., from “regularly scheduled” to “as needed”) due to scope of practice and labelling requirements.
- **When unused inhalers are not returned to the pharmacy.** Unused inhalers (with intact tamper seals) can be returned to pharmacy for re-dispensing

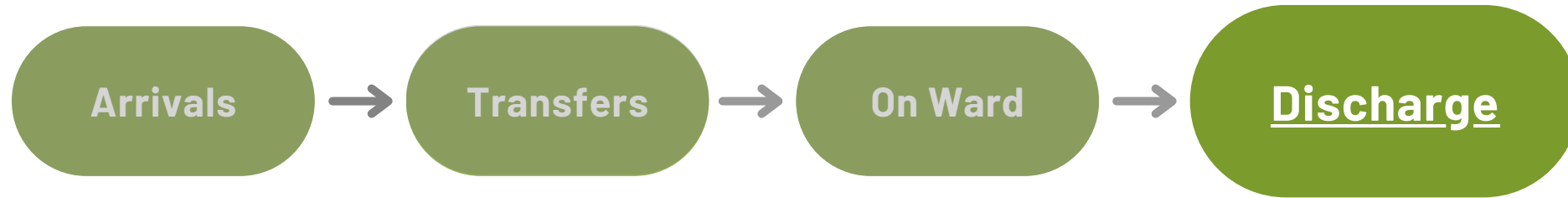
OPPORTUNITIES FOR CLIMATE CONSCIOUS INHALER PRESCRIBING PRACTICES

- **Type.** Some patients may be candidates for lower carbon inhalers. NB. Many patients admitted to hospital are not candidates for change, due to respiratory health issues
- **Technique.** Patients can be supported to use their device appropriately
- **Disposal.** Discontinued devices can be returned to the pharmacy where they will be discarded appropriately (i.e., not in general or sharps waste)





INPATIENT INHALER JOURNEY: DISCHARGE



When patients are **discharged**

Inhaler waste occurs when patients are discharged.

- There is limited guidance and a lack of support for front-line health care providers to safely provide patients with hospital-dispense inhalers upon discharge. This results in waste of usable medication that cannot be repurposed for another patient
 - Even if a patient is prescribed an inhaler at discharge that is *identical* to the one used in hospital, the patient would not necessarily be provided with the hospital-dispensed device
 - Inhalers must be appropriately labeled if they are to be taken home by the patient

CONTEXT:

What happens to inhalers when patients are discharged?

The Critical Air Project team found that inhalers with multiple doses left were being discarded when patients left the hospital

Patient discharged; inhaler typically discarded and outpatient prescription written



The gold standard for safe inhaler disposal is incineration to neutralize the propellant.

OPPORTUNITIES FOR CLIMATE CONSCIOUS INHALER PRESCRIBING PRACTICES

- Discharge letters can invite the patient’s outpatient provider to consider:
 - **Need.** Confirming diagnosis
 - **Type.** Offering lower carbon inhaler options
 - **Technique.** Ensuring appropriate technique
 - **Disposal.** Facilitating appropriate disposal
- **Disposal.** Inhalers left behind at discharge can be returned to pharmacy where they will be discarded appropriately (i.e., not in general or sharps waste)





Action Opportunities

Many climate-conscious inhaler practice and policy change initiatives are possible in inpatient hospital settings.

The **Critical Air Project** identified 10 potential avenues for change and selected 6 for phase 1 action

- In line with “the 3 Rs” of waste management, the team opted to focus upstream on reducing use. Thus, issues of reuse and disposal, though critical, were left for a later phase of work

To make these upstream changes, the team focused on:

- **Operational changes** – emphasizing low hanging fruit, with high reward
- **Policy changes** – with significant effort required, but far-reaching change possible
- An **Educational campaign** – to increase awareness and engagement with a wide range of clinical and operational changes, and build momentum for policy change

ADDITIONAL OPERATIONAL AND POLICY CHANGES THAT THE CRITICAL AIR PROJECT TEAM CONSIDERED BUT HAVE NOT YET TRIALED INCLUDE:

- The coordination of safe inhaler disposal practices
- Strategies to support patients to bring their own inhalers from home during brief, preplanned elective admissions such as joint replacement surgeries
- Considering a pharmacy-led dispensing strategy to avoid sending duplicate inhalers to the hospital ward
- Considering a respiratory educator to provide inpatient inhaler teaching
- Strategies to minimize inhaler loss on hospital transfers





WHAT

The Tools for Change

- 1 Action Area 1: Operational Changes
- 2 Action Area 2: Policy Changes
- 3 Action Area 3: Educational Campaign





Overview of Action Areas



Operational Changes	Policy Changes	Educational Campaign
<p>Goal: Resources designed to support changes in day-to-day activities and processes within the organization. Even seemingly small changes in how things are done can result in meaningful, large-scale reductions in inhaler waste and associated greenhouse gas emissions.</p> <p>Change strategies:</p> <ul style="list-style-type: none"> • Clinical Order Set Redesign • Prioritizing Inhaler Wardstock • Tamper Sealing the Inhaler Cap 	<p>Goal: Resources designed to address macro or systemic-level issues that extend beyond an individual hospital and beyond a single tool. These are long-term strategies that require concerted effort from many key partners coming together to advocate for effective change.</p> <p>Change strategies:</p> <ul style="list-style-type: none"> • Low-Volume versus High-Volume HFA Inhaler Procurement • Hospital Formulary • Multidose Medication Discharge Policy 	<p>Goal: Resources designed to engage providers across the care pathway, to enable operational and clinical change and build momentum for policy change. Providing accessible, tailored education to relevant key partners is a critical adjunct to any intervention.</p> <p>Change strategies:</p> <ul style="list-style-type: none"> • Inpatient provider-specific information • Outpatient provider-specific information • Patient information





Action Area 1: Operational Changes



Policy Changes

Goal:

Resources designed to address macro or systemic-level issues that extend beyond an individual hospital and beyond a single tool. These are long-term strategies that require concerted effort from many key partners coming together to advocate for effective change.

Change Idea	Resource
Clinical Order Set Redesign	Step-by-step guide Access resource
	Worked example: <ul style="list-style-type: none"> Clinical Order Set Before and After Access resource
Prioritizing Inhaler Wardstock	Step-by-step guide Access resource
	Worked example from Fraser Health: <ul style="list-style-type: none"> Staff engagement memo Project briefing slide deck Access resource
Tamper Sealing the Inhaler Cap	Step-by-step guide Access resource
	Worked example: <ul style="list-style-type: none"> Tamper seal briefing note Access resource





CLINICAL ORDER SET REDESIGN



GOAL

Adapt standardized order sets to highlight opportunities for low carbon inhaler prescribing, where clinically appropriate and acceptable to the patient

CLINICAL ORDER SETS FOR DECISION SUPPORT

- Standardized order sets are mainstream clinical decision support tools in many hospitals.
- They facilitate appropriate prescribing by providing a “pre-defined set of applicable drugs and recommended dosages, based off of evidence-based guidelines for a specific disease area”. (14)
- Clinical order sets are typically curated to include best practice alternatives, (14) such as narrowing the available antibiotic options for a given infection through an antimicrobial stewardship lens.

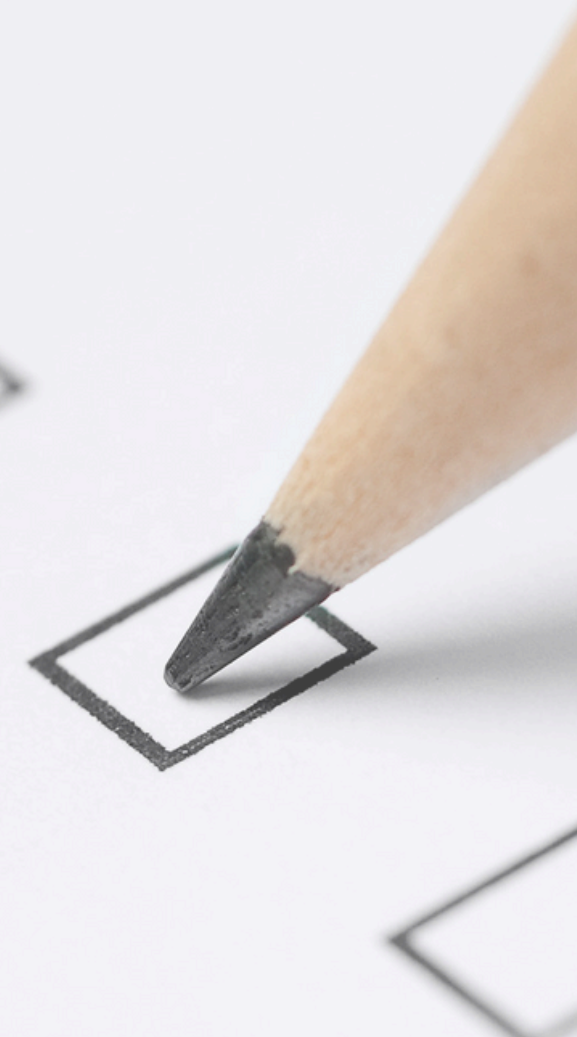
ADAPTING ORDER SETS FOR CLIMATE STEWARDSHIP

- Standardized order sets can include a climate stewardship component. Akin to antimicrobial stewardship, clinical order sets can highlight the least harmful environmental alternatives - leaving the prescribing decision to the clinician.

Keep in mind: Lower carbon alternatives may not be appropriate for every patient. The patient’s most responsible inpatient prescriber is best placed to judge whether a lower carbon alternative is appropriate, in consultation with the patient.

Resources:

- [Step-by-Step Guide](#)
- [Worked example: Clinical Order Set Before and After](#)





PRIORITIZING INHALER WARDSTOCK

GOAL

Review wardstock contents and consider the removal of maintenance inhalers

WHAT IS WARDSTOCK?

- Medications stored in a patient care area without being labelled for a particular patient to use. (15)
They are typically kept on medical wards in automated dispensing cabinets (eg. Accudose, Omnicell) or low-tech cabinets and bins.

WHY HAVE WARDSTOCK?

- Some medications need to be immediately accessible on an urgent basis, without waiting for dispensing from pharmacy, or for emergent use overnight when there is no overnight staff in the pharmacy, such as a short-acting bronchodilator.

WHAT MEDICATIONS ARE NOT NEEDED IN WARDSTOCK?

- Medicines that are not needed urgently need not be stored in Wardstock, and if it is generally safe to wait until daytime hours to have a medication sent from pharmacy.
- For example, maintenance inhalers such as inhaled corticosteroids, long-acting bronchodilators, long-acting muscarinic and combination inhalers are seldom needed on an emergency basis (except for budesonide/formoterol). (13)

WHY PRIORITIZE WARDSTOCK?

- Storing maintenance inhalers in wardstock is associated with significant inhaler waste, and high financial and carbon costs. (16, 17)
- A Canadian study of inpatient salmeterol-fluticasone identified key contributors to inhaler waste, with an annual loss of over \$176,000 of useable medication. (16)



Resources:

- Step-by-step guide
- Worked example from Fraser Health:
 - Staff engagement memo
 - Project briefing slide deck





TAMPER SEALING THE INHALER CAP

GOAL

Identify a location for the tamper seal that results in the least amount of waste possible, particularly for "as-needed" inhalers that may not be required for a patient and thus avoid unintentional waste.

WHAT IS TAMPER SEALING?

- Medicines are dispensed with a tamper seal, for medication safety and security
 - When properly used and inspected seals indicate if something has been opened, providing assurance that a critical item has not been violated or taken.
 - As well, seals can identify or verify specific items through unique seal design, so that a quick visual check can identify what is inside.

UNINTENDED CONSEQUENCES OF TAMPER SEALING

- While tamper sealing medicines is important, there are different ways to do this, and some approaches may lead to unintended waste.
- Inhalers returned to pharmacy with a broken tamper seal are considered contaminated and are discarded – even if they were never used – increasing financial and carbon costs.

CONSIDER ALTERNATE TAMPER SEALING STRATEGIES

- Tamper seal the inhaler cap rather than the plastic bag used to transport the device.



Resources:

- [Step-by-step guide](#)
- [Worked example: Tamper seal briefing note](#)





Action Area 2: Policy Changes



Policy Changes	Change Idea	Resource
<p>Goal: Resources designed to address macro or systemic-level issues that extend beyond an individual hospital and beyond a single tool. These are long-term strategies that require concerted effort from many key partners coming together to advocate for effective change.</p>	<p>Low-Volume versus High-Volume HFA Inhaler Procurement</p>	<p>Step-by-step guide</p> <p>Access resource</p>
		<p>Worked example:</p> <ul style="list-style-type: none"> • Salbutamol briefing note <p>Access resource</p>
	<p>Hospital Formulary</p>	<p>Step-by-step guide</p> <p>Access resource</p>
		<p>Worked example:</p> <ul style="list-style-type: none"> • Terbutaline formulary request assessment <p>Access resource</p>
	<p>Multidose Medication Discharge Policy</p>	<p>Step-by-step guide</p> <p>Access resource</p>
		<p>Literature summary</p> <p>Access resource</p>
<p>Worked Example:</p> <ul style="list-style-type: none"> • Policy vs. procedure chart <p>Access resource</p>		





HIGH VS. LOW VOLUME HFA INHALER PROCUREMENT

GOAL

Procure lower carbon HFA inhalers by preferentially valuing low volume HFA inhalers and weighting the climate impact when awarding inhaler contracts.

WHAT IS THE DIFFERENCE BETWEEN HIGH AND LOW VOLUME MDIS?

- Total inhaler GHG emissions are a function of the type of HFA (HFA-134a vs HFA-227ea) & the volume of HFA.
- Both low and high-volume HFA inhalers contain the same active ingredient and the same delivery mechanism. They are clinically equivalent and interchangeable.
- There can be significant variability in the carbon footprint of different MDIs, even within the same pharmacologic category.
 - A low-volume HFA salbutamol MDI has the GHG equivalent of driving 38.8km in a standard gasoline powered vehicle (9,720 gCO₂e).
 - A high-volume HFA salbutamol MDI has the GHG equivalent of driving 112.6km in a standard gasoline powered vehicle (28,200 gCO₂e). (18)

WHICH INHALERS ARE PROCURED?

- 10,000 MDIs may be used in inpatient care annually, depending on the size and catchment area of the hospital or health authority. (8)
 - This includes short-acting beta-agonists, short-acting muscarinic antagonists, inhaled corticosteroids, and combination products.



Resources:

- [Step-by-step guide](#)
- [Worked example - Salbutamol briefing note](#)





HOSPITAL FORMULARY

GOAL

Implement policy to ensure that a low carbon option is available in each pharmacologic category on the hospital/ provincial formulary.

There are over 35 different inhaler products commercially available in Canada. (18)
Only a subset of them are available in inpatient settings (i.e., on the hospital formulary).

LOWER CARBON OPTIONS ARE NOT ALWAYS AVAILABLE IN RELEVANT PHARMACOLOGIC CATEGORIES

- Important considerations for inpatient coverage include:
 - Carbon footprint of each inhaler.
 - Cost of each inhaler in the inpatient and outpatient setting.
 - Coverage of each inhaler by provincial plans.

HOSPITAL FORMULARIES DIFFER ACROSS CANADA

- In some provinces, such as Ontario, the inpatient formulary is developed by individual hospitals or groups of them, at the discretion of the organization.
- In some provinces, such as BC, the inhaler formulary is provincial, meaning that every hospital in the province has access to the same inhalers.
- Hospital-specific or Province-wide formularies create different challenges and opportunities.
- Changing the formulary at an individual hospital requires input from a limited number of key partners, so is easier to accomplish but has limited impact.
- Changing the formulary on a provincial level requires input from key partners across many organizations but has broader impact.



Resources:

- Step-by-step guide
- Worked example - Terbutaline formulary request assessment





MULTIDOSE MEDICATION DISCHARGE POLICY

GOAL

Implement policy to permit multidose medication products dispensed to admitted patients to be sent home with the patient at discharge.

Patients with asthma and COPD are prescribed inhalers in hospital, whether they are admitted with an acute exacerbation of their underlying lung disease or for an unrelated indication.

At discharge, these inhalers are discarded though there are often multiple doses remaining, resulting in waste of otherwise useable medication, costs to healthcare system and patients, as well as excess GHG emissions.

- The quantity of wasted doses varies with inhaler type, from 76% of fluticasone-salmeterol doses wasted (8) to 98% of salbutamol doses wasted. (19)

In many settings, it will be necessary to change both organizational policy and operational procedure to permit previously dispensed multidose medication products to be sent home with patients at hospital discharge.

Such a policy is relevant to multidose medication products other than inhalers, including ophthalmic solutions, nitroglycerin sprays, creams, etc.

Resources:

- Step-by-step guide
- Literature Summary
- Worked Example: Policy vs. procedure chart





Action Area 3: Educational Campaign



Educational Campaign

Goal:
Resources designed to engage providers across the care pathway, to enable operational and clinical change and build momentum for policy change.
Providing accessible, tailored education to relevant key partners is a critical adjunct to any intervention.

Change Idea	Resource
Inpatient Provider-Specific Information	Inpatient Pharmacists poster Access resource
	Inpatient Pharmacy Technicians poster Access resource
	Nurses poster Access resource
	Respiratory Therapists poster Access resource
	Physician and Trainee infographic Access resource
	Critical Air Project Webinar Access resource
	Trainee Video Access resource
Outpatient Provider-Specific Information	Outpatient Pharmacy discharge letter Access resource
	Primary Care Provider discharge letter Access resource
Patient Information	Infographic Access resource





INPATIENT PROVIDER-SPECIFIC INFORMATION

PHARMACISTS AND PHARMACY TECHNICIANS

Pharmacists and pharmacy technicians are key partners for climate conscious care

- In addition to their clinical scopes, pharmacy professionals routinely develop operational procedures, and inform organizational and public policy.
- As well, pharmacy professionals regularly liaise with community pharmacies.

CONTEXT: Engaging Pharmacy Professionals

The Critical Air Project Team:

- Engaged pharmacy professionals by presenting at a local pharmacy conference about inhalers and at clinical learning sessions (“Clinical Chit Chats”).
- Engaged in multiple rounds of key partner engagement to create two separate infographics targeting inpatient pharmacists and inpatient pharmacy technicians.
- Posted Infographics in high traffic areas such as pharmacist work stations, the dispensary and staff rooms.
- Each features 3-4 brief, rapidly implementable change ideas within scope of practice.

PHARMACISTS FIGHT CLIMATE CHANGE

Each metered-dose inhaler (MDI) – carbon footprint equivalent to driving up to **139km** by car (1)

Island Health uses 2,930 inhalers monthly – carbon footprint of driving around the circumference of the earth **4.5 times** (2)

Inhaler loss/waste ↑↑ carbon footprint without contributing to patient care.

Up to **80%** of patients have 1+ identical inhalers dispensed per admission (3)

Up to **98%** of doses per inhaler are wasted (4)

WHAT I CAN DO TODAY

- LABEL INHALERS TAKEN OUT OF WARDSTOCK**
As part of discharge planning, label inhalers for continued use as outpatient.
- REVIEW INHALER TECHNIQUE WITH YOUR PATIENT**
To help them get the most out of their medication – whether this is a new or existing inhaler!
www.iung.ca/eng/health/how-use-your-inhaler/
- ASSESS APPROPRIATENESS OF SWITCHING TO DPI**
Discuss with the care team and patient for shared decision making
- FOR PLANNED SHORT ADMISSIONS**
Ask the patient to bring in their own inhalers (formulary and non formulary) to reduce waste

The Critical Air Project

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3. Sukawa S, Wilson D, Lee J, Finkel DC, Schiff TH. Inhaler Use in Hospitalized Patients with Chronic Obstructive Pulmonary Disease or Asthma: Assessment of Waste Dates. Hosp Pharm. 2019;54(5):289-293.

4. Aung ESY, McDougall KC, Allegretto-Serch EN, Tjelen AM. Hidden Costs of Multiple-Dose Products: Quantifying (pre)expirator Inhaler Wastage in the Hospital Setting. Can J Hosp Pharm. 2021;74(2):117-124.

WANT TO LEARN MORE? WANT TO GET INVOLVED?
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PHARMACY TECHNICIANS FIGHT CLIMATE CHANGE

Each metered-dose inhaler (MDI) – carbon footprint equivalent to driving up to **139km** by car (1)

Island Health uses 2,930 inhalers monthly – carbon footprint of driving around the circumference of the earth **4.5 times** (2)

Inhaler loss/waste significantly increases carbon footprint without adding to patient care.

Up to **80%** of patients have 1+ identical inhalers dispensed per admission (3)

Up to **98%** of doses per inhaler are wasted (4)

WHAT I CAN DO TODAY

- If the larger seal is intact, disinfect inhaler with wipe as per infection control recommendations and return to inventory/stock
- During BPMH, write inhaler compliance comments (eg frequency, last use) plus any other information in the supplemental note. This will help the prescriber or pharmacist decide whether it is needed while in hospital.
- Encourage patients and providers to return used inhalers to pharmacy for safe disposal

The Critical Air Project

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INPATIENT PROVIDER-SPECIFIC INFORMATION

NURSES

Nurses play a critical role in ensuring climate conscious inpatient care:

- As nurse educators, ensuring that the healthcare team has high quality information.
- As patient educators, supporting appropriate inhaler technique and helping patients to consider their options.
- As frontline providers, ensuring patient access to their medicines and appropriate disposal.

CONTEXT: Engaging Nurses

The Critical Air Project Team:

- Engaged nurses in planning for change ideas, through email communication, and in-person learning sessions.
- Recognized the large numbers and high turnover of nursing staff on different units.
- Focused efforts on educating nurse educators about the environmental impact of inhalers and the various practice change ideas.
- Created an infographic for distribution to nursing staff in high traffic nursing areas focusing on three rapidly implementable climate-conscious inhaler practices.
 - Inhaler labelling
 - Inhaler technique
 - Inhaler disposal

NURSES FIGHT CLIMATE CHANGE ONE SHIFT AT A TIME



Each metered-dose inhaler (MDI) = carbon footprint equivalent to driving up to **139km** by car (1)

Island Health uses 2,930 inhalers monthly = carbon footprint of driving around the circumference of the earth **4.5 times** (2)

Inhaler loss/waste ↑↑ carbon footprint without contributing to patient care.

Up to **80%** of patients have 1+ identical inhalers dispensed per admission (3)

Up to **98%** of doses per inhaler are wasted (4)



WHAT I CAN DO TODAY



Label each inhaler taken out of wardstock so it can be reunited with the patient if lost.



Learn technique for different inhaler types to help your patients get the most out of their medications

www.lung.ca/lung-health/how-use-your-inhaler



Return ALL inhaler to pharmacy for repurposing (if unused) or safe disposal (if used)

The Critical Air Project

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INPATIENT PROVIDER-SPECIFIC INFORMATION



RESPIRATORY THERAPISTS

Respiratory therapists play a critical role in ensuring climate conscious inpatient care:

- Supporting appropriate inhaler technique.
- Reducing waste through proper inhaler management, including labeling, patient transfers and disposal.

CONTEXT: Engaging Respiratory Therapists (RT)

The Critical Air Project Team:

- Recognized that inpatient respiratory therapists predominantly manage patients in acute respiratory distress.
- Key partner engagement revealed that they have concerns about the frequency and quality of inpatient inhaler teaching, but that redirecting limited acute RT resources to inhaler teaching isn't possible.
- Thus, the team created an infographic highlighting three rapidly implementable changes within scope of practice.
- Posted Infographics in high traffic areas such as break rooms and the spirometry unit.

RESPIRATORY THERAPISTS FIGHT CLIMATE CHANGE

Each metered-dose inhaler (MDI) = carbon footprint equivalent to driving up to **139km** by car (1)

Island Health uses 2,930 inhalers monthly = carbon footprint of driving around the circumference of the earth **4.5 times** (2)

Inhaler loss/waste **↑↑** carbon footprint without contributing to patient care.

Up to **80%** of patients have 1+ identical inhalers dispensed per admission (3)

Up to **98%** of doses per inhaler are wasted (4)

WHAT I CAN DO TODAY

- Check if the inhaler you're using is labelled - this will make it easier to reunite with the patient if lost
- Don't leave inhaler behind during patient transfers (yes! even the ones sitting on top of the vent!)
- Return unused inhaler to pharmacy for repurposing
- Return used inhaler to pharmacy for safe disposal

The Critical Air Project

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INPATIENT PROVIDER-SPECIFIC INFORMATION



PHYSICIANS

Engaging inpatient physicians can help to inform both inpatient and outpatient prescribing practice:

- Prescriptions written at hospital discharge are often continued in the outpatient setting.
- Even where inpatient prescriptions are not changed, outpatient providers can be encouraged to consider appropriate diagnosis, technique, and inhaler options.
- As patient educators, supporting appropriate inhaler technique and helping patients to consider their options.
- As frontline providers, ensuring patient access to their medicines and appropriate disposal.

TRAINEES

Equip future health professionals

- Many healthcare organizations help train health professionals, including medical students and residents, pharmacy and nursing trainees and more.
- Sustainability can be integrated into trainee placements, to build capacity in the future health workforce.

CONTEXT:

Engaging Physicians & Equipping Trainees

To engage physicians, the Critical Air Project Team:

- Developed a webinar detailing some of the efforts put in place.
- Presented at grand rounds and division meetings
- Created a letter to be completed and sent to the primary care provider at hospital discharge.

To equip trainees, the Critical Air Project Team:

- Created a brief ~5min orientation video to be presented at the end of the mandatory CTU orientation for every new trainee who starts on service - to accommodate the large number of trainees and the brief nature of their CTU rotations.
- Created an Infographic encouraging trainees to consider opportunities for climate conscious inpatient practices on admission, in hospital and on discharge.



The Critical Air Project: Climate Conscious Inpatient Inhaler Practices

Watch the **Critical Air Project Webinar** to get an overview of the opportunities for change.

CLIMATE CONSCIOUS INPATIENT INHALER PRACTICES

Watch the **Trainee Video** to get an orientation for medical students and residents.





OUTPATIENT PROVIDER-SPECIFIC INFORMATION

OUTPATIENT PHARMACY – DISCHARGE LETTER

Hospital pharmacists regularly liaise with community pharmacies and can equip outpatient pharmacists with information about climate conscious inhaler prescribing.

- Outpatient pharmacists may be encouraged to consider following up to ensure appropriate technique, inhaler options, and disposal.

PRIMARY CARE PROVIDERS – DISCHARGE LETTER

At discharge, primary care providers can be equipped with information about climate conscious inhaler prescribing.

- Depending on the patient and their clinical needs, primary care providers may be encouraged to consider following up to ensure appropriate diagnosis, technique, or inhaler options.

CONTEXT:

Outpatient Pharmacy

The Critical Air Project Team:

- Created a letter targeting community pharmacists that can be stapled to a patient's discharge prescription.

CLIMATE CONSCIOUS INHALER PRACTICES

KEY FACTS

- Metered-dose inhalers (MDIs) contain hydrofluorocarbon propellants (HFCs). This potent greenhouse gas traps the medication from the canister. Each MDI has the carbon footprint equivalent of driving up to 138km by car (2).
- Dry powder inhalers (DPIs) and soft mist inhalers (SMIs) have a significantly lower carbon footprint, ranging between 2-km by car (2). They can still have other environmental impacts (2).
- 80% of patients consider the carbon footprint of their inhaler therapy to be an important consideration (3).
- Switching to DPIs in appropriate patients through shared decision making between the patient and prescriber leads to similar or improved health outcomes (3,4,5).
- Carbon MIs use ethanol as an I.I.A. expiring agent. They have up to a thirteen fold higher carbon footprint (6).
- MIs need to be incinerated to neutralize the remaining I.I.A. for safe disposal.
- The Health Products and Services Agency has operation free medication takeback programs for the safe disposal of medications including inhalers in BC. Find out if your pharmacy is registered or learn more at healthbc.ca

WHAT YOU CAN DO TODAY

- Continue to regularly review inhaler technique including direct observation of patients with targeted feedback.
- If an MI is necessary, consider dispensing a low I.I.A. volume MI and encourage spacer use.
- Continue to encourage patients to bring back their inhalers to a pharmacy for safe disposal.

CONTEXT: Primary Care

The Critical Air Project team:

- Created a letter to be printed and sent to the primary care provider when the patient is discharged.

CLIMATE CONSCIOUS INHALER PRACTICES IN TRANSITIONS OF CARE

KEY FACTS

- Metered-dose inhalers (MDIs) contain hydrofluorocarbon propellants (HFCs). This potent greenhouse gas traps the medication from the canister. Each MDI has the carbon footprint equivalent of driving up to 138km by car (2).
- Dry powder inhalers (DPIs) and soft mist inhalers (SMIs) have a significantly lower carbon footprint, ranging between 2-km by car (2). They can still have other environmental impacts (2).
- 80% of patients consider the carbon footprint of their inhaler therapy to be an important consideration (3).
- DPIs are safe and effective in adults and children over the age of 12. Switching to DPIs in appropriate patients through shared decision making leads to similar or improved health outcomes (3,4,5).

RECOMMENDATIONS

- We couldn't find optometry or PTs on file - please review whether you have any in your DMH. If not, consider ordering to clarify diagnosis.
- Close visits, assessment, improve and patient feedback current MDI inhaler, consider switching to lower carbon alternatives such as DPI or SMI.
- Consider reviewing inhaler technique with your patient, or ask the pharmacist to review technique on your next prescription. Excellent educational videos can be found at www.bccph.ca/long-health/how-use-your-inhaler
- Other:





PATIENT INFORMATION

Sustainable healthcare is important to many patients

- Studies from the UK reveal that 80% of patients consider the climate impact of their treatment. (20)
- Many patients in hospital may have lower inspiratory capacity so dry powder inhalers may not be the best choice in the inpatient setting.

Patients are critical partners in their care

- Switching to low carbon inhalers in appropriate patients through shared decision making between the patient and prescriber leads to similar or improved health outcomes. (21-23)
- Non-consensual switches are associated with decreased satisfaction with care and worse outcomes. (21)

CONTEXT:

How Patients are Engaged in Climate Conscious Inhaler Practices in the Inpatient Setting, and Informed About Options Once Discharged

The Critical Air Project Team created:

- An Infographic outlining issues and options.
- A brief educational video that can be played by patients on their hospital television (coming soon).



HOW CAN YOU REDUCE THE CARBON FOOTPRINT OF INHALERS, IN AND OUTSIDE OF THE HOSPITAL?

01 WHEN YOU GO IN TO THE HOSPITAL	If you are coming in for a planned admission – for instance, elective joint replacement surgery – think about bringing your own inhaler from home. This is particularly important if the hospital doesn't carry your exact kind of inhaler device; it will save you from having to learn a whole new inhaler device for only a few days.
02 IN YOUR ROOM	If your inhaler is kept in your hospital room, make sure you leave it in an easy to find location, such as your bedside table. Avoid keeping your inhaler in the bathroom, in a drawer, in your bed covers or among your belongings; this will make it harder for your nurse/doctor to find it in an emergency. Check to make sure your inhaler has a label with your name on it. If the inhaler gets misplaced, your healthcare team will be able to safely return it to you.
03 WHEN YOU MOVE ROOMS	When you move between wards, such as moving from the emergency department to the medical ward, or moving from surgical recovery to the surgical ward, ask about whether your inhalers are moving with you if you are able. Inhalers lost during transfers waste hundreds of tons of GHG emissions every year.
04 WHEN YOU USE YOUR INHALER	Ask your doctor, pharmacist, nurse, or respiratory therapist to teach you how to use your inhaler and ask them to watch you use your inhaler and give you feedback. Ask if you need to use a spacer device. Up to 90% of people don't have the right technique to use their inhaler – often without knowing it.* Making sure you have good technique will help you get the most out of your medication and reduce your likelihood of coming back to hospital for breathing difficulties.
05 WHEN YOU ARE GETTING READY FOR DISCHARGE	Ask your healthcare provider if: <ul style="list-style-type: none"> • You have been tested to confirm you have asthma or COPD. • A lower carbon inhaler option may be right for you. • You should be taking your hospital inhaler and/or the spacer device home with you.
06 AFTER YOU GO HOME	Ask your community pharmacist, primary care provider, or lung specialist to look at you using your inhaler every so often. Having a refresher on technique is an important way to make sure you are getting the most use out of your inhaler doses. Bring your empty inhaler back to your community pharmacy for disposal.

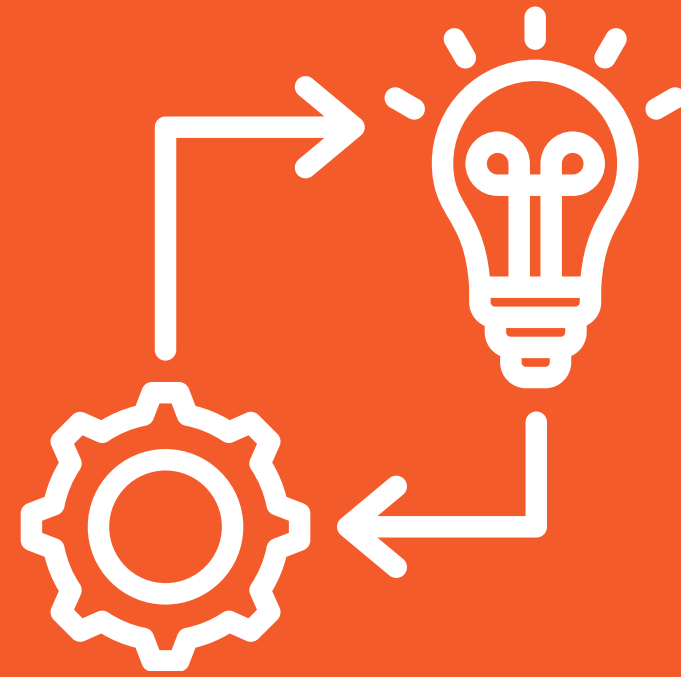
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Clinicians can share this infographic with patients about climate conscious inhaler care as it relates to both inpatient and outpatient care.





HOW

Strategy and Partnerships

- 1 Partnerships for Change
- 2 Assess the Problem in your Setting
- 3 Identify Change Management Metrics
- 4 Cultivate Patience





Partnerships for Change

CULTIVATE INTEREST

- **Socialize the idea:** Build awareness and interest
 - Talk informally about the environmental impact of inhalers at staff huddles or with interdisciplinary team members.
 - Engage with an internal climate change or environmental sustainability group, if one exists.
- **Align with mission:** Find ways to demonstrate how the work aligns with existing commitments
 - Your organization may have a commitment to sustainability that you can align with - Seek out your health authority's (or hospital's) strategic plan.
 - Your province may have a commitment to climate action and sustainability that you can align with.
 - Canada is a signatory to the 2021 Conference of the Parties 26 (COP26) Health Programme committing to climate-resilient health systems and sustainable low-carbon health systems. (24)

BUILD NETWORKS

- **Governance & leadership:** Secure support “from above”
 - Consider quality councils or committees to engage with early in your project.
 - Those relating to medication operations and clinical practice are particularly important.
 - Having leadership endorsement makes it easier to move forward with change ideas.
 - It gives confidence to other key partners and may elevate your project in priority lists.
- **Key partners:** Identify allies
 - Some actors can play a key role in helping you understand the issue.
 - Some actors can play a key role in helping you implement or monitor your project.
 - Consider the Pharmacy Informatics team
 - Some actors will be critical allies, providing support AND helping you amplify the message.



- The Critical Air Project Team worked to demonstrate alignment with:
- The Environmental Sustainability commitment of the health authority, Island Health. (25)
 - The BC Ministry of Health - Minister of Health's mandate letter. (26)

- The Critical Air Project Team developed a key partner map. To identify what groups and individuals might have a role to play in changing inhaler practice in their setting [see [next page](#)]:
- A critical and early partnership with the Pharmacy Informatics team at the Health Authority, which included a Clinical Informatics Pharmacist and a Systems Analyst.





KEY PARTNER MAPPING

The Critical Air Project Team worked to identify all the critical partners that their project would affect - directly and indirectly.



Key partner maps help to develop a visual representation of all the actors that could influence a project and how they are connected.





Assess the Problem in your Setting

IDENTIFY THE INHALER "JOURNEY"

Develop an understanding of the pattern of inhaler use - the inhaler journey - within your setting (see [next page](#))

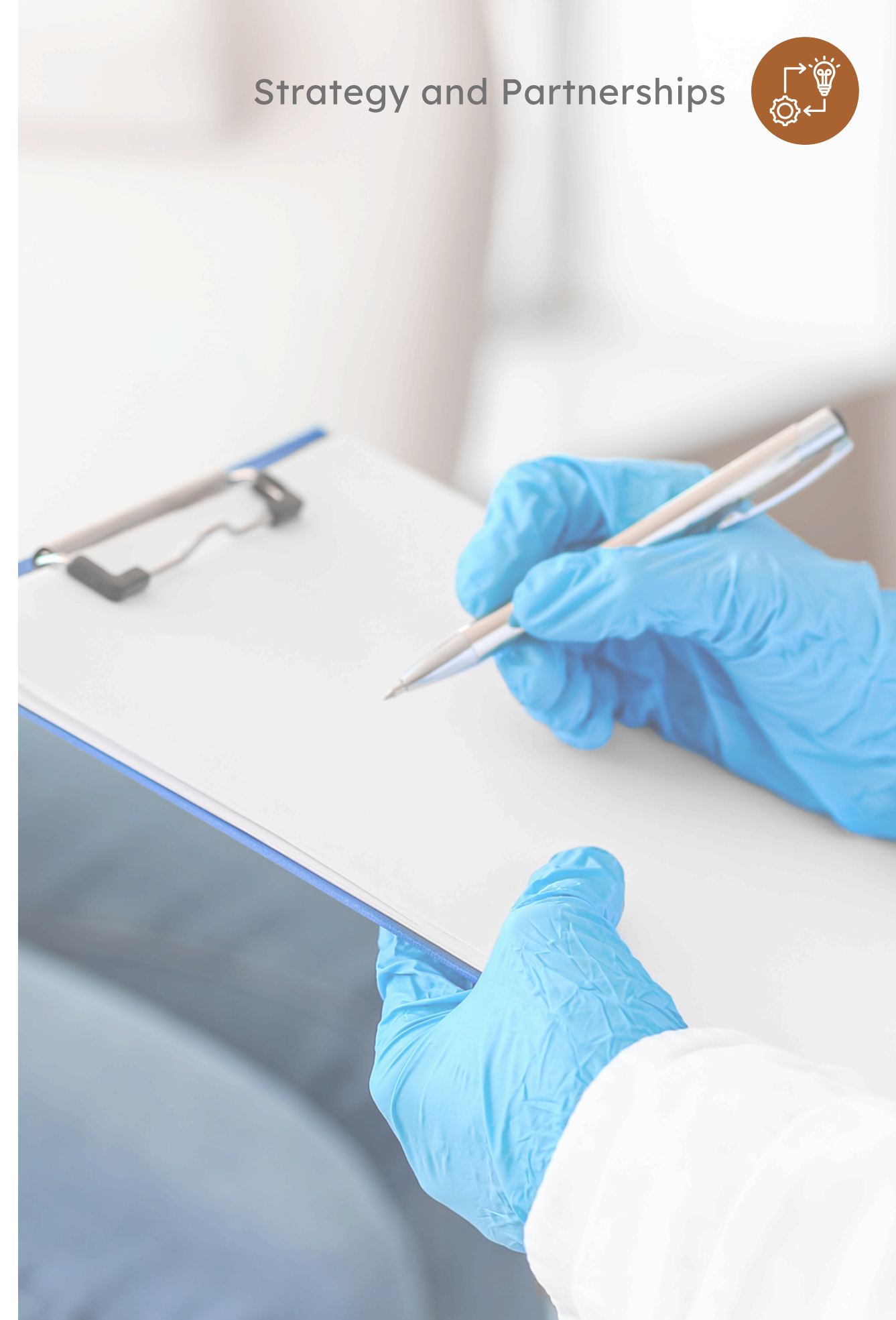
Engage key partners from multiple levels of the organization to get a clear idea about how inhalers are prescribed, dispensed, moved, used and disposed of. Individual interviews and focus groups are one way to gather this information.

- Be sure to engage nurses, physicians (both sub-specialists and hospitalists), physician trainees, pharmacists (both clinical and dispensary), pharmacy technicians, respiratory therapists, housekeeping, facilities maintenance and porter services.

Gathering information in this way allows teams to develop a holistic picture of inhaler use within their hospital and areas where there is room for improvement.

This is a critical step to identify where to target change ideas.

It may be useful to develop a **process map**. This is a planning and management tool that visually describes the flow of work - showing the inputs, actions, and outputs of a process in a clear, step-by-step manner.

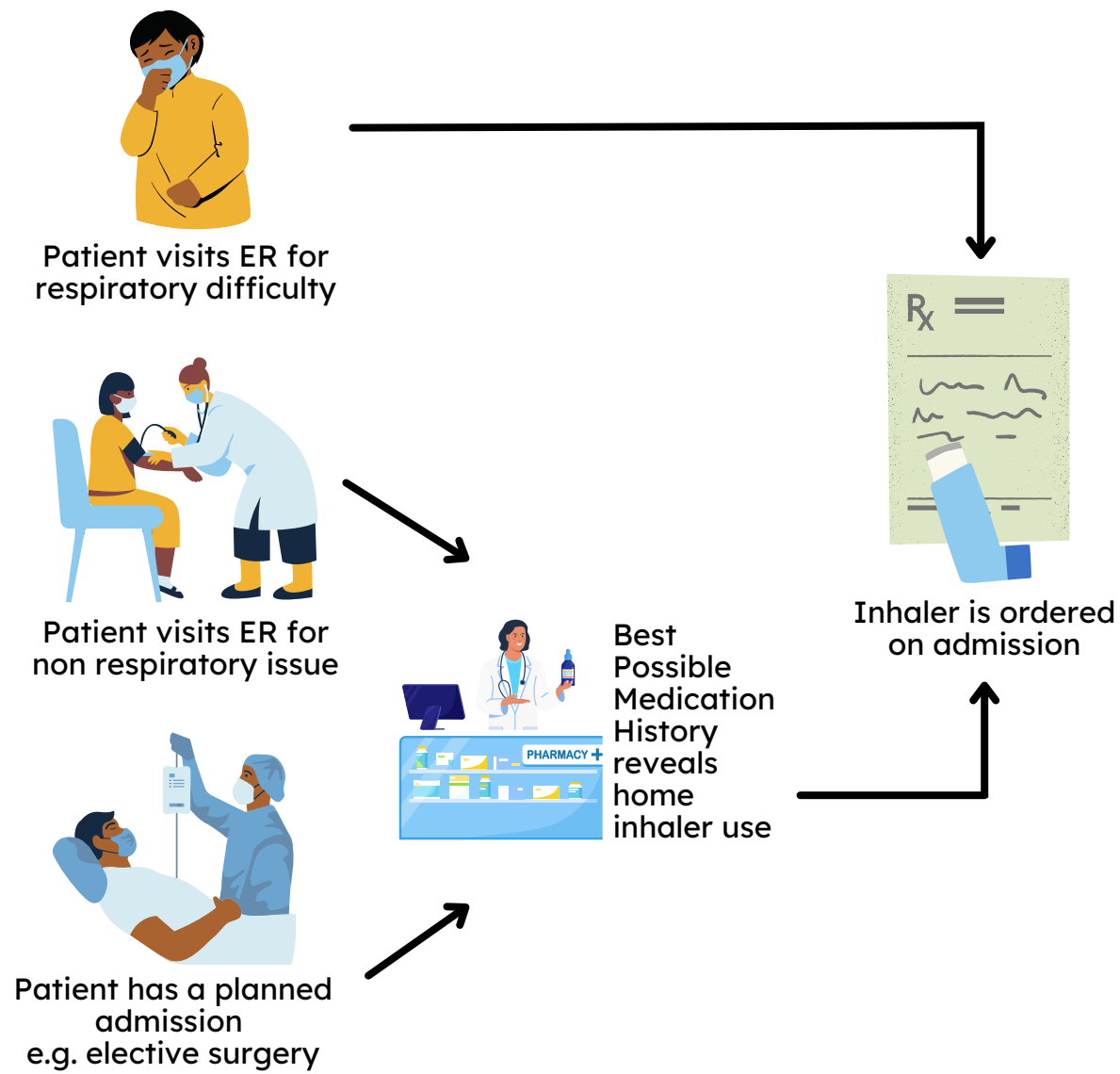




The Critical Air Project Team developed two process maps, to understand how inhalers moved around their hospital:

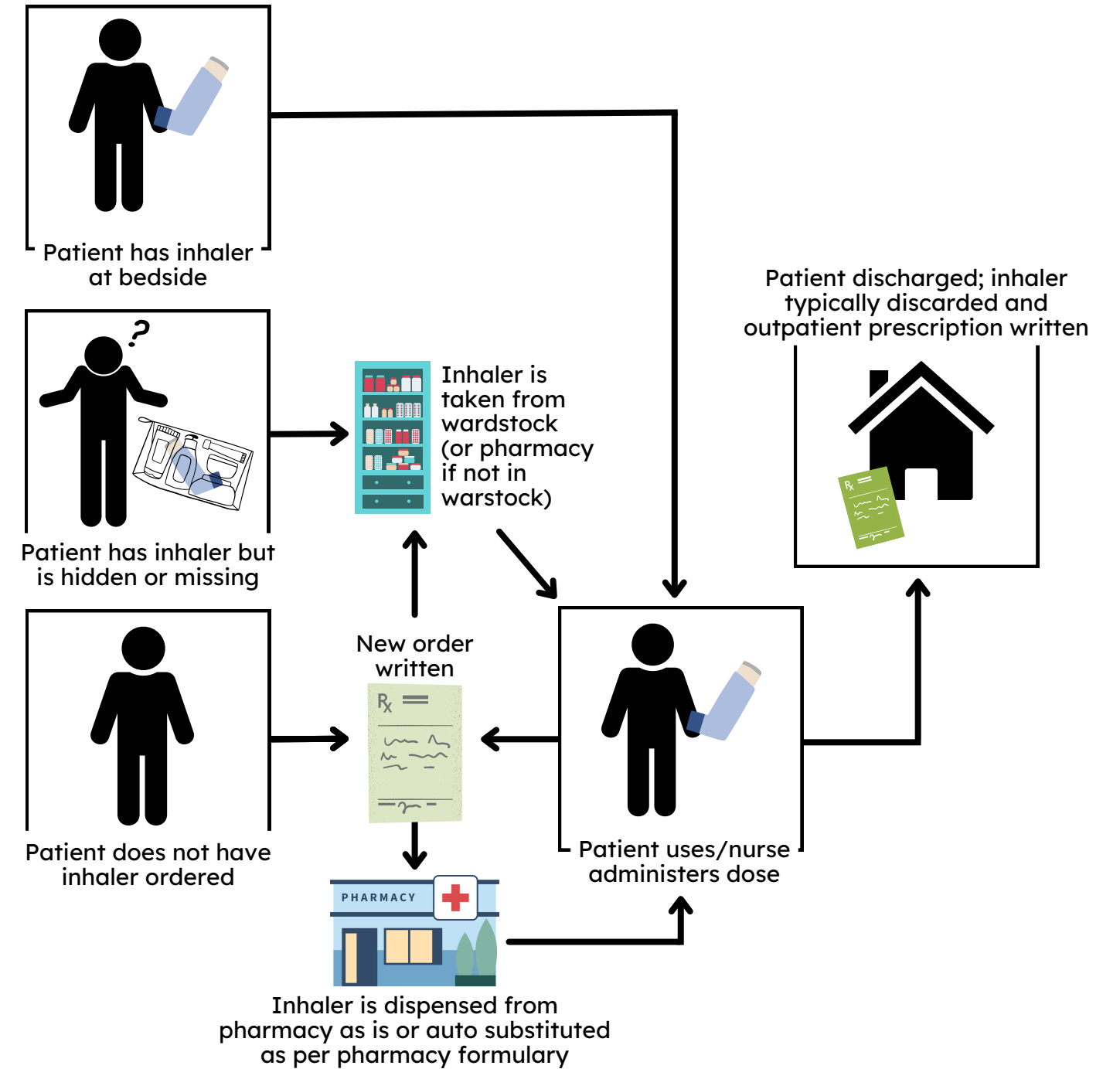
- at the time of patient admission to the tertiary centre,
- of inhaler practices in admitted patients at the tertiary centre.

View the inhaler lifecycle and process maps [here](#).



Process map: Inhaler journey at time of admission

NEED FOR INHALER IDENTIFIED



Process map: Inhaler journey for admitted patients





Identify Change Management Metrics

MEASURE IMPACT

Measuring the impact of the intervention is important to determine whether you have achieved your targets.

IMPACT ON PRESCRIBERS

- Custom extract assessing dispensed inhalers.

IMPACT ON DISPENSING - Developed a run chart tracking intervention in real time

- Monthly dispensing data from pharmacy.
- Monthly wardstock replenishing data.

IMPACT ON FINANCE - Overall decrease in use and financial savings

- Ordering data, purchasing data and associated costs.

IMPACT ON KEY PARTNERS

- Continuously collecting key partner feedback about the policy, operational and education changes being implemented to ensure that they are feasible, realistic, and practical.



The Critical Air Project Team developed multiple tracking tools:

Prescriptions

- The Clinical Informatics Pharmacist wrote an algorithm to identify the number of orders written by providers monthly, stratified by hospital site (Cerner software).

Pharmacy dispensing

- The team used pharmacy dispensing data as tracked in Cerner Pharmacy module (PharmNet) within the Cerner Health Information Management (HIM) system to identify the number of inhalers directly dispensed by pharmacy.

Wardstock dispensing

- Not tracked by pharmacy dispensing system.
- Variable in situ tracking systems (automated dispensing systems such as Acudose and Omnicell) as well as low tech medication cupboards and bins.
- Used restocking data as tracked in the Cerner inventory transfer system. We are tracking the frequency and number of inhalers sent from the pharmacy to each individual ward to replenish the wardstock and using this data as a surrogate marker for wardstock inhaler use.





Cultivate Patience



TIMELINE OF CHANGE

MANAGE YOUR OWN EXPECTATIONS OF PROGRESS:

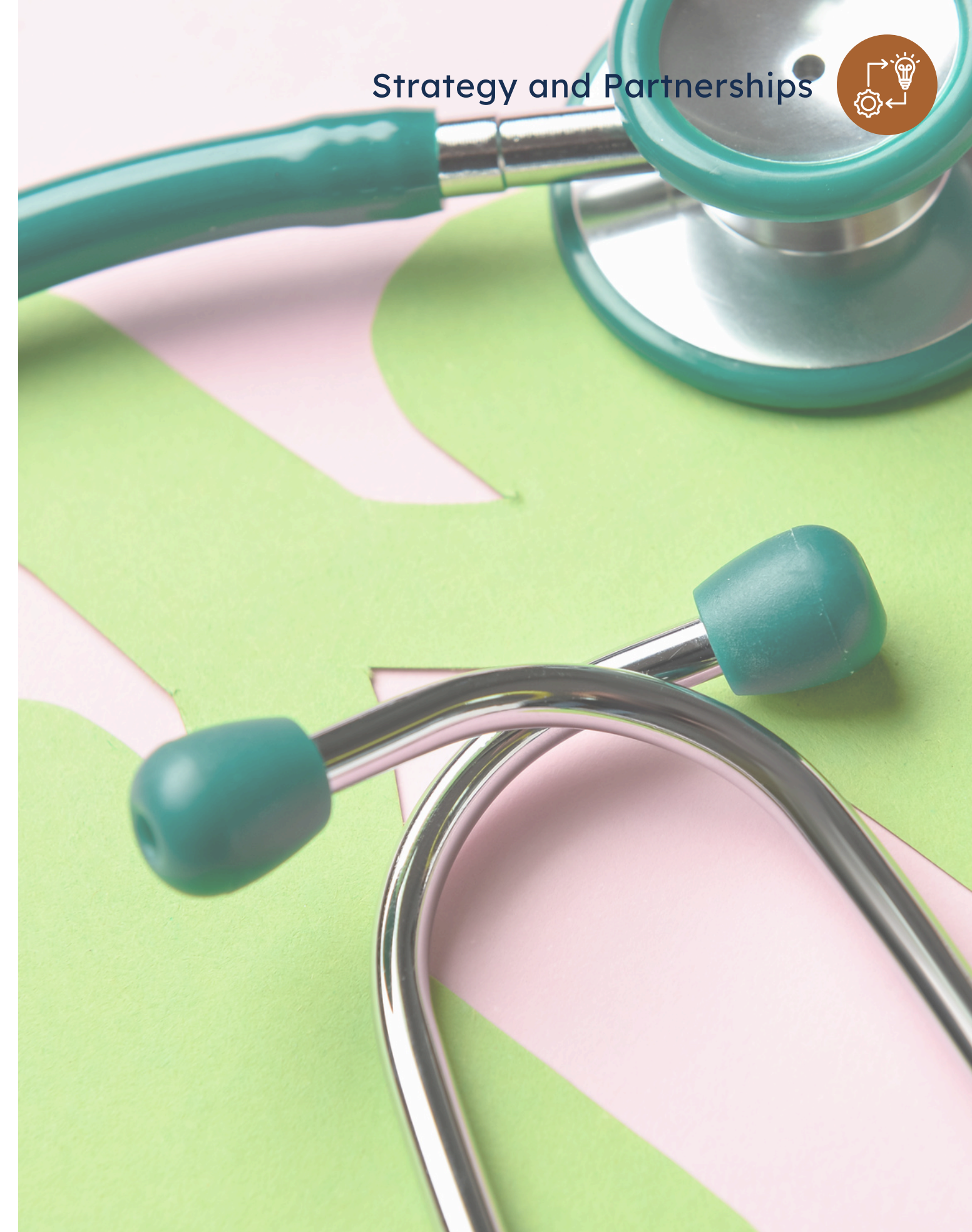
- Engagement takes time: It takes significant time to engage various and critical partners for meaningful and lasting change. Simply identifying the wide array of relevant key partners for each project, contacting them and meeting with them will involve email-writing, coordinating schedules and discussion. Although this is time-consuming, it will be the foundation for a successful change in practice.
- Developing new approaches takes time: Drafting, reviewing, incorporating feedback, and approving policies, procedures and resources can be a lengthy process.
- Implementing new approaches take time: Progress will be measured in months and years, not weeks.

MANAGE YOUR OWN EXPECTATIONS FOR WHAT YOU CAN ACCOMPLISH:

- Many sustainability leaders do sustainability projects outside the scope of their formal position.
- Even those lucky enough to have dedicated, funded time to do the work, have to carve out time from other duties to work on the project.

STEERING A COMPLEX SYSTEM IN A DIRECTION OF CHANGE TAKES TIME:

- Systemic change is slow going, but the advantage is widespread and sustained change on a meso and macro scale that has massive and far-reaching implications.
- This is well worth the patience and perseverance invested upfront.





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