CLIMATE RESILIENT, LOW CARBON SUSTAINABLE PHARMACY

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

CASCADES

The Canadian Coalition for Green Health Care
Coalition canadienne pour un système de santé écologie

COLLABORATIVE CENTRE FOR Climate, Health + Sustainable Care

UNIVERSITY OF TORONTO

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Canada

CENTRE FOR PRACTICE EXCELLENCE

CAPSI • ACEIP

CAPhE
Canadian Association of Pharmacy for the Environment

cshp scph

NAVIGATION

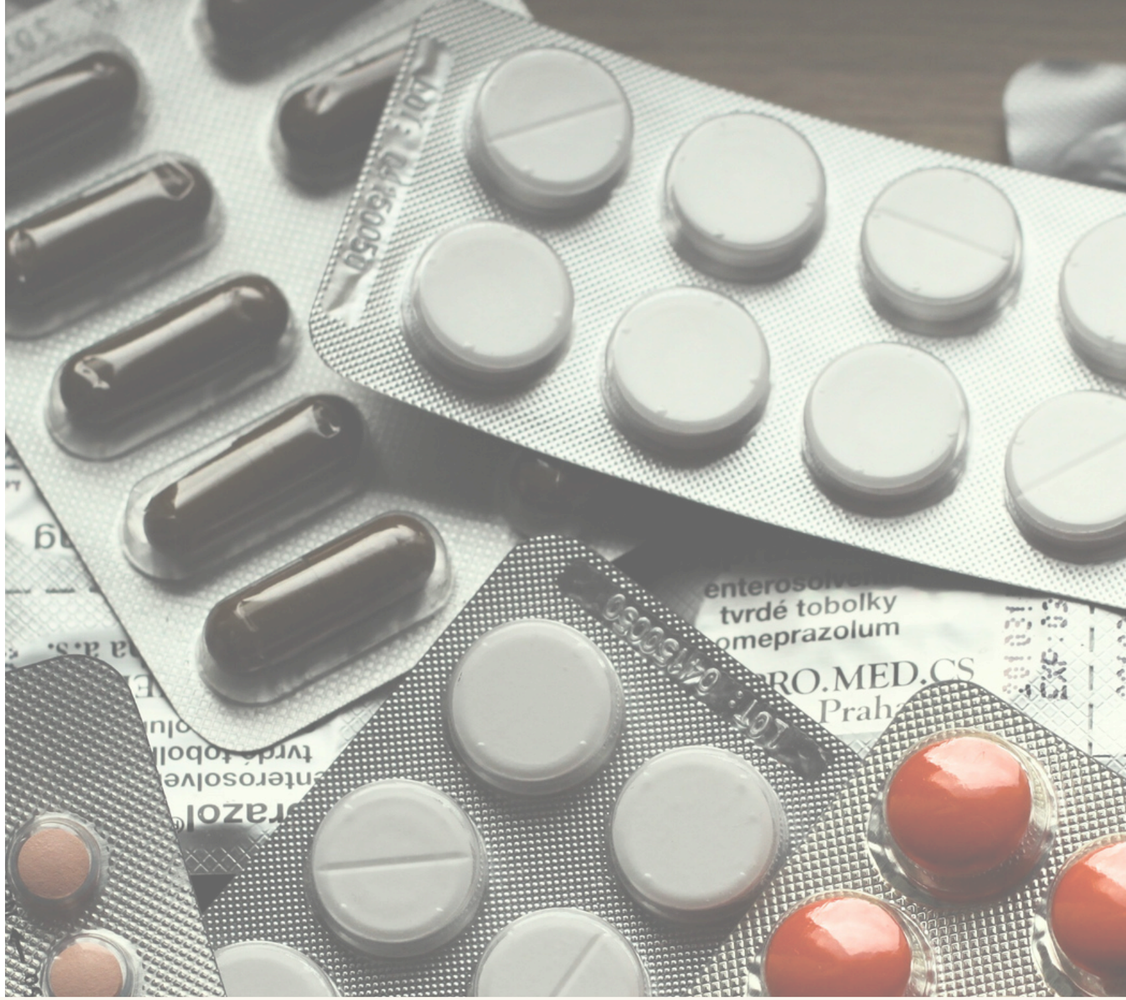
Click on a topic on the table found on the right to navigate the document.

INTRODUCTION

This Playbook is intended for Canadian pharmacy professionals including pharmacists, pharmacy technicians, pharmacy assistants, educators and trainees.

The Playbook provides background information, resources and considerations to guide more climate resilient and environmentally sustainable pharmacy practice.

These considerations have been compiled from a review of the literature, experiences from practicing pharmacy professionals and guidance from academics in the field.



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PLAYBOOK STRUCTURE

WHY
The Case for Change

WHAT
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HOW
Strategy and Partnerships

WHY

The Case for Change

1. Climate Change, the Environment and Healthcare
2. Environmental Impacts of Medications
3. Role of Pharmacy Professionals

Climate Change, the Environment and Health Care

Climate change is one of the biggest threats to human health. Healthcare services and systems contribute to climate change & other global environmental challenges.

Climate change has been recognized by the World Health Organization as a significant threat to human health in the 21st century, with harms already evident and accelerating. (1)

High-quality care and effective health services and systems are threatened by the impacts of climate change, including extreme weather events and cumulative and compounding climate-related stresses. (2)

Ironically, healthcare is part of the problem. According to the Lancet Countdown on Health & Climate Change, **Canada has the second most climate intensive health system, on a per capita basis (3), estimated at 4.6% of national greenhouse gas emissions. (4)**

While climate change is acknowledged as one of the pre-eminent threats to human health this century, a range of other human-induced environmental problems (e.g., toxins, air, and plastics pollution) also threaten the health of people and ecosystems. Increasingly, the international scientific community recognizes the "interdependence of climate, ecosystems and biodiversity". (5)

There is a critical need to mitigate a wide range of environmental harms from healthcare, while adapting to the health threats from these human-induced risks.

Environmental Impacts of Medications

Take action to minimize the environmental harm of medications throughout their lifecycle and address increased medication-related risks due to climate change.

Medications are foundational to the provision of healthcare. At the same time, medications are highly polluting and their reliable and safe use is threatened by climate change. (6)

Medications are estimated to contribute 25% of the carbon footprint of healthcare in Canada. (4) The pharmaceutical industry's carbon emissions intensity in 2015 was 55% higher than that of the automotive sector. (7)

Medications can be highly damaging to the environment during manufacturing, excretion by the user or through improper disposal as they are "designed for their potency, bioavailability, and degradation resistance". (8)

The shocks and stresses of climate change also threaten the medical product supply chain, including damages to manufacturing infrastructure leading to shortages of medications. (6, 9-11) They can also increase risks to patients from adverse effects associated with climate impacts such as increased heat. (12)

THE ROLE OF PHARMACY PROFESSIONALS

Pharmacy professionals can support climate resilient and low carbon sustainable health services and systems.

Pharmacists, pharmacy technicians, and pharmacy assistants have a wealth of therapeutic knowledge, trusted relationships with the communities they serve, and familiarity with the medication provision life cycle.

As a result, pharmacy professionals have a critical role to play in promoting a climate resilient, low carbon and sustainable health system, in two important ways:

1. MITIGATION

Reduce the climate and environmental harms of medications and waste generated by pharmacy.

2. ADAPTATION

Adapt to the stresses and shocks of climate change, to build climate resilient pharmacy.

Look for the color-coded shapes to learn about mitigation and adaptation-specific actions.

Summary of Actions

1. MEDICATION OPTIMIZATION

MITIGATION

- **Action 1:** Consider the environmental risks of medications when prescribing, during shared decision-making processes and when dispensing
  - Identify and act on sustainable practice opportunities and share this knowledge with members of the care team
- **Action 2:** Recommend change from high carbon/environmental impact products to lower impact alternatives where appropriate
  - Incorporate environmental considerations when prescribing for minor ailments and providing professional services
- **Action 3:** Identify and discontinue unnecessary medications as appropriate
- **Action 4:** Encourage preventative and non-pharmacologic interventions where appropriate
- **Action 5:** Educate and review proper medication administration and device use to help improve adherence
- **Action 6:** Advise patients to return medications and medical sharps for disposal to a pharmacy

ADAPTATION

- **Action 7:** Educate patients on risks and preparedness for climate-related health threats and increase monitoring for patients at risk or on medications that can predispose to heat-related illnesses.
- **Action 8:** Inform patients about continuity of care during climate-related health threats
  - Encourage patients to document details about special health needs as part of their emergency kit.

2. SUSTAINABLE OPERATIONS

MITIGATION

- **Action 9:** Evaluate current pharmacy practice activities to develop a strategic environmental plan
- **Action 10:** Evaluate scientific evidence and case examples and identify opportunities to implement environmental improvements in the pharmacy
- **Action 11:** Consider revising activities to reduce the climate and other environmental impacts of pharmacy operations
  - Adopt green purchasing strategies
  - Make your pharmacy/workspace energy efficient
  - Consider whether minimizing use of paper is environmentally preferable in your setting
  - Utilize virtual care for certain kinds of appointments
  - Participate in regional environmental sustainability programs for collaborative benchmarking and knowledge sharing

ADAPTATION

- **Action 12:** Review disaster preparedness for the pharmacy regularly to ensure continuity of care
  - Establish and review policies on procurement, and recommendations for managing shortages.
  - Identify patient populations that are profoundly impacted during extreme weather events. Ensure appropriate protocols are in place to provide continuity of care during these times.
  - Continue to strengthen relationships with other local pharmacies/hospitals to build resiliency during extreme weather events.
  - Develop/regularly update Disaster "Fan-Out" Lists to communicate with staff during extreme event(s).

3. EDUCATION & POLICY DEVELOPMENT FOR PHARMACY PROFESSIONALS AND TRAINEES

MITIGATION **ADAPTATION**

- **Action 13:** Inform and equip current and future pharmacy professionals through education
  - Revisit the current accreditation standards for Canadian Pharmacy Professional Programs
  - Develop and make resources on climate stewardship and climate resilience readily available
- **Action 14:** Encourage policy development to support a climate resilient, low carbon and sustainable health care system
  - Collaborate with professional organizations to raise awareness of areas of improvement

WHAT

The Tools for Change

1. Medication Optimization
2. Sustainable Operations

Medication Optimization

ACTION 1: CONSIDER THE ENVIRONMENTAL RISKS OF MEDICATIONS WHEN PRESCRIBING, DURING SHARED DECISION-MAKING PROCESSES AND WHEN DISPENSING[6, 12-15]

Identify and act on sustainable practice opportunities and share this knowledge with members of the care team.

Some medications are known to have harmful effects on ecosystems. (16, 17) It is important to be aware of the environmental effects of these medications when prescribing, dispensing and/or making clinical recommendations.

The OECD report on the management of pharmaceutical waste identifies the effects of certain pharmaceutical residues on aquatic organisms, as established in laboratory studies. (See Table 2.1 in the OECD report to view examples of measured effects of certain pharmaceutical residues on aquatic organisms in laboratory studies). (16)

ENVIRONMENTAL RISK ASSESSMENT FOR PHARMACEUTICALS

The German Federal Agency (UBA) reviewed the environmental risk assessment of 650 human pharmaceutical products. (15, 21) Approximately 10% of these substances were found to pose a potential environmental risk. These pharmaceutical products were classified under hormones, antibiotics, analgesics, antidepressants and antineoplastics.

PRACTICE CHANGE EXAMPLE: DICLOFENAC

Diclofenac is persistent in the environment post-disposal and toxic to living organisms (e.g. aquatic animals, vultures, mammals, plants). (22) It could also negatively impact human health by accumulating in foods. In the Netherlands, a multi-stakeholder collaborative group (healthcare professionals, members of the water board) worked to reduce the prescription of diclofenac. (15)

RESOURCES:

- FASS
  - Swedish national formulary. Provides summaries on environmental risk, degradation, and bioaccumulation (15, 18)
- Pharmaceuticals and Environment
  - Can search for environmental impact of medications. Information is based on multiple European sources, including FASS.(19)
- Välvald symbol for over-the-counter (OTC) products (Sweden)
  - Once the pharmaceutical company meets certain criteria showing transparency in their sustainability efforts, all their OTC products will receive a Välvald symbol. (20)

ACTION 2: RECOMMEND CHANGE FROM HIGH CARBON/ ENVIRONMENTAL IMPACT PRODUCTS TO LOWER IMPACT ALTERNATIVES WHERE APPROPRIATE [12, 23-29]

Incorporate environmental considerations when prescribing for minor ailments and providing professional services (e.g. Medication Review, Medication Adaptation, Renewal, Best Possible Medication History, Pharmaceutical Opinion).

HIGH IMPACT AREAS FOR INTERVENTION

Metered Dose Inhalers (MDI) to Inhaler Alternatives (30)

- MDIs utilize HFC propellants to deliver the active ingredient. (31)
  - The HFC propellants act as potent greenhouse gases (GHGs) when released into the atmosphere.
- Where clinically appropriate and after engaging in shared decision-making with patients, pharmacists can collaborate with prescribers to switch to MDI alternatives such as dry powder inhalers (DPIs) or soft mist inhalers (SMIs). This will help reduce the carbon footprint of inhalers (though all of these options have environmental impacts). (32)
- When MDIs are necessary or preferred: Choose smaller volume relievers (e.g. Teva-salbutamol pMDI, Airomir pMDI; see Common inhalers & alternatives for adults resource for further details). Small volume relievers emit less propellant at each use, and therefore, have lower carbon footprints than large volume relievers. (33)
- Pharmacists can also educate patients on proper inhaler techniques and encourage medication inhaler return to pharmacies for licensed disposal.

Carbon-intensive anesthetic gas (AG) to less carbon-intensive AG

- At a global scale, it is estimated that anesthetic gas emissions are equivalent to 3.1 million tons of carbon dioxide annually. (34)
- Pharmacists can help promote the use of AGs with lower global environmental impact (e.g. sevoflurane) over those with high values (e.g. desflurane, nitrous oxide). (12, 23, 29, 35)

RESOURCES:

- Environmentally Sustainable Opportunities for Health Systems: Metered Dose Inhalers (MDIs), Infographic
- Community pharmacy opinion letter
- Sustainable Inhaler Alternatives
- Detailed inhaler comparison chart
- Inhaler Categorization Sheet (MDI/DPI)
- Cost and Coverage Estimates for Less vs. More Sustainable Adult Asthma Therapies
- Sustainable Pharmacy and Prescribing, Infographics and Posters for Patient Education
- Environmentally Sustainable Opportunities for Health Systems: Anesthetic Gases (AGs), Infographic
- Anesthetic Gases Primer
- Correct Inhaler Usage Resources

ACTION 3: IDENTIFY AND DISCONTINUE UNNECESSARY MEDICATIONS AS APPROPRIATE

Pharmacists play an integral role in deprescribing, which has particular relevance for older patients receiving polypharmacy. (36, 37) Deprescribing can improve patient health while reducing adverse events, environmental harm, waste, and healthcare costs.

Medication reviews led by pharmacists can support deprescribing (38-41)

Pharmacists can integrate deprescribing opportunities into their workflow in diverse ways. (42, 43)

In general, successful community pharmacies pursue four steps (42):

Step 1: Build capacity and processes to engage patients in deprescribing
Step 2: Support preliminary interactions between patients and pharmacy support staff to consider deprescribing opportunities
Step 3: Enable detailed interactions between patients and pharmacists (e.g., Medication Review)
Step 4: Pursue follow-up with healthcare providers and monitoring of patient outcomes

OPTIMIZING SUSTAINABLE PRESCRIBING PRACTICE

A study from England evaluated the cost and carbon burden of long-term flupentixol decanoate long-acting injectable. (44)

- A reduction of £300,000 could be achieved across England by improving prescribing behaviour, which equates to £250 per patient per year and 170,000 kg CO_2e.
- Most of these carbon emissions were attributable to the carbon footprint of the appointment – 88,000 kg CO_2e (including energy use and materials used) and the overprescribing of medication – 66,000 kg CO_2e

REDUCE UNNECESSARY MEDICATION USE

- Minimize as-needed pro re nata (PRN), over-the-counter (OTC) medications when applicable (e.g. existing patient supplies, use of single product vs combo product, minimizing use of medications for mild, manageable symptoms)
- Avoid dispensing duplicate products or insulin pens that will not get used in an inpatient care setting (e.g. multidose products) or after discharge if patient is sent home with supply.
- Avoid refilling PRN medications if patient already has sufficient supply.
- When dispensing single-dose or single-use vial medications, select the smallest vial necessary
- Dispense smaller amounts, especially when starting a new medication (6, 17)
  - Note: Some 3rd party insurers will allow only 1 month fill for newly prescribed medications

RESOURCES:

- Choosing Wisely Canada
  - Mission: Promotes conversations with patients and clinicians to avoid unnecessary treatments and medical tests

ACTION 4: ENCOURAGE PREVENTATIVE AND NON-PHARMACOLOGICAL INTERVENTIONS WHERE APPROPRIATE [6,13]

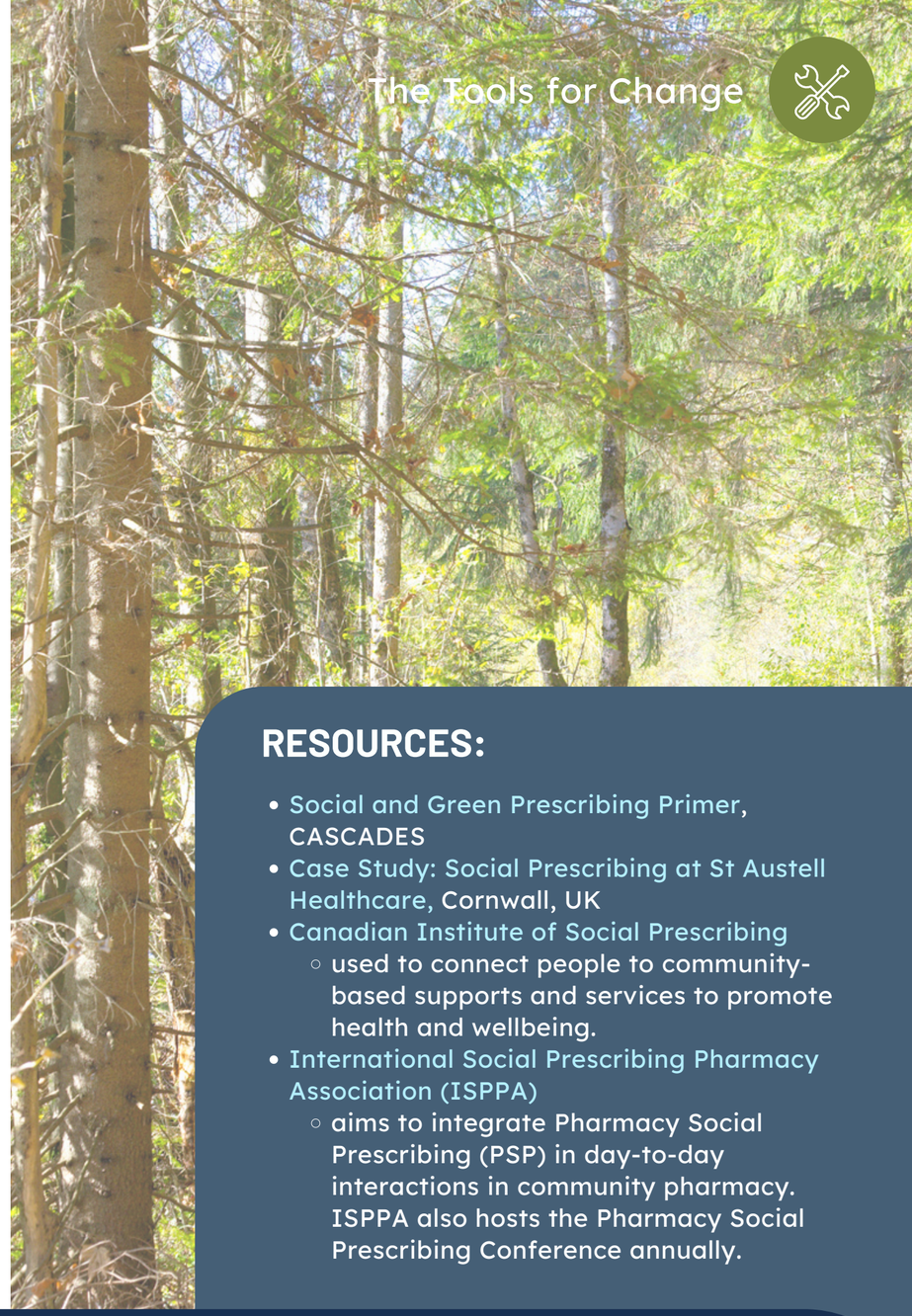
Human health is influenced by a wide range of social, economic, and environmental factors. Medications can help relieve symptoms but may not address the key underlying causes of illness. At times, non-pharmacological interventions may be clinically appropriate ways to address patient care needs.

For example, Social Prescribing is a holistic approach to healthcare that brings together the social and medical models of health and wellness. The goal is to provide a formal pathway for healthcare providers to address the diverse determinants of health, using the familiar and trusted process of writing a prescription. (1, 45)

Increasing accessibility to primary care services (46) and improving chronic disease management (47, 48) are additional potential solutions to reduce demand on the health care system. (49)

SOCIAL PRESCRIBING IN THE UK

One of ways the UK aims to reduce the clinical and climate harms of overprescribing is through encouraging social prescribing. (26) Their strategy includes increasing resources for prescribers by developing treatment guidelines, training and increasing the numbers & accessibility of social prescribing services.



RESOURCES:

- Social and Green Prescribing Primer, CASCADES
- Case Study: Social Prescribing at St Austell Healthcare, Cornwall, UK
- Canadian Institute of Social Prescribing
  - used to connect people to community-based supports and services to promote health and wellbeing.
- International Social Prescribing Pharmacy Association (ISPPA)
  - aims to integrate Pharmacy Social Prescribing (PSP) in day-to-day interactions in community pharmacy. ISPPA also hosts the Pharmacy Social Prescribing Conference annually.

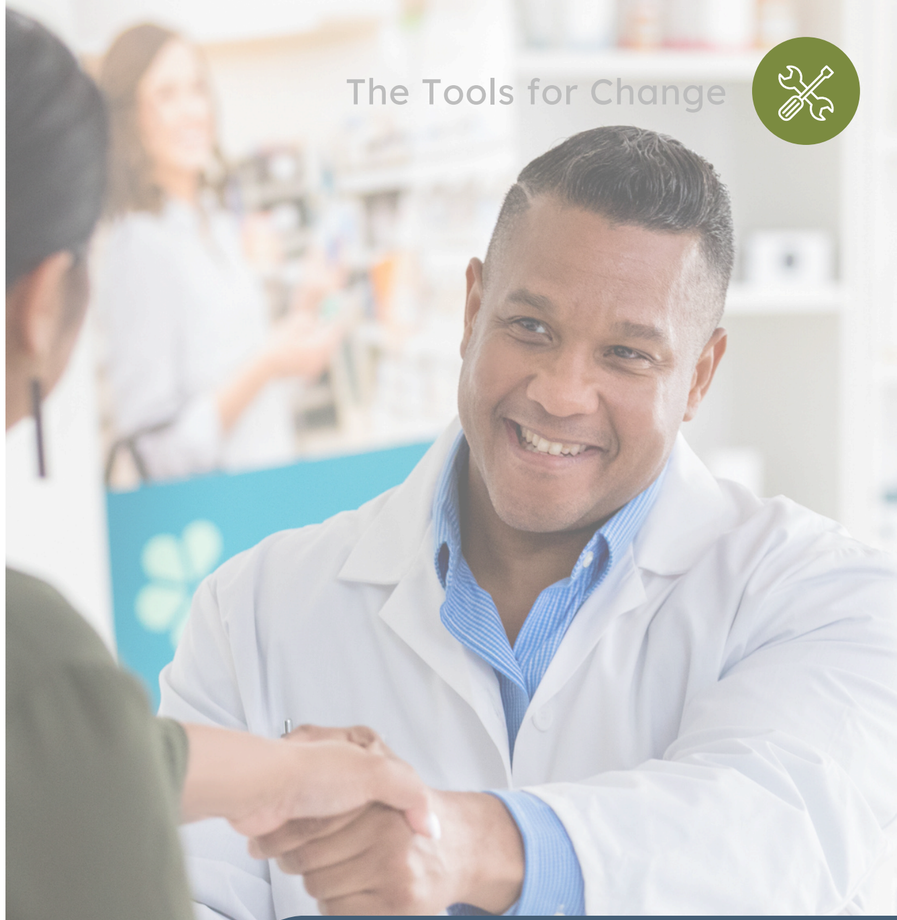
ACTION 5: EDUCATE AND REVIEW PROPER MEDICATION ADMINISTRATION AND DEVICE USE TO HELP IMPROVE ADHERENCE[6]

Each year, Canadian pharmacists dispense and provide advice on 750 million prescriptions per year. (50)

In Canada, approximately 30% of Canadians shared that they discontinued their medications prior to when they were advised to and 1 in 4 Canadians reported not filling their prescription or taking less medication than prescribed. (51)

Medication non-adherence worsens health outcomes (52, 53), adds to unnecessary healthcare costs (54), and can lead to environmental harms. (6)

Pharmacists are highly accessible healthcare providers who play a vital role in educating and conducting medication reviews. They can help review patients' medications and devices such as inhalers to ensure proper use, minimize waste and educate patients on the environmental impact of medications.



RESOURCES:

CASCADES

- What's The Deal With Inhalers? (patient education and communication resources)
  - Printable Version
- How to Dispose of your Inhalers
- Thinking about how you can be more climate friendly?
- Correct Inhaler Usage Resources

ACTION 6: ADVISE PATIENTS TO RETURN MEDICATIONS AND MEDICAL SHARPS FOR DISPOSAL TO A PHARMACY [6, 12, 15, 16, 23, 25, 28, 29, 55, 56-59]

Improper disposal of medicines is a major environmental and public health challenge, with harms to ecosystems, risks of antibiotic resistance (15) and the potential for accidental or intentional misuse or poisoning. (15, 16) Pharmacy professionals can help make it easier for patients to return medications and medical sharps.

Medications that are flushed in sinks and toilets enter sewage waters and risk leaking into freshwater systems. Most wastewater treatment plants are not designed to remove pharmaceuticals, so pharmaceuticals are released into the environment in unchanged or metabolised form. (60-63)

Medications that are disposed of as solid waste can also enter the environment, by leaching from municipal landfill. (16) They can also harm the environment because of the time it takes for medications to degrade and the potential formation of leachate if waste is not captured and treated appropriately. (16)

To learn more about the sources and entry of medications into the environment, see the Management of Pharmaceutical Household Waste Limiting Environmental Impacts of Unused or Expired Medicine – Policy Highlights (OECD). (16)

SAFE MEDICATION DISPOSAL PRACTICE IN THE COMMUNITY

In a cross-sectional survey conducted in the US (2010), 80% of the patients who received an education intervention from pharmacy students at community pharmacies were willing to dispose medications appropriately. (65)

RESOURCES:

- Safe disposal of prescription drugs, Health Canada
- Health Products Stewardship Association (HPSA)
  - Collected 4,221,608 kg of medicines and 2,671,177kg since inception (64)
  - Offers free medication take-back programs in Ontario, British Columbia, Manitoba, New Brunswick, Prince Edward Island and Quebec
- Information for consumers
  - Guide to returning medications and/or medical sharps
  - Posters on how to return medications and/or medical sharps
  - HPSA FAQ for consumers

ACTION 7: EDUCATE PATIENTS ON RISKS AND PREPAREDNESS FOR CLIMATE-RELATED HEALTH THREATS AND INCREASE MONITORING FOR PATIENTS AT RISK OR ON MEDICATIONS THAT CAN PREDISPOSE TO HEAT-RELATED ILLNESSES

HEAT-RELATED ILLNESSES (HEAT EXHAUSTION, HEAT STROKE)

Health Canada's recommendations for pharmacists and pharmacy technicians during extreme heat events* (66):

- **Recognize** early signs of heat illnesses and direct patients to appropriate treatment or medical care.
- **Discuss** safe handling of medications sensitive to heat. Identify patients more at risk during extreme heat events.
- **Identify** medication history or prescribed medications that may exacerbate heat-related conditions.
- **Provide** Health Canada heat health information to patients, especially those prescribed medications that may increase their vulnerability to heat related illnesses

Mechanism	Drug/Class[a]
Increased heat production	Excessive thyroid medication Sympathomimetics
Inhibition of hypothalamic regulation	Amphetamines (including MDMA/"ecstasy") Antipsychotics Opioids
Reduction of sweat excretion (either by direct effects on the skin/swear glands or through reduced blood flow to the skin)	Alcohol Anticholinergics Antihistamines Antiparkinsonian (anticholinergic) agents Antipsychotics (anticholinergic) Belladonna alkaloids Beta-blockers Calcium channel blockers Creatine[b] Diuretics Laxatives Lithium Selective serotonin reuptake inhibitors Topiramate Tricyclic antidepressants
Vasoconstriction of cutaneous vessels	Alpha-agonists Monoamine oxidase inhibitors Sympathomimetics (including pseudoephedrine, cocaine, amphetamines, diet products containing ma huang)

TABLE 1. Medications that can predispose to heat-related illnesses (CTC -Heat Related Disorders)**

[a] In addition, any medication or substance (e.g., tranquilizers, cocaine, cannabis) that can alter a person's behaviour, including the perception of the environment or need for proper hydration, may increase the risk of heat-related illnesses in the right conditions.
[b] Evidence has been contradictory; however, use of creatine ≤28 days or when exercising ≤60 min does not appear to influence hydration status or temperature regulation. It is not clear whether creatine use >28 days or when exercising >60 min affects thermoregulation.

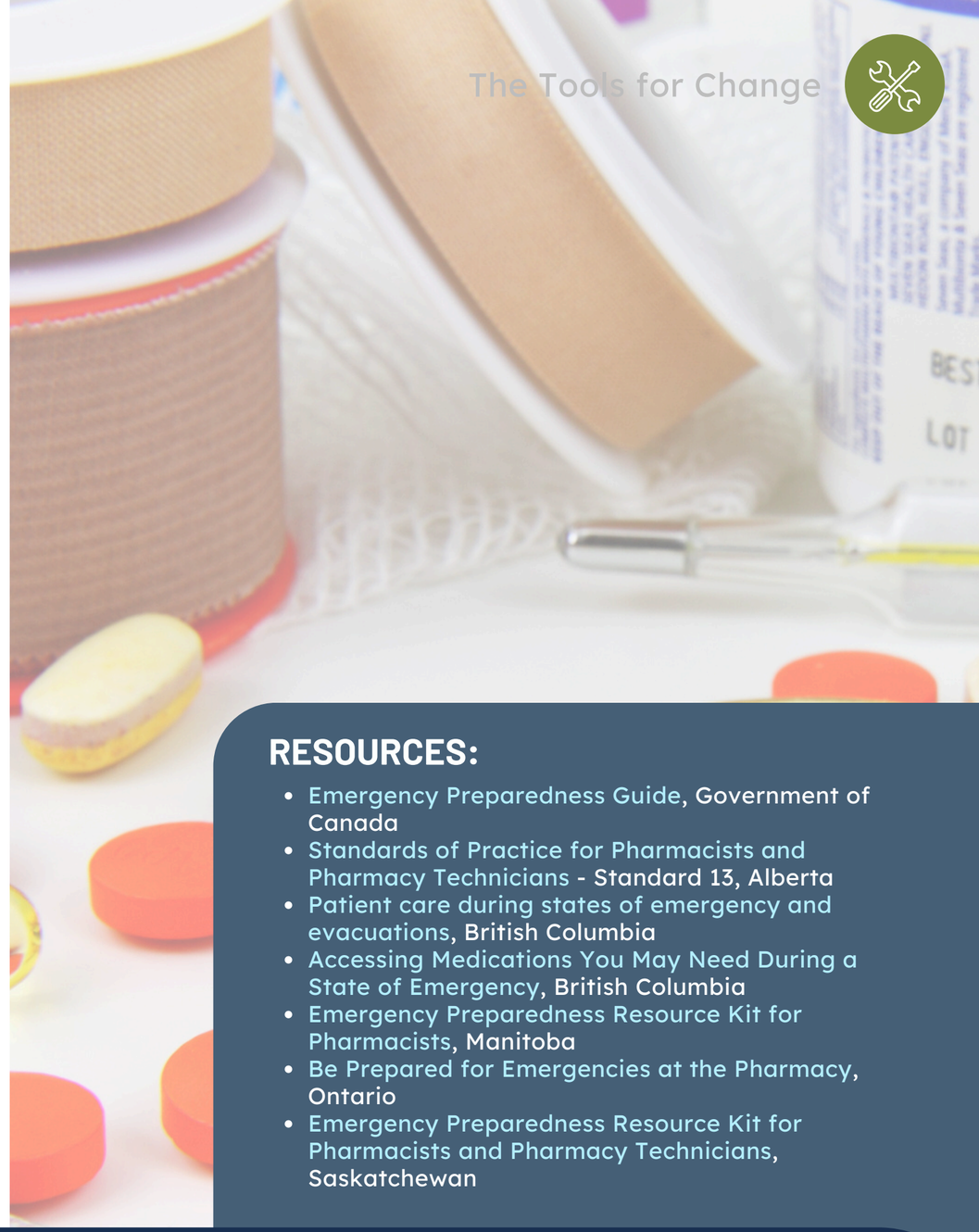
*A copy of the reproduction is available at https://www.canada.ca/en/health-canada/services/publications/healthy-living/extreme-heat-human-health-pharmacists-technicians.html
**Reproduced with permission from Tscheng D. Heat-Related Disorders. CPS Full Access [internet]. June 15, 2022. Available from: https://cps.pharmacists.ca

ACTION 8: INFORM PATIENTS ABOUT CONTINUITY OF CARE DURING CLIMATE-RELATED HEALTH THREATS[27]

Encourage patients to document details about special health needs as part of their emergency kit.

Climate-related health threats (e.g. heat-related illness, wildfires, hurricanes, floods, earthquakes) can occur at any time and with limited or no warning.

Pharmacists can play a crucial role to help inform patients on how to prepare for these emergencies and how to receive continuity of care. (67)



RESOURCES:

- Emergency Preparedness Guide, Government of Canada
- Standards of Practice for Pharmacists and Pharmacy Technicians - Standard 13, Alberta
- Patient care during states of emergency and evacuations, British Columbia
- Accessing Medications You May Need During a State of Emergency, British Columbia
- Emergency Preparedness Resource Kit for Pharmacists, Manitoba
- Be Prepared for Emergencies at the Pharmacy, Ontario
- Emergency Preparedness Resource Kit for Pharmacists and Pharmacy Technicians, Saskatchewan

Sustainable Operations

ACTION 9: EVALUATE CURRENT PHARMACY PRACTICE ACTIVITIES TO DEVELOP A STRATEGIC ENVIRONMENTAL PLAN

Tools have been developed to help pharmacy professionals to methodically analyze activities and identify sustainability opportunities. Consider developing tailored pharmacy assessment tools based on pharmacy needs.

Examples of considerations when assessing your pharmacy may include awareness of environmental concerns, lighting, energy use, reduction of paper and plastic use, appropriate recycling, and minimizing stock.

These assessments could be revisited every few years to track progress, and revise entries.

RESOURCES:

- Risk analysis table in a community pharmacy, Finland (56)

Activity	Issue	Effect on Environment	What can We Do	Indicators

- Table utilized to present recommendations for greening opportunities for BC Lower Mainland hospital pharmacy departments, Canada (68)

Waste Item	Sites Implicated	Opportunities Identified

ACTION 10: EVALUATE SCIENTIFIC EVIDENCE AND CASE EXAMPLES AND IDENTIFY OPPORTUNITIES TO IMPLEMENT ENVIRONMENTAL IMPROVEMENTS IN THE PHARMACY [6, 30]

ALCOHOL SWABBING BEFORE INJECTIONS

- Alcohol swabbing before injections has been widely used for infection control practice. For many years, there has been debate around whether it indeed helps reduce infection. With limited evidence available in the literature (69, 70), the World Health Organization advises against using alcohol routinely prior to vaccination if the skin is visibly clean. (71)
- There is a need to revisit this process during immunization and identify whether alcohol swabbing should be mandated. If it is not providing safety to patients, it is adding increased costs to healthcare and added waste and environmental harm that could be reduced.

NITROUS OXIDE WASTE IN HEALTHCARE

- Nitrous Oxide (N_2O) is persistent in the atmosphere. It has 298 times the Global Warming Potential (GWP) of carbon dioxide and persists for over 100 years. (71) Many older N_2O systems with very large external tanks are designed to release N_2O whenever pressure increases. (72)

SUNNYBROOK HEALTH SCIENCES CENTRE

Over five years, Sunnybrook Hospital has consumed 32,600 Kg of N_2O. (73) This is equivalent to approximately 9,714,500 Kg of carbon dioxide. (73)
Sunnybrook Hospital is currently working on reducing the N_2O waste by minimizing the pressure of the tanks.

GLOVES WASTE IN HEALTHCARE[30]

- Unnecessary and inappropriate use of non-sterile gloves has been associated with cross-contamination and transmission of healthcare-associated infections (HAIs) – as gloves are used when they aren't needed, put on too early, taken off too late or not changed at critical points. (74)
- Pharmacists could consider revisiting when gloves should be used, and which type is appropriate for each level of risk.

"GLOVES OFF" CAMPAIGN IN NHS (ENGLAND)

The campaign aimed "to improve patient safety by ensuring that patients and their familiesare seen by staff with clean hands". (74) One of the ways they proposed to do so was to reduce overuse of non-sterile gloves.

The Lead Nurse for Infection Prevention and Control and Lead Practice Educators at the Great Ormond Street Hospital NHS Foundation Trust (GOSH) developed an educational awareness program for staff, including information on appropriate use of gloves and a risk assessment strategy for use of gloves when preparing intravenous medication. They also provided education to patients and parents through resources, posters and events.

POTENTIAL FOR REUSE OF UNUSED MEDICATIONS

- Significant quantities of unused medications are disposed of each year, wasting resources and increasing environmental harms. In the United States, it is estimated that approximately $3 billion of medications are wasted by hospitals each year and another $2 billion of medications are wasted by long term care facilities. (69) These medications are discarded even though they are unused due to various reasons: improvement of patient's health, dose changes, change in care facilities, death, medication expiry and associated regulations.
- In some jurisdictions, programs exist to collect these unused medications and redistribute them to patients or pharmacies in need [See examples below].

EXAMPLES OF REUSE OF UNUSED MEDICATIONS

State Prescription Drug Repository Programs (US)

- Collects unused prescription medications from individuals/organizations and redistributes to underserved patients
- 40 states implemented the program and regulations may differ from state to state.
- Common provisions:
  - Controlled substances are not accepted
  - All prescription medications must be unopened/sealed, tamper-evident packaging
  - Need to be checked by pharmacist

Pharmaswap (Netherlands)

- A shared marketplace for pharmacies/wholesales to sell medications approaching expiry date at an agreed price with another pharmacy.
- Pharmacy A will then send required information and prescription to Pharmacy B and Pharmaswap will help deliver. Opiates and cold-chain products are not eligible.
- During their 6-month pilot, 20 pharmacies participated and the destruction of 58 packages with a procurement value of €54,000 was avoided.

ACTION 11: CONSIDER REVISING ACTIVITIES TO REDUCE THE CLIMATE AND OTHER ENVIRONMENTAL IMPACTS OF PHARMACY OPERATIONS [6, 30]

Significant quantities of unused medications are disposed of each year, wasting resources and increasing environmental harms. In the United States, it is estimated that approximately $3 billion of medications are wasted by hospitals each year and another $2 billion of medications are wasted by long term care facilities. (75)

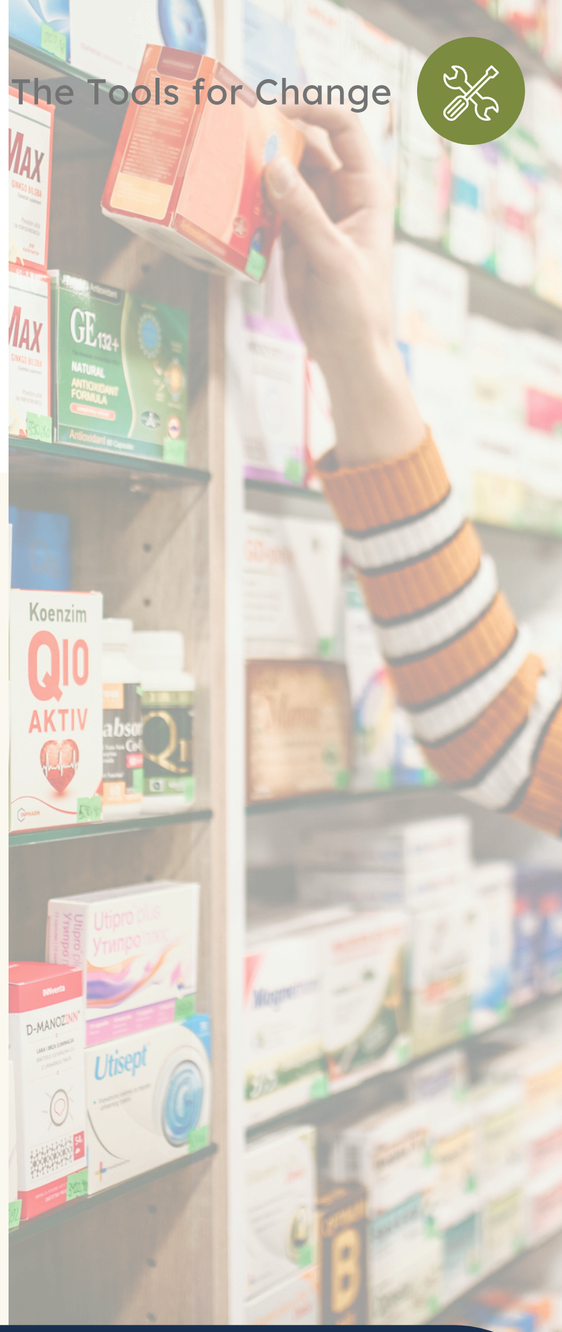
These medications are discarded even though they are unused due to various reasons: improvement of patient's health, dose changes, change in care facilities, death, medication expiry and associated regulations.

ADOPT GREEN PURCHASING STRATEGIES (30)

- Regularly monitor drug inventory to reduce overstocking (e.g. lean or Kanban systems); overstocking increases expired medications and unnecessary costs for disposal processes.
- Streamline ordering and delivery of medicines to reduce carbon emissions.
- Ensure medicine procurement policies incorporate, and where possible prioritize, manufacturers', suppliers', and distributors' commitments to sustainability.
- Purchase bulk bottles for drugs used in large quantities.

Strategies to Implement in Your Practice from Canadian Hospital Pharmacists

- Re-use large zip-loc bags for antibiotics when returned to pharmacy distribution centre in good condition
- Replace smaller zip-loc type bags used for patient refills and sorting/containing ward stock with small brown paper bags
- Re-use dosing bags where applicable
- Use dose-rounding protocols
- Batch commonly used medications
- Implement tracking systems to reduce missing doses
- Allow reuse of products returned to the pharmacy through unit dose and tamper tape
- Re-use styrofoam coolers and ice packs or return to distributors
- Attach patient-specific labelling for multidose products in hospital and transfer with the patient or send home on discharge
- Use climate-friendly packaging materials



MAKE YOUR PHARMACY/WORKSPACE ENERGY EFFICIENT

Lighting

- Consider switching to energy-efficient LED lighting. Keep in mind that more efficient lighting may be more costly initially but over time, brings long term energy savings, reduced GHG emissions and fewer materials from longer lighting lifespans.
- Consider installing motion sensors in infrequently used rooms (e.g. bathrooms, closets).

Water

- Consider setting the baseline temperature in water heaters to 49°C, aligning with Government of Canada's recommended baseline. The temperature is high enough to prevent growth of harmful bacteria (e.g. Legionella) while saving the energy required to ensure higher baseline temperatures.
- Insulate hot water pipes with foam to prevent heat loss.
- Check whether the pharmacy has water efficient, low-flow faucets based on provincial standards.
- Schedule inspections for toilets and plumbing leaks.
  - A slow drip at 1 drop per minute can waste 200 litres per year.

LIGHT BULB COMPARISON CHART*

Light Source	Lifetime (Hours)	Dimmable
Typical incandescent	1,000	Yes
Halogen	2,500-5,000	Dimmable above 60% power
Compact Fluorescent (CFL)	8,000-10,000	Check label – varies by design and manufacturer
High-quality LED	25,000	Check label; may require a specific dimmer type

Important! CFLs contain mercury.

*Reproduced with permission from The Green Office Toolkit

RESOURCES:

- The Green Office Toolkit
  - Provides evidence-based and evidence-informed, practical, and cost-effective ideas to make eco-friendly office improvements that could be applied to pharmacies or office workspace.

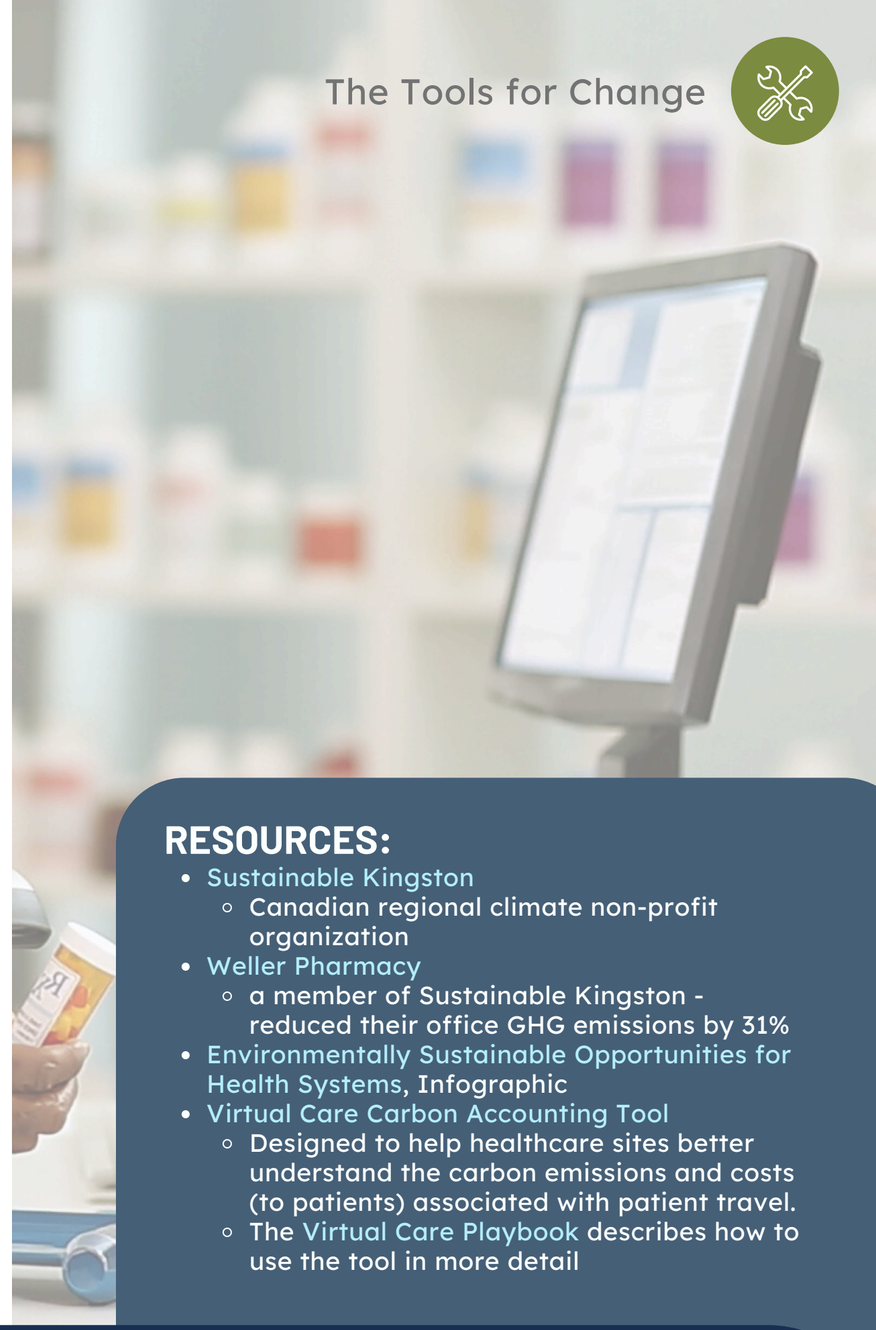
ACTION 11: CONSIDER REVISING ACTIVITIES TO REDUCE THE CLIMATE AND OTHER ENVIRONMENTAL IMPACTS OF PHARMACY OPERATIONS [6]

CONSIDER WHETHER MINIMIZING USE OF PAPER IS ENVIRONMENTALLY FEASIBLE IN YOUR SETTING

- Explore integrating technology in your practice/pharmacy
  - E-prescriptions, e-patient labeling, electronic communication/reporting (e.g. paper-less faxing), paperless pharmacy workflow software
  - Unsubscribe from paper mails/newsletters/journals or access them electronically based on pharmacy needs.
- Utilize virtual care for certain kinds of appointments (e.g., brief follow-ups). (30)
- Participate in regional environmental sustainability programs for collaborative benchmarking and knowledge sharing.

PAPERLESS WORKFLOW: UOFT DISCOVERY PHARMACY

- Accepts and sends faxes electronically through Kroll
- Programmed thermal printers to print parts of the patient's record that is necessary, instead of full details
- Digitalized documentation at the pharmacy and is saved in a retrievable format.



RESOURCES:

- Sustainable Kingston
  - Canadian regional climate non-profit organization
- Weller Pharmacy
  - a member of Sustainable Kingston - reduced their office GHG emissions by 31%
- Environmentally Sustainable Opportunities for Health Systems, Infographic
- Virtual Care Carbon Accounting Tool
  - Designed to help healthcare sites better understand the carbon emissions and costs (to patients) associated with patient travel.
  - The Virtual Care Playbook describes how to use the tool in more detail

ACTION 12: REVIEW DISASTER PREPAREDNESS FOR THE PHARMACY REGULARLY TO ENSURE CONTINUITY OF CARE

Natural disasters may result in drug shortages, by affecting manufacturing or transportation capacity. (76) Climate change increases the likelihood of extreme weather events that may lead to drug shortages or disrupt local supply. (77) For example, in 2017, Hurricane Maria disrupted the drug and health care manufacturing in Puerto Rico, one of the world's biggest manufacturing sites. Saline and around 40 drugs were impacted by the shortage. (78) During this time, the US imported supplies from factories overseas, rationed the supply, and looked into alternatives. (79, 82)

To be prepared for these natural disasters, pharmacy professionals should:

- Establish and review policies on procurement, and recommendations for managing shortages.
- Identify patient populations that are profoundly impacted during extreme weather events. Ensure appropriate protocols are in place to provide continuity of care during these times.
  - E.g. Patients receiving opioid agonist therapy and/or daily dispensing of medications might be especially affected by extreme weather events as they need to be physically present at the pharmacy to receive their medication.
- Continue to strengthen relationships with other local pharmacies/hospitals to build resiliency during extreme weather events.
- Develop/regularly update Disaster "Fan-Out" Lists to communicate with staff during extreme event(s).

STRATEGIES TO ENSURE CONTINUITY OF CARE DURING DRUG SHORTAGES

- Pharmacists should advise patients against hoarding medications or stockpiling.
  - E.g. Create a policy to be displayed to patients, that they are allowed to get only a certain number of short medications.
- Pharmacists to continue considering switching medication on shortage to a generic/brand as appropriate.
- Pharmacists to continue reassessing and collaborating with prescribers to consider deprescribing medications on shortage when appropriate.
- Continue communications with other pharmacies to secure medication supply or transfer patient to another pharmacy. (83, 84)

RESOURCES:

- CPhA's work and resources on Drug Shortages
- CSHP's work and resources on Drug Shortages
- CSHP Drug Shortages Pharmacy Specialty Network (PSN) – Free for CSHP members. Provides updates about drug shortages
- Drug Shortages Canada / Pénuries de médicaments Canada
- ASHP Guidelines on Managing Drug Product Shortages

HOW

Strategy and Partnerships

1 Education & Policy Development for Pharmacy Professionals and Trainees

Education & Policy Development for Pharmacy Professionals and Trainees

ACTION 13: INFORM AND EQUIP CURRENT AND FUTURE PHARMACY PROFESSIONALS THROUGH EDUCATION [30]

Revisit the current accreditation standards for the Canadian Pharmacy Professional Programs

- Consider including topics such planetary health, or sustainable climate resilient pharmacy as part of the curriculum. (85)

Develop and make resources on climate stewardship and climate resilience readily available

- E.g. CE credits, articles, training, helpful websites
- Consider reviewing with pharmacy students the impact of medication reviews on deprescribing unnecessary medications. (86)

RESOURCES:

- Learning outcomes for the initial education and training of pharmacists indicating where sustainability could be addressed, UK (2021)
- Sustainable Pharmacy: Piloting a Session on Pharmaceuticals, Climate Change, and Sustainability within a U.S. Pharmacy Curriculum, (2017)
  - 3 hour session (pre-course activities, lecture, panelists, group case-based learning) as part of a required 3rd-year pharmacy health policy course
- Laboratory session on emergency preparedness, US (2016)
  - 3 hours case-based learning session for 2nd-year pharmacy students as part of required laboratory course.
- International pharmacy groups working on climate resilience and sustainability, educational materials, publications, and resources for pharmacists and educators:
  - Pharmacy Declares, UK
  - RxforClimate, International
  - Pharmacists for the Environment Australia (PEA), Australia

ACTION 14: ENCOURAGE POLICY DEVELOPMENT TO SUPPORT A CLIMATE RESILIENT, LOW CARBON AND SUSTAINABLE HEALTH CARE SYSTEM

Collaborate with professional organizations to raise awareness of areas of improvement

- Professional organizations could work with health authorities to identify challenges and develop/implement solutions

CLIMATE CONSCIOUS PRACTICE SELF-AUDIT INSTRUMENT

- Currently being developed by the Centre for Practice Excellence, Leslie Dan Faculty of Pharmacy, University of Toronto:
  - Centre Administrator: Annalise Mathers
  - Researcher: Stella Fisher
  - Academic Director: Prof Zubin Austin

- Mission:
  - To create a tool that encourages community pharmacists to self-reflect on their environmentally sustainable practices to see how they could improve in the future
  - To provide a repository of information that allows the structure and ease of learning

RESOURCES:

- Canadian Association of Pharmacy for the Environment (CAPhE)
  - Mission: Promote and improve planetary health among the Canadian pharmacy profession
- Canadian Society of Hospital Pharmacists (CSHP)/CAPhE Sustainability Task Force
  - Purpose: The Task Force will recommend to the CSHP Board policy and program approaches to practice issues relating to environmental sustainability in pharmacy practice.

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