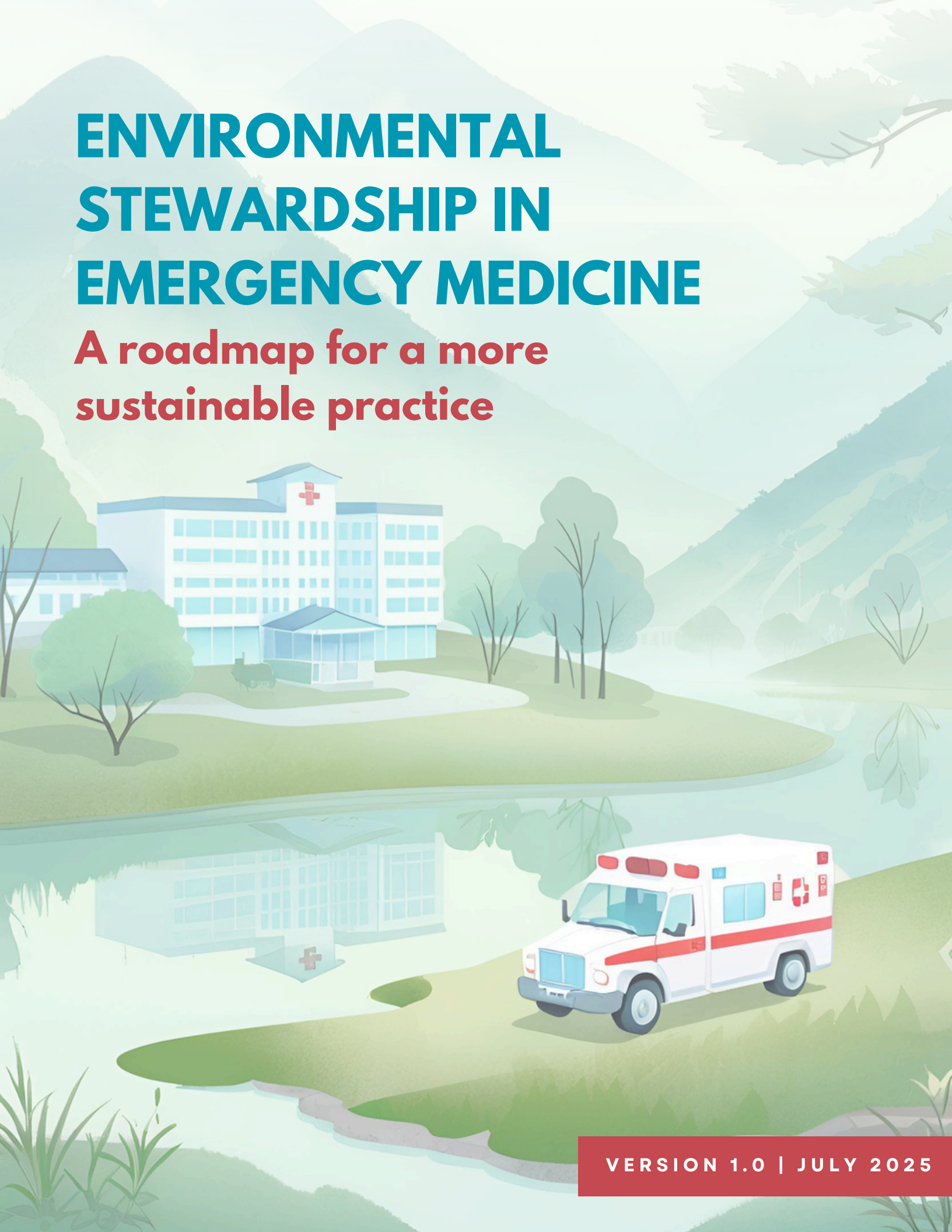
ENVIRONMENTAL STEWARDSHIP IN EMERGENCY MEDICINE

A roadmap for a more sustainable practice



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PURPOSE AND SCOPE

The climate crisis is not just an environmental issue; it is a pressing health crisis, much like the recent pandemic, that demands the urgent and immediate attention of the health care community. The escalating impact of climate change is profoundly affecting human health in numerous ways. Extreme weather events, such as heatwaves, hurricanes, and floods, are becoming more frequent and severe, leading to increased injuries, illnesses, and deaths. Rising temperatures exacerbate respiratory and cardiovascular conditions, while changing weather patterns contribute to the spread of infectious diseases. The continued degradation of natural resources and ecosystems disrupts food and water supplies, leading to malnutrition and waterborne diseases. Vulnerable populations, including the elderly, children, and those with pre-existing health conditions, are disproportionately affected, highlighting the inequities in health outcomes exacerbated by climate change.

As health care professionals, we are on the front lines, witnessing the direct and indirect impacts of climate change on our patients and communities. It is our responsibility to recognize these challenges and respond proactively. By integrating climate awareness into our practices, advocating for sustainable policies, and educating our patients about the health risks associated with climate change, we can mitigate its effects and promote a healthier future.

This guidebook is our call to action on climate change. It provides an overview of the key factors contributing to the crisis facing our planet and offers recommendations for actions we in emergency medicine can take to create sustainable workplaces and reduce our negative impact on the environment. It also suggests ways to integrate 'green' approaches into our clinical work and advocate for changes in our communities. Above all, it highlights our responsibility as clinicians to better understand the inequitable effects of planetary health on patient health and to bring these issues to the attention of elected officials and the wider community.

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HEALTH CARE AND THE CLIMATE CRISIS

The health care sector is responsible for approximately 5% of global greenhouse gas emissions and has a carbon footprint equivalent to 514 coal-fired power plants [1]. If it were a country, it would be the fifth largest polluter on earth [1]. In Canada, the health care system contributes 5% of our nation's total carbon footprint, far higher than the airline industry (1%; 2]. Under a 'business as usual' scenario, emissions from health care could triple between now and 2050 [1].

Hospitals, clinics, and other health care facilities consume vast amounts of energy for heating, cooling, lighting, and medical equipment, all of which contribute significantly to carbon emissions [1-2]. The health care sector also generates a substantial amount of waste, both medical and pharmaceutical, which further exacerbates environmental degradation. The production, transportation, and disposal of medical supplies and pharmaceuticals also contribute to the industry's overall carbon footprint [1].

HEALTH CARE SHOULD BE WITHOUT HARM.

WHY FOCUS ON THE ED?

Emergency medicine plays a pivotal role in both contributing to and being impacted by climate change. Emergency departments (EDs) are highly resource-intensive, operating around the clock with continuous energy demands for lighting, heating, cooling, and powering critical medical equipment.

Although hospitals make up only a small fraction of building floor space, they consume a disproportionate amount of energy.

For instance, in 2009, Canadian hospitals constituted roughly 2%–3% of commercial building floor area but about 5% of energy use [3]. The carbon footprint associated with this energy use is significant. Canada's health care sector is estimated to produce roughly 4.6%–5% of the nation's greenhouse gas emissions [4].

Beyond energy use, EDs generate vast amounts of waste, including single-use medical supplies, personal protective equipment (PPE), and pharmaceuticals. The life cycle of these items—from production to disposal—further exacerbates their environmental impact. Many single-use products are plastic-based, derived from fossil fuels, and their disposal, often via incineration, releases greenhouse gases and harmful pollutants [4].

However, by adopting sustainable practices, emergency medicine can reduce its environmental impact and bolster resilience against climate change. Implementing energy-efficient technologies, minimizing waste through the Choosing Wisely initiative, and encouraging sustainable procurement are just a few strategies that can make a significant difference. Additionally, emergency departments can lead by example, fostering a culture of sustainability by educating both staff and patients on the importance of climate action [3-4].

IMPACTS OF CLIMATE CHANGE

INFECTIOUS DISEASES

Climate change is significantly altering the distribution and dynamics of infectious diseases, exposing 'immunologically naive' populations to new health risks. The expansion of disease ranges has led to increased morbidity and mortality among previously unaffected populations. For example, black-legged ticks have expanded northward in Canada, contributing to a steep rise in Lyme disease cases from 2004 to 2019. Other tick-borne illnesses, such as anaplasmosis, Powassan virus, and Borrelia miyamotoi, are also expected to become more prevalent. As well, warmer conditions could support the survival of exotic vectors, potentially enabling diseases such as Eastern equine encephalitis and West Nile virus to establish themselves in Canada [5].

Climate change has also fuelled an increase in the frequency and scale of infectious disease outbreaks. Cholera outbreaks have grown in size and frequency due to extreme weather events, such as droughts, floods, and cyclones [6]. In Africa, in areas where there is already high meningitis transmission, rising temperatures and desertification may intensify meningococcal meningitis transmission, although a projected decrease in global wind speeds by 2100 might reduce the airborne spread of dust and associated pathogens [7].

These patterns, just a few among many, highlight the urgent need to monitor and address the evolving risks of infectious diseases as a consequence of climate change.

MENTAL HEALTH

Climate change also poses significant risks to mental health, with extreme weather events such as floods, wildfires, hurricanes, drought, sea level rise, and melting permafrost increasingly affecting Canadians. These events not only cause immediate distress but also lead to long-term impacts such as economic instability, food and water insecurity, and displacement from homes, further worsening mental health outcomes. Vulnerable populations, including those with poor determinants of health, housing instability, and food insecurity, are particularly at risk, as these factors amplify their exposure to climate-related stressors [8].

The mental health impacts of climate change can include the worsening of pre-existing conditions, the emergence of new disorders (namely PTSD and anxiety), and additional stressors like grief, vicarious trauma, and the disruption of community cohesion and psychosocial well-being. Behavioural risk factors, such as increased substance use, may also be influenced by climate-related stress. Health inequities are likely to deepen as vulnerable groups bear the brunt of these compounded risks [8].

HEAT EXPOSURE

It is well-established that prolonged exposure to high temperatures can lead to heat exhaustion, heatstroke, dehydration, and exacerbations of pre-existing conditions such as cardiovascular, renal, and respiratory diseases. The elderly, children, individuals with chronic illnesses, those living in urban heat islands, and populations without access to cooling infrastructure are particularly vulnerable [9].

Climate models project that the frequency, duration, and intensity of heatwaves will increase significantly across Canada in the coming decades, particularly in more northern latitudes. These events strain emergency departments, especially in urban centres, as they coincide with higher hospital admissions and increased emergency calls for heat-related symptoms. Extreme heat also disproportionately impacts those experiencing homelessness, outdoor workers, and marginalized communities with limited access to cooling, housing, or hydration, highlighting the intersection of climate change, health equity, and emergency medicine [9].

DISASTER EFFECTS

During climate-related events, emergency departments face surges in patient volumes and complex presentations. Wildfire smoke, laden with fine particulate matter (PM2.5), volatile organic compounds, and other noxious pollutants, poses a serious health threat. Exposure can trigger respiratory exacerbations (asthma, COPD), cardiovascular events, and eye and throat irritation. Patients with underlying pulmonary or cardiac conditions are especially at risk, and EDs often see an uptick in visits during wildfire seasons.

EMERGENCY DEPARTMENTS SERVE AS FRONTLINE RESPONDERS DURING CLIMATE-RELATED EVENTS.

In 2023 alone, western Canada experienced its worst wildfire season on record, affecting millions and exposing populations to sustained periods of poor air quality.

Floods, another intensifying consequence of climate change, present both immediate and long-term health risks. Contact with floodwaters can lead to skin infections, soft tissue injuries, and exposure to waterborne pathogens (E. coli, Salmonella, leptospirosis). Power outages, loss of refrigeration for medications, and displacement following floods further contribute to emergency presentations. Mold growth in homes after flooding also increases the risk of respiratory illness, particularly in children and immunocompromised individuals [9,10].

These are but a few examples of the growing health impacts of climate-driven disasters, with EDs serving as frontline responders during these events.

RESPIRATORY ISSUES (POLLUTION, POOR AIR QUALITY)

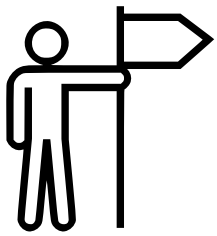
Climate change contributes to worsening air quality through increased ground-level ozone, wildfire smoke, and airborne allergens, all of which exacerbate respiratory conditions and drive up ED visits. Ground-level ozone, formed by the interaction of sunlight with pollutants from vehicles and industrial sources, increases with higher temperatures. This pollutant irritates the lungs, promotes bronchoconstriction, and aggravates conditions such as asthma and bronchitis [11].

Rising carbon dioxide levels also extend the growing season for allergenic plants, leading to longer and more intense pollen seasons. Combined with wildfire smoke and urban air pollution, this creates a cumulative burden on respiratory health [11].

EDs are already seeing increased visits for asthma attacks, COPD exacerbations, and respiratory infections linked to these environmental exposures. Vulnerable populations, including children, the elderly, and those living in areas with high traffic or industrial emissions are disproportionately affected [11].

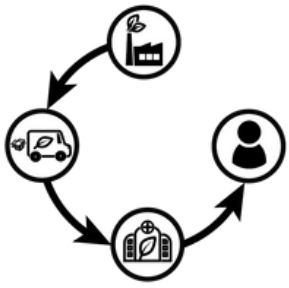
ACTION ITEMS

LEADERSHIP



- [ ] Establish a 'green' steering committee to guide and oversee the implementation of sustainability initiatives, building on existing efforts [12,13].
- [ ] Ensure the committee is represented in departmental meetings.
- [ ] Foster a 'green' culture by having the committee articulate a clear vision for sustainability in emergency medicine and demonstrate strong, visible commitment to this cause [14].
- [ ] Develop and enforce internal policies prioritizing environmental sustainability, including energy usage, waste management, and procurement guidelines [15].
- [ ] Advocate for broader health care policies that support environmental sustainability by engaging with policymakers, participating in networks such as the Canadian Association of Physicians for the Environment (CAPE) and the Canadian Coalition for Green Health Care (CCGHC), and backing legislation aimed at reducing health care's environmental footprint [16].
- [ ] Promote ongoing education for ED staff and learners on the environmental impact of health care practices through regular seminars, workshops, and presentations of current research on climate change's effect on health [17].
- [ ] Establish metrics to track the department's environmental impact and progress toward sustainability goals, regularly reviewing and reporting these metrics to maintain transparency and accountability [18].
- [ ] Encourage a collaborative environment by using feedback to improve practices, celebrating successes (no matter how small!) and learning from challenges.

SUPPLY CHAIN



- [ ] Whenever possible, opt for reusable medical supplies, such as gowns, drapes, and sterilizable instruments (e.g., tourniquets, suture trays, and speculums), instead of single-use items [19].
- [ ] Work with procurement to analyze monthly and yearly purchases of disposable instruments to estimate usage rates. Determine the cost of reusable alternatives and calculate their potential return on investment [20,21].
- [ ] Partner with suppliers who hold sustainability certifications and offer maintenance and take-back programs for medical devices and packaging.

- [ ] **Obtain turnaround time and sterilization costs from medical device reprocessing. Use the following stocking formula:**

Stocking Formula

Turnaround time (days) **x** daily use **x** (1 + safety factor) = **Stocking Number**

Initial Investment Formula

Reusable instrument cost **x** stocking number = **Initial Investment**

Estimated Annual Cost

Yearly use **x** sterilization cost + attrition rate **x** initial investment = **Annual Cost**

Break-Even Time

Break-even time = initial investment / (reusable cost **x** annual use - annual cost)

- [ ] **Partner with suppliers who hold sustainability certifications and offer maintenance and take-back programs for medical devices and packaging** [20,21].
- [ ] **Advocate for supplies made from recycled or biodegradable materials (e.g., recycled paper, paper basins) and choose products with minimal, recyclable, or compostable packaging** [22].
- [ ] **Implement automated inventory systems to avoid overstocking and reduce waste from expired products. Adopt a Just-in-Time (JIT) system to minimize excess stock** [23].
- [ ] **Streamline procurement by standardizing supplies, which reduces environmental impact and simplifies waste management. Coordinate with other departments to consolidate orders, decreasing shipment frequency and associated emissions** [13,21].
- [ ] **Integrate sustainability factors, such as reduced packaging, recyclable materials, and environmental reporting, into supplier contracts and procurement decisions** [22].
- [ ] **Source from local or regional suppliers when possible to reduce transportation distances and emissions** [13].
- [ ] **Use lifecycle assessments to understand the environmental impact and 'afterlife' of supplies, factoring this into procurement decisions** [24].

MINIMIZING OUR WORK'S ENVIRONMENTAL IMPACT

Our work in emergency medicine can be resource-intensive. Therefore, emergency teams should focus on strategies to provide lower-carbon and lower waste care. By promoting health-enhancing behaviors, such as smoking cessation, spending time in nature, adopting a plant-rich diet (which produces fewer greenhouse gas emissions than animal agriculture), and increasing physical activity, we can improve patient health and reduce the demand for intensive medical services. These interventions are especially effective during the teachable moments that arise in emergency encounters [13,20,21,25].

Below are some practical strategies to reduce carbon emissions and waste while promoting health:

- ☐ **Track Emergency Department waste by conducting visual audits of waste bins to monitor waste production.**
- ☐ **Educate staff on proper waste segregation and reduction efforts, possibly with informative signs to guide correct disposal.**
- ☐ **Encourage the use of reusable personal items, such as coffee mugs, water bottles, and food containers.**
- ☐ **Reduce pharmaceutical and clinical waste by implementing evidence-based prescribing practices and patient education programs to minimize waste. For example, use the Choosing Wisely guidelines (see appendix) to inform decisions** [26].
- ☐ **Promote deprescribing to interrupt unnecessary prescribing cascades and discontinue non-evidence-based medications. For example, address prescribing cascades, such as using furosemide for edema caused by calcium channel blockers, and discontinuing medications that lack supporting evidence.**
- ☐ **Implement medication stewardship programs focusing on high-carbon medications such as inhalers by:**
  - ☐ **Specifying criteria for inhalers versus nebulizers.**
  - ☐ **Establishing protocols for sending inhalers home and managing inhaler/nebulizer equipment.**
  - ☐ **Replacing high-carbon MDI inhalers with lower-carbon options, such as terbutaline instead of salbutamol and avoiding brand-name medications that have a higher carbon footprint.**
    - Avoid brand-name Ventolin (2x the GHG of generic!).
    - Symbicort controller and rescue combination.
    - Controller substitutions for asthma and COPD.
- ☐ **Enhance medication disposal instructions by including disposal information in discharge instructions to ensure proper disposal.**
- ☐ **Reduce unnecessary cannulation, as routine cannulation can lead to patient discomfort and wasted resources. Increase awareness through posters and educational sessions on appropriate cannula use, including a revised policy to allow short-term cannulas to omit Bionectors (IV connectors).**

- ☐ **Implement the Gloves Off Campaign to reduce unnecessary plastic glove usage, which can decrease landfill waste by 21 tonnes annually. More information can be found at Sustainable Healthcare.**

- ☐ **Make use of Park Prescriptions by prescribing time in nature for appropriate medical conditions, including for** [27]**:** Cancer Care, Cardiovascular Health, Elder Health, Mental Health, Respiratory Health & Immunity, ADHD, Allergies & Asthma, Healthy Weight & Activity, Mental Health, Pregnancy and Early Life.

- ☐ **Animal agriculture accounts for 15-25% of all greenhouse gas emissions** [28]**. We can promote healthy eating by counselling patients on the importance of a plant-rich diet for various health conditions. The Canada Food Guide offers four simple recommendations** [29]**:**
  - Fill half your plate with fruits and vegetables.
  - Fill a quarter with whole grains.
  - Fill a quarter with protein, emphasizing plant proteins.
  - Choose water as your drink of choice.

- ☐ **Encourage physical activity by highlighting the benefits of regular activity across multiple health conditions. Patients should aim for 30 minutes of moderate-intensity activity five times a week.**

- ☐ **Train ED staff in smoking cessation, which will reduce carbon emissions from cigarette consumption and its downstream health effects.**

- ☐ **Explore virtual care options to offer to emergency department patients to improve access to care while reducing resource use.**

TRANSPORTATION

Promoting sustainable transportation options within health care can significantly reduce carbon emissions and enhance employee well-being. For instance, e-meetings allow for virtual attendance at medical conferences, minimizing travel-related emissions and waste.

- ☐ **Create charging and storage solutions to facilitate the use of e-scooters, e-bikes, and other Battery-Powered Micro Mobility (BPMM) alternatives.**
  - The average range of BPMM devices is between 20-50 km, which aligns well with commuting distances. In Toronto, where the average commute is 9.2 km, e-bikes can extend the range for many workers. A 15% reduction in personal car travel could lead to a 12% decrease in CO_2 emissions, with each individual e-bike reducing emissions by approximately 225 kg per year [30,31].

- ☐ **Providing secure storage for BPMM is essential, as they require significantly less parking space compared to cars:**
  - A single car parking spot (2.4 meters x 4.8 meters) can accommodate up to ten BPMM.
  - The average vehicle carries 1.2 people, compared to 1 per BPMM.
  - Adequate storage source: **The City of Toronto's Bike Storage Guide**.

Encouraging a culture of common good within the workplace is vital for enhancing employee engagement. As defined by Schiefer and Van der Noll in 2016, this concept involves fostering responsibility, social participation, and engagement among colleagues [32]. Increased interactions among coworkers, facilitated by BPMM usage, can lead to a greater sense of community and happiness in the workplace [32].

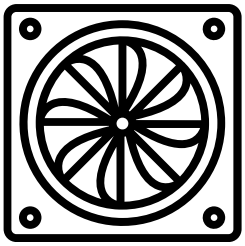
- ☐ **Advocate for safe cycling infrastructure connecting health care facilities with transit hubs; e-bike riders are more likely to ride if infrastructure is available** [33]**.**

- [ ] **Encourage virtual meetings for hospital conferences to minimize carbon emissions.**
  - A 2019 study found that emissions from 4,500 participants totaled 8,646 metric tons, equivalent to the weekly carbon footprint of approximately 9,366 American households [34].

- [ ] **Implement a no-idling policy outside the emergency department to reduce emissions.**

- [ ] **Encourage the use of tele-health to reduce the emissions associated with patient transport.**
  - Carbon savings ranged from 0.69 kg CO_2e (carbon dioxide equivalent) to 893 kg CO_2e per encounter. Distances saved also ranged from 6.1 to 3,386 km [35].

OUR PHYSICAL AREA



To foster a more sustainable environment within emergency departments, we can implement strategies that focus on reducing paper usage, conserving water, and minimizing energy consumption.

- [ ] **Promote the adoption of digital tools and electronic health records to significantly reduce our reliance on paper** [36].

- [ ] **Reduce departmental water usage by ensuring sinks are turned off when not in use** [37,38]. **Promptly report any water leaks.**

- [ ] **Implement linen conservation measures by:**
  - Not storing clean linen in patient rooms.
  - Removing patient items from soiled linen before bagging.
  - Using pillows to position patients instead of blankets.
  - Avoiding cutting patient gowns to change IVs.

- [ ] **Reduce departmental energy consumption by** [39-41]**:**
  - Powering down non-critical medical equipment between uses.
  - Using stairs instead of elevators whenever possible.
  - Turning off lights when they are not in use.
  - Advocating for the procurement of energy-efficient equipment.
  - Switch to LED lighting, which can save approximately 520 tonnes of CO_2 per year.
  - Implement smart lighting or timed switches in patient rooms that default to dimmer settings at night.
  - Ensure computer screens are turned off when not in use, saving an estimated 800 tonnes of CO_2 annually.

- [ ] **Strive for climate literacy within the ED by creating a workshop series for staff to learn about the environmental impacts of hospital operations and the interventions being developed to address these issues. Encourage collaborative green teams. Provide education on the Choosing Wisely Canada recommendations to reduce unnecessary medication prescribing and investigations, lowering greenhouse gas emissions without compromising patient care** [42].
  - Research indicates that the carbon cost of various imaging examinations is significant [43]:
    - Abdominal Ultrasound: 1.15 kg CO_2
    - CT scan: 6.61 kg CO_2
    - MRI scan: 19.72 kg CO_2
  - Notably, approximately 50% of imaging performed may not be indicated by medical guidelines [44].

CHOOSING WISELY CANADA

EMERGENCY MEDICINE RECOMMENDATIONS

Choosing Wisely Canada works to advocate for the reduction of unnecessary tests and treatments in Canadian medical care. Their mission statement of responsible resource allocation aligns with the spirit of this toolkit. Choosing Wisely Canada and the Canadian Association of Emergency Physicians (CAEP) partnered to compile 10 recommendations for emergency department care and they are summarized below [26]:

1. **Don't order CT head scans in adults and children who have suffered minor head injuries (unless positive for a validated head injury clinical decision rule).**
   - Example decision making tools include Canadian CT head rule for adults, and for children the Canadian Assessment of Tomography for Childhood Head Injury (CATCH) and/or PECARN rules.

2. **Don't prescribe antibiotics in adults with bronchitis/asthma and children with bronchiolitis.**
   - Most patients with respiratory symptoms from bronchitis, asthma and bronchiolitis in children do not have bacterial infections.
   - Antibiotics have the potential to cause antibiotic induced diarrhea, C.difficile infection and widespread antibiotic resistance.

3. **Don't order lumbosacral (low back) spinal imaging in patients with non-traumatic low back pain who have no red flags/pathologic indicators.**
   - Imaging of the lower spine for symptomatic low back pain does not improve outcomes, exposes the patient to unnecessary ionizing radiation and contributes to flow delays without providing additional value.

4. **Don't order neck radiographs in patients who have a negative examination using the Canadian C-spine rules.**
   - The Canadian C-spine rule has been validated and implemented successfully in Canadian centres, and physicians should not order imaging unless this rule suggests otherwise.
   - Unnecessary radiography delays care, may cause increased pain and adverse outcomes (from prolonged spinal board immobilization), and exposes the patient to ionizing radiation without any possible benefit.

5. **Don't prescribe antibiotics after incision and drainage of uncomplicated skin abscesses unless extensive cellulitis exists.**
   - Antibiotics may be considered when patients are immunocompromised, systemically ill, or exhibit extensive surrounding cellulitis or lymphangitis.

6. **Don't order CT head scans in adult patients with simple syncope in the absence of high-risk predictors.**
   - In the absence of high risk predictors a CT head is unlikely to aid in management of patients with syncope.

7. **Don't order CT pulmonary angiograms or VQ scans in patients with suspected pulmonary embolism until risk stratification with decision rule has been applied and when indicated, D-dimer biomarker results are obtained.**
   - CTPAs have a risk of causing allergic reaction and AKI, expose patients to ionizing radiation, and may contribute to increased length of stay and misdiagnosis.

8. **Don't routinely use antibiotics in adults and children with uncomplicated sore throats.**
   - Evidence shows that antibiotics should only be used in patients with high-risk clinical prediction scores for GAS and confirmatory testing.

9. **Don't order ankle and/or foot X-rays in patients who have a negative examination using the Ottawa ankle rules.**
   - The Ottawa ankle rules are validated in children and adults to reduce the number of unnecessary X-rays without negatively affecting patient care.

10. **Don't use antibiotics in adults and children with uncomplicated acute otitis media.**
    - For uncomplicated otitis media in healthy non-toxic patients over 6 months with mild disease, observation for 48-72 hours before administration of antibiotics should be employed.

PEDIATRIC EMERGENCY MEDICINE RECOMMENDATIONS

1. **Do not obtain radiographs in children with bronchiolitis, croup, asthma, or first-time wheezing.**
   - Radiographs should not be routinely obtained unless findings such as significant hypoxia, focal abnormalities on lung exam, prolonged course of illness, or severe distress are present.

2. **Do not obtain screening laboratory tests in the medical clearance process of pediatric patients who require inpatient psychiatric admission unless clinically indicated.**
   - A large body of evidence, in both adults and children, has shown that routine laboratory testing without clinical indication is unnecessary and adds to health care costs.

3. **Do not order laboratory testing or a CT scan of the head for a pediatric patient with an unprovoked, generalized seizure or a simple febrile seizure who has returned to baseline mental status.**
   - Blood tests such as electrolyte panels should not be routinely ordered and are only indicated in specific circumstances based on history and clinical examination findings.
   - CT scans are associated with radiation-related risk of cancer, increased cost of care, and added risk if sedation is required to complete the scan.
   - A head CT scan may be indicated in patients with a new focal seizure, new focal neurologic findings, or high-risk medical history (such as neoplasm, stroke, coagulopathy, sickle cell disease, age <6 months).

4. **Do not obtain abdominal radiographs for suspected constipation.**
   - Constipation is a clinical diagnosis and does not require testing.
   - Use of abdominal radiographs to diagnose constipation has been associated with increased diagnostic error.

5. **Do not obtain comprehensive viral panel testing for patients who have suspected respiratory viral illnesses.**
   - Testing should be reserved for high-risk patients and those whose clinical management will be clearly affected.

Applying these recommendations is not only more environmentally responsible, but improve patient care by eliminating unnecessary testing and treatments which carry their own risks with them. Patient education on the rationale behind decisions to limit testing and treatment in these common presentations will be crucial to ensure successful implementation of these recommendations. These are strategies that can be implemented immediately by all emergency department practitioners to yield tangible results in environmentally responsible resource stewardship.

GLOSSARY

Accreditation Standards - Accreditation Canada evaluates health care facilities based on national standards for quality and operational efficiency. Recently, new guidelines promoting environmental stewardship have been introduced for these facilities.

Battery-Powered Micro Mobility (BPMM): Small, lightweight, battery-powered transportation devices such as electric bikes, scooters, and skateboards designed for short-distance travel, promoting sustainable and efficient urban mobility.

Break-Even Time: The time required for the benefits of an investment or action to offset its initial costs, such as the environmental or financial savings gained from adopting a new technology.

Carbon Footprint: The total amount of greenhouse gases emitted, directly or indirectly, by an individual, organization, product, or activity, measured in carbon dioxide equivalents (CO_2e).

Climate Literacy: The understanding of climate science and its implications, enabling individuals to make informed decisions and take action to address climate change effectively.

Circular Economy: An approach to economic growth focused on benefiting businesses, society, and the environment by keeping products in circulation, beyond simple recycling. It emphasizes reducing waste and replenishing natural resources.

De-prescribing: The process of intentionally stopping or reducing unnecessary or potentially harmful medications to improve a patient's health outcomes and quality of life.

Divesting Funds: Redirecting investments from conventional portfolios to low-carbon ones, significantly reducing greenhouse gas emissions.

Greenhouse Gas (GHG) Emissions: GHGs include gases like carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), and fluorinated gases (F-GHGs) that contribute to global warming.

Green Hospital Scorecard: The annual benchmarking survey of environmental performance carried out by the Canadian Coalition for Green Health Care provides both comparative and retrospective information for participants.

HVAC Systems: Heating, Ventilation, and Air Conditioning systems that produce a considerable share of GHG emissions in facilities.

Just-in-Time (JIT) System: A management strategy that reduces inventory waste by producing or delivering goods only as they are needed, minimizing storage and associated costs.

Lifecycle Assessments: A systematic method for evaluating the environmental impacts of a product, process, or service throughout its entire life cycle, from raw material extraction to disposal.

Nature-based Solutions: Using sustainable designs and natural elements in the built environment to support resilience and adaptation. Examples include rain gardens, green roofs, trees, pollinator gardens, and native plants.

Net-zero: The goal of balancing greenhouse gases emitted and removed from the atmosphere. CO_2 emissions make up the majority, over 80%, of GHGs and are classified into Scope 1 (direct emissions like heating and cooling), Scope 2 (indirect emissions from purchased utilities), and Scope 3 (indirect emissions from supply chains and travel). To mitigate severe climate impacts, global net carbon emissions need to decrease by 45% from 2010 levels by 2030, aiming to achieve net-zero by around 2050.

Sustainable Prescribing: Optimizing medication choices to reduce the volume prescribed. In certain cases, providers can switch to medications with lower GHG impacts, such as alternative inhalers.

Sustainable Procurement: Incorporating environmental sustainability into the evaluation criteria for purchasing or leasing property, goods, or services, factoring in their environmental impact.

ORGANIZATIONS WITH KEY RESOURCES

LEADERSHIP

- **CAPE (Canadian Association of Physicians for the Environment) -** supporting physicians to be advocates for healthier environments and ecosystems - **https://cape.ca/**

- **Climate Emergency Jumpstart Kit -** an overview of key actions that health system leaders can initiate to move towards a climate-resilient, sustainable health system. **https://greenhealthcare.ca/wp-content/uploads/2024/11/EN_Streamline-your-journey-guidebook_2024.pdf**

- **Divesting From Fossil Fuels -**a guide on shifting away from fossil fuel investments. **https://greenhealthcare.ca/phase-out-fossil-fuel-investments/**

TRANSPORTATION

- **Prescribing Active Transport -** Prescribing Active Travel for Healthy People and a Healthy Planet: A Toolkit for Health Professionals (PDF). **https://res.cloudinary.com/capeacme/image/upload/v1522366665/2.Report_-_Prescribing_Active_Travel_for_Healthy_People_and_a_Healthy_Planet_-_A_Toolkit_for_Health_Professionals.pdf**

- **Improving cycling infrastructure -** Transportation: Bike Friendly Streets PEACH Byte (PDF). **https://peach.healthsci.mcmaster.ca/wp-content/uploads/2024/04/Transportation-Bike-Friendly-Streets.pdf**

- **PEACH (Partnerships for Environmental Action by Communities within Healthcare systems) Health Ontario -** PEACH fosters partnerships across Ontario's health care facilities to support climate action by providing a central hub for sharing initiatives, resources, and collaboration opportunities while offering guidance on sustainability and environmental action. **https://peach.healthsci.mcmaster.ca/**

SUPPLY CHAIN

- **Life Cycle Assessments -** Green Building Canada guide to lifecycle assessment including explanation of the process and links to free resources that can be used to conduct lifecycle assessments. **https://greenbuildingcanada.ca/green-building-guide/life-cycle-assessment-lca/**

MORE KEY GREEN ORGANIZATIONS

- **Choosing Wisely Canada -** Emergency Medicine - general overview of responsible resource stewardship practices in emergency medicine. **https://choosingwiselycanada.org/recommendation/emergency-medicine/**

- **Give the Test a Rest** - Toolkit to apply to emergency medicine and reduce unnecessary ED lab testing orders. **https://choosingwiselycanada.org/toolkit/give-the-test-a-rest/**

- **PaRx Prescription for Nature -** Time in nature has health promoting benefits even in the absence of physical activity. PaRx is a program for licensed health care practitioners (nurses, physicians, PTs) to prescribe nature to their patients. **https://www.parkprescriptions.ca/en/prescribers**

- **Environmentally sustainable medicine** **https://networks.sustainablehealthcare.org.uk/sites/default/files/media/Green%20ED.pdf**

- **Preparing Canada's Health Care Buildings for Net-Zero** **https://greenhealthcare.ca/net-zero-ready/**

REFERENCES

1. Smith L. **The nexus between climate change and healthcare.** [Internet]. The Health Policy Partnership. 2022, Jan 19. [cited 2025 May 29]. Available from: https://www.healthpolicypartnership.com/the-nexus-between-climate-change-and-healthcare/

2. Duong D. **How Canadian hospitals are decreasing carbon emissions.** CMAJ. 2023 Apr 24;195(16):E594. https://doi.org/10.1503/cmaj.1096048

3. Nguyen, D. **Dan's dose of the day – Energizing your hospital.** ThoughtWire. 2020, July 9. [cited 2025 May 30]. Available from: https://blog.thoughtwire.com/energizing-your-hospital

4. Health Care Without Harm. **Canada – Health sector emissions fact sheet.** Global Road Map for Health Care Decarbonization. 2021. [cited 2025 May 30]. Available from: https://healthcareclimateaction.org/fact-sheets/en/English%20-%20Canada

5. Ogden NH, Bouchard C, Brankston G. Infectious diseases. In Berry P, Schnitter R, editors. **Health of Canadians in a changing climate: Advancing our knowledge for action.** Ottawa, ON: Government of Canada; 2022. p. 366-467. Available from: https://changingclimate.ca/health-in-a-changing-climate/chapter/6-0/

6. World Health Organization. **Disease Outbreak News; Cholera – Global situation.** 2023, Feb 11. [cited 2025 May 29]. Available at: https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON437

7. Charnley GE, Kelman I. Perspectives on climate change and infectious disease outbreaks: is the evidence there? NPJ Clim. Action 2024 July;3, 61. https://doi.org/10.1038/s44168-024-00115-3

8. Hayes K, Cunsolo A, Augustinavicius J. **Mental health and well being.** In Berry P, Schnitter R, editors. Health of Canadians in a changing climate: Advancing our knowledge for action. Ottawa, ON: Government of Canada; 2022. p. 226-285. Available from: https://changingclimate.ca/health-in-a-changing-climate/chapter/4-0/

9. Gosselin P, Campagna C, Demers-Bouffard D. **Natural Hazards.** In Berry P, Schnitter R, editors. Health of Canadians in a changing climate: Advancing our knowledge for action. Ottawa, ON: Government of Canada; 2022. p. 114-225. Available from: https://changingclimate.ca/health-in-a-changing-climate/chapter/3-0/

10. Berry P, Enright P, Varangu L. **Adaptation and health system resilience.** In Berry P, Schnitter R, editors. Health of Canadians in a changing climate: Advancing our knowledge for action. Ottawa, ON: Government of Canada; 2022. p. 668-755. Available from: https://changingclimate.ca/health-in-a-changing-climate/chapter/10-0/

11. Egyed M, Blagden P, Plummer D. **Air quality.** In Berry P, Schnitter R, editors. Health of Canadians in a changing climate: Advancing our knowledge for action. Ottawa, ON: Government of Canada; 2022. p. 286-365. Available from: https://changingclimate.ca/health-in-a-changing-climate/chapter/5-0/

12. UC Davis Health. **Environmentally sustainable emergency medicine.** 2023, July 24. [cited 2025 May 30]. Available at: https://health.ucdavis.edu/news/headlines/environmentally-sustainable-emergency-medicine/2023/07

13. World Health Organization. **Environmentally sustainable health systems: A strategic document.** 2017, Feb 7. [cited 2025 May 30]. Available at: https://www.who.int/publications/i/item/WHO-EURO-2017-2241-41996-57723

14. American Hospital Association. [Internet]. **Supporting efficiency through sustainability.** Sustainability roadmap for health care. c2025. [cited 2025 May 30]. Available at: https://www.aha.org/sustainability

15. Australasian College for Emergency Medicine. [Internet]. **Environmental sustainability practices in emergency departments.** 2024, June. [cited 2025 May 30]. Available at: **https://acem.org.au/getmedia/4e106709-0948-4a4d-a9d5-4d46d681f833/ACEM-EPA_-Environmental-sustainability-practices-in-EDs**

16. UK Health Alliance on Climate Change. [Internet]. **London: UK Health Alliance on Climate Change.** c2025. [cited 2025 May 30]. Available at: **https://ukhealthalliance.org/**

17. **Healthcare Sustainability & Public Health: Yale School of Public Health** [Internet]. [cited 2025 May 30]. Available at: **https://ysph.yale.edu/yale-center-on-climate-change-and-health/healthcare-sustainability-and-public-health/**

18. Price K. **How to improve emergency department sustainability: GreenED explained.** Hospital Healthcare Europe. 2023, Nov 12. [cited 2025 May 30]. Available at: **https://hospitalhealthcare.com/clinical/emergency-and-critical-care/how-to-improve-emergency-department-sustainability-greened-explained/**

19. McGain F, Naylor C. **Environmental sustainability in hospitals - a systematic review and research agenda.** J Health Serv Res Policy. 2014 Oct;19(4):245-52. **https://doi.org/10.1177/1355819614534836**

20. Practice Greenhealth. [Internet]. **Sustainable procurement guide.** c2025. [cited 2025 May 30]. Available at: **https://practicegreenhealth.org/sustainableprocurementguide**

21. Health Care Without Harm. **Sustainable procurement.** c2025. [cited 2025 May 30]. Available at: **https://us.noharm.org/sustainable-procurement**

22. Dilger A, Meiklejohn, DA. **The environmental and health impacts of packaging and disposable medical equipment.** ENTtoday. 2023 Dec 20. [cited 2025 May 30]. Available from: **https://www.enttoday.org/article/the-environmental-and-health-impacts-of-packaging-and-disposable-medical-equipment/**

23. Nadeau KL. **Green healthcare supply chains: Strategies to reduce environmental impact.** GHX: Global Healthcare Exchange. 2024 June 7. [cited 2025 May 30]. Available from: **https://www.ghx.com/the-healthcare-hub/reducing-environmental-impact-healthcare-supply-chain/**

24. Meister JA, Sharp J, Wang Y. **Assessing long-term medical remanufacturing emissions with life cycle analysis.** Processes. 2024 April;11(1):36. **https://doi.org/10.3390/pr11010036**

25. McGain F, Naylor C. **Environmental sustainability in hospitals - a systematic review and research agenda.** J Health Serv Res Policy. 2014 Oct;19(4):245-52. **https://doi.org/10.1177/1355819614534836**

26. Canadian Association of Emergency Physicians. **Emergency medicine recommendations.** Choosing Wisely Canada. 2024, Sept. [cited 2025 May 30]. Available at: **https://choosingwiselycanada.org/recommendation/emergency-medicine/**

27. BC Parks Foundation. **PaRx: A prescription for nature.** c2025. [cited 2025 May 30]. Available at: **https://www.parkprescriptions.ca/**

28. Gerber PJ, Steinfeld H, Henderson B. [Internet]. **Rome: Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities.** Food and Agriculture Organization of the United Nations. 2013. [cited 2025 May 30]. Available at: **https://www.fao.org/4/i3437e/i3437e.pdf**

29. Health Canada. **Canada's food guide.** 2019. [cited 2025 May 30]. Available at: **https://food-guide.canada.ca/en/**

30. Ukpanah I. **Are electric bikes bad for the environment?** GreenMatch. 2024, Sept 17. [cited 2025 May 30]. Available at: **https://www.greenmatch.co.uk/electric-bikes**

31. Statistics Canada. **Employment by industry**, annual (Table 14-10-0202-01). 2025, March 27. [cited 2025 May 30]. Available at: **https://doi.org/10.25318/1410020201-eng**

32. Schiefer, D., & van der Noll, J. **The essentials of social cohesion: A literature review.** Soc Indic Res 2017 April; 19(4), 579–603. **https://doi.org/10.1007/s11205-016-1314-5**

33. Givoni M, Perl A. **The role of high-speed rail in mitigating climate change: A review of the literature.** Transp Policy 2020; 87, 1–9. **https://doi.org/10.1016/j.tranpol.2019.12.001**

34. Bousema T, Selvaraj P, Djimde AA. **Reducing the carbon footprint of academic conferences: The example of the American Society of Tropical Medicine and Hygiene.** Am J Trop Med Hyg. 2020 Nov;103(5):1758-1761. **https://doi.org/10.4269/ajtmh.20-1013**

35. Donald N, Irukulla S. **Greenhouse gas emission savings in relation to telemedicine and associated patient benefits: A systematic review.** Telemed J E Health. 2022 Apr 20; 28(11): 1431–1439. **doi: 10.1089/tmj.2022.0047.**

36. Iron Bridge. (2019, October 2). **Why are electronic health records better than paper records?** 2019, Oct 2. [cited 2025 May 30]. Available from **https://www.ironbridgecorp.com/blog/why-are-electronic-health-records-better-than-paper-records**

37. Environmental Protection Agency. **Saving water in hospitals** (EPA-832-F-12-032). 2012, November). [cited 2025 May 30]. Available from **https://www.epa.gov/sites/default/files/2017-01/documents/ws-commercial-factsheet-hospitals.pdf**

38. Global Green and Healthy Hospitals. **Water.** Health Care Without Harm. c2025. [cited 2025 May 30]. Available from **https://greenhospitals.org/water**

39. DeLong A. **Energy efficient tips for healthcare facilities.** UGI EnergyLink. 2024, Nov 14. [cited 2025 May 30]. Available from **https://ugienergylink.com/energy-efficient-tips-for-healthcare-facilities/**

40. Delgado A. **Integrating health and energy efficiency in healthcare facilities.** U.S. Department of Energy. 2021 June. [cited 2025 May 30]. Available from **https://www.energy.gov/femp/ articles/integrating-health-and-energy-efficiency-healthcare-facilities**

41. Energy Saving Lighting. **LED lighting significantly reduces carbon footprint.** c2025. [cited 2025 May 30]. Available from **https://www.energysavinglighting.org/led-lighting-significantly-reduces-carbon-footprint/**

42. Health Care Without Harm. **Global road map for health care decarbonization: A navigational tool for achieving zero emissions with climate resilience and health equity.** 2021 April 14. [cited 2025 May 30]. Available from **https://noharm-global.org/documents/global-road-map-health-care-decarbonization**

43. Picano E, Mangia C, D'Andrea A. **Climate change, carbon dioxide emissions, and medical imaging contribution.** J Clin Med. 2022 Dec 27;12(1):215. **https://doi.org/10.3390/jcm12010215**

44. Carpeggiani C, Marraccini P, Morales MA. **Inappropriateness of cardiovascular radiological imaging testing; a tertiary care referral center study.** PLoS One. 2013 Nov 27;8(11):e81161. **https://doi.org/10.1371/journal.pone.0081161**

45. American Academy of Pediatrics, Section on Emergency Medicine, & Canadian Association of Emergency Physicians. **Paediatric emergency medicine recommendations.** Choosing Wisely Canada. 2022, Nov. [cited 2025 May 30]. Available from **https://choosingwiselycanada.org/recommendation/paediatric-emergency-medicine/**

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