

# The Climate-Smart Emergency Department: A Primer

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Climate change and environmental pollution from health care present urgent, complex challenges. The US health care sector produces 10% of total US greenhouse gas emissions, which have negative influences on human and environmental health. The emergency department (ED) is an important place in the hospital to become more environmentally responsible and “climate smart,” a term referring to the combination of low-carbon and resilient health care strategies. Our intent is to educate and motivate emergency providers to action by providing a guide to sustainable health care and an approach to creating a climate-smart ED. [Ann Emerg Med. 2019;■:1-13.]

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## INTRODUCTION

A child with asthma enters the resuscitation bay in respiratory arrest after exposure to smoke from a wildfire. An elderly man in multiorgan failure arrives by ambulance during a heat wave, having been transported from an assisted living facility without air conditioning. A young woman presents with posttraumatic stress disorder because she has been displaced from her devastated home during a flood. An entire town, including its hospitals, is destroyed by a superstorm. These illustrations of climate change–related medical catastrophes are not representations of the future; they are representations of the present. Climate change is a health crisis for which emergency physicians are front-line experts, seeing firsthand acute and chronic effects on patients. Our responsibility as leaders in disaster response and caring for society’s most vulnerable gives us the insight to also recognize the need to address our own environmental impacts and climate change.

Pollution and climate change are harming human health.<sup>1</sup> Pollution is the largest environmental cause of disease.<sup>2</sup> Morbidity and mortality caused by US health care–generated pollution might have a greater effect than medical errors.<sup>3</sup> The health care sector has a large supply chain that generates huge amounts of waste, uses enormous amounts of chemicals and pharmaceuticals, and demands significant food production and disposal, all of which contribute to pollution. Although health care overall is a significant polluter, it has the opportunity to reduce this adverse effect on human and environmental health.

According to *The Lancet*, climate change is the biggest public health threat of the 21st century<sup>4</sup>; thus, tackling it is the greatest public health opportunity.<sup>5</sup> The US health care sector produces 10% of the total greenhouse gases generated in this country, and if it were a country it would rank 13th in the world for emissions, ahead of the entire United Kingdom.<sup>3</sup> Climate change causes extreme weather events, instability in temperatures, and water and energy insecurity. These changes lead to increased cardiovascular events, gastrointestinal illnesses, traumatic injuries, psychiatric illnesses, and many other health effects.

In keeping with the mission of health care and the time-honored oath to do no harm, the health care sector has ample opportunities to reduce its carbon footprint and promote climate-smart health care through mitigation, resilience, and leadership.<sup>6</sup> The American College of Emergency Physicians (ACEP) has a policy to “advocate for initiatives to reduce the carbon footprint of emergency departments and their affiliated institutions through energy conservation and health care waste reduction and/or recycling.”<sup>7</sup> Emergency medicine is on the front line of health care and so is positioned to be a noticed advocate for climate-smart health care and climate solutions. This is highly relevant for practicing emergency physicians and academics alike.

*Climate-smart health care* is a term defined in the 2017 joint report by the World Bank Group and Health Care Without Harm, referring to the combination of low-carbon and resilient health care strategies.<sup>8</sup> Key features of climate-

smart health care include waste minimization and sustainable waste management; low-carbon procurement policies for products, supplies, and pharmaceuticals; energy and water efficiency; sustainable transportation policies; and resilience strategies to withstand extreme weather events.

The emergency department (ED) is a critical department to promote sustainable health care. As the hospital's face to the community, the ED should advocate to hospital leadership for organizational commitment to climate solutions and greenhouse gas reduction. Physicians and staff from all medical specialties regularly visit the ED and stand to learn from the example set there. The ED, hospital, and health care system are interdependent. Making an ED climate smart can be laborious, but if it becomes inspirational for the rest of the hospital, it is well worth the effort. From momentum and focused success comes systemic progress.

Many hospital systems have made positive changes. For example, Austin-Travis County EMS uses biodiesel and hybrid vehicles in its fleet, leading to a potential 31.2% reduction in ambulance carbon dioxide emissions.<sup>9</sup> Virginia Mason, a hospital that implemented a supply chain change to buy reprocessed medical devices, saved \$3 million during 3 years and in 1 year reprocessed or recycled 18,850 pounds of devices that would otherwise likely have been deposited in a landfill.<sup>10</sup> Although no ED to our knowledge has yet claimed to have become independently climate smart, these success stories should encourage us to pursue beneficial interventions so that emergency medicine can be on the cutting edge of climate-smart health care.

Our intent is to give emergency providers a guide to sustainable health care. This includes an overview of issues contributing to pollution and climate change, effects of these issues, reasons to act, what can be done to enact climate-smart health care, and key resources to guide implementation of these changes. We recognize that much of what follows applies to other hospital locations, but that does not diminish its relevance to the ED. We hope that every ED and its patrons benefit from emergency physicians who choose to protect human health by practicing climate-smart health care.

## HEALTH CARE'S CONTRIBUTION TO POLLUTION

### The Issues

Daily operations of EDs and hospitals contribute significantly to pollution. The multiple waste streams in EDs include solid, regulated medical, hazardous,

pharmaceutical, and food wastes. Hospitals in the United States generate a total of 14,000 tons of waste per day, 20% to 25% of which is plastic products or packaging.<sup>11</sup> The health care sector represents 18% of the US gross domestic product,<sup>12</sup> and its supply chain is the second largest expense in health care after labor.<sup>13</sup> Thus, supply chain in the medical field is a significant contributor to waste and pollution.

The health care sector is the single largest consumer of chemicals in the United States, spending more than twice the amount spent by the next-largest-consuming sector,<sup>14</sup> and is also the largest consumer of pharmaceuticals worldwide.<sup>15</sup> Globally, pharmaceutical-caused pollution is an emerging threat because pharmaceuticals accumulate in the environment throughout their life cycles, from manufacturing and distribution to excretion and disposal.<sup>16</sup>

Our global food system adversely affects human and environmental health because of methods of food production, processing, packaging, distribution, and disposal. Conventional agricultural practices contribute to deforestation, water and air pollution, and biodiversity loss. Animal agriculture, especially beef production, has a substantial climate effect,<sup>17</sup> and antibiotic use in animal agriculture contributes to antimicrobial resistance.<sup>18</sup> In the United States, food waste is the greatest waste stream reaching landfills and constitutes 22% of municipal solid waste.<sup>19</sup> In line with this reasoning, food use and waste are a large part of the health care sector's contribution to harming the environment.

### The Influences

Health care waste in the ED is regulated into different "streams," which are collected in a variety of bins. Regulated medical waste (a regulatory term that denotes sharps, red bag waste, and pathologic waste) is collected in biohazardous waste bins and subsequently incinerated, or sterilized and sent to a landfill. Landfill waste generates methane gas, which has greater than 25 times the global warming potential of carbon dioxide.<sup>20</sup> Incinerated waste, which is declining in prevalence, produces greenhouse gases and emits toxic substances that include dioxins and furans.<sup>8</sup> Table 1 gives examples of health care waste streams.

The waste produced by the health care sector can be traced upstream through its supply chain. Across all industries, 60% of businesses' environmental impacts are accounted for in the products and services they buy, or their upstream supply chain.<sup>21</sup> Globally, 71% of health care emissions are derived from the supply chain through production, transport, and disposal of goods and services, providing huge opportunity to focus on the supply chain.<sup>22</sup>

**Table 1.** Description of health care waste streams.

Type of Waste Stream	Definition	Examples in the ED
Solid waste	Municipal, nonhazardous waste	Garbage or trash
Regulated medical waste	Biohazardous or potentially infectious waste; includes: “Red bag” waste Liquid and semiliquid blood or blood-borne products Infectious liquid waste Does not include blood-stained items, urine, feces, and emesis Pathologic waste: Human tissues or organs Sharps: Any object used to lacerate or puncture the skin	Red bag: amniotic fluid, cerebrospinal fluid, peritoneal/pleural and pericardial fluid, discarded tubes of blood, liquid blood, blood clots Pathologic: biopsy samples Sharps: needles, glass, sharp disposable instruments
Recycling	Collecting and processing materials that would otherwise be thrown away as solid waste and turning them into new products	Plastics, glass, paper, cardboard, chipboard, boxboard, food and beverage containers
Pharmaceutical waste	Unused, contaminated, and expired medications and vaccines	Unused or expired medications
Universal wastes	Hazardous wastes that can be recycled and are not regulated as strictly as hazardous wastes (definition can vary state to state)	Batteries, pesticides, mercury-containing devices, fluorescent bulbs
Single-use device reprocessing	Cleaning, disinfection, remanufacturing, and repackaging for reuse of devices labeled as “single use” by third-party reprocessors	Pulse oximeter sensors, blood pressure cuffs
Hazardous waste	Waste with properties that are capable of harming human or environmental health and characterized by the EPA as hazardous chemical waste	Methotrexate
Food waste	Food that is thrown away	Unused or expired food
Reuse and donation	Items that can no longer be used by the ED, or are expired, but can be used by another department or health facility in need	Clinical supplies, equipment, furniture, electronics
Construction and demolition	Bulky waste generated during construction and renovation projects	Concrete, building materials

EPA, Environmental Protection Agency.

Source: <https://practicegreenhealth.org/topics/waste/waste>.<sup>56</sup>

Chemicals used in the health care sector can have long-lasting adverse effects on human and environmental health. Many of these chemicals have not been tested for safety or are linked to health problems that include asthma and other respiratory illnesses, cancers, and neurodevelopmental disorders. The World Health Organization estimates that 1.6 million lives were lost in 2016 because of exposure to chemicals.<sup>23</sup> Studies have shown that nursing professionals exposed to workplace chemicals are at increased risk for health issues such as asthma.<sup>24</sup>

Pharmaceuticals contribute to the health care sector's carbon footprint as well. Although some pharmaceutical packaging is recycled,<sup>25</sup> a large amount ends up in landfills.<sup>26</sup> The full effect is challenging to estimate because pharmaceutical production processes, including inputs and emissions, are often kept proprietary. At the very least,

pharmaceutical production requires energy, chemicals, and water, with all of the associated environmental impacts.

### The Reasons to Act

The main reason to act is that pollution and climate change will worsen at an accelerating rate unless immediate and bold action is taken. To begin with, health care waste must be properly handled to protect the environment and preserve human health. Health care facilities and EDs have the opportunity to eliminate certain harmful chemicals and switch to safer alternatives to protect patients, employees, and visitors. In addition to contributing to carbon-source pollution, pharmaceuticals can affect health and the environment in other ways. Traces of pharmaceuticals have been found worldwide in natural water sources and organisms, and can accumulate in water, wildlife, and

livestock.<sup>16</sup> Thirty percent to 90% of a human oral drug dose is excreted in waste as an active substance.<sup>27</sup> Municipal sewage treatment plants are unable to treat these contaminants, permitting metabolized and unmetabolized drugs to pass to waterways and accumulate in the environment, negatively affecting ecosystems.<sup>16</sup>

Environmentally preferable purchasing programs have a substantial opportunity to decrease the environmental impact of the health care sector.<sup>21</sup> This will help reduce waste and minimize the effect of waste that is inevitably produced. The health care sector can also use its purchasing power to alter food consumption trends by procuring and serving environmentally sustainable food, and take steps to reduce food and solid wastes.

There are economic benefits. Although the benefit varies by waste stream and treatment method, hospitals have saved hundreds of thousands of dollars through education and implementation of better waste segregation practices.<sup>28</sup> ED practices can contribute to this financial benefit.

## HEALTH CARE'S CONTRIBUTION TO CLIMATE CHANGE

### The Issues

Hospitals are energy, water, and transportation intensive, all of which contribute to greenhouse gas emissions. They are the second most energy-intensive commercial buildings in the United States,<sup>29</sup> consuming approximately 8% of the total energy used in such buildings.<sup>30</sup> They are the third most water-intensive facility type, behind senior care facilities and hotels,<sup>31</sup> and use an average of 570 gallons of water per staffed bed per day.<sup>32</sup> Transportation entities, such as fleets of ground ambulances, helicopters, hospital vehicles, delivery vehicles, and staff and patient vehicles, all add to health care's carbon footprint caused by combustion engines.<sup>33</sup> According to the Environmental Protection Agency, in 2017, overall transportation activities accounted for approximately 29% of total US greenhouse gas emissions, making them the largest source of greenhouse gas emissions in the United States.<sup>34</sup>

### The Effects

The fossil fuel combustion on which hospitals rely for their energy needs generates, among other pollutants, carbon dioxide and particulate matter, both of which are public health hazards. The US health care sector was responsible for 9% of national particulate matter generation and related respiratory disease burden in 2013.<sup>3</sup> Water use is a major contributor to greenhouse gas emissions because of the energy needed to distribute, treat, and heat it.<sup>35</sup>

### The Reasons to Act

Minimizing the effect on climate change should be a priority for every ED and its related hospital system. Transitioning to renewable energy sources, along with reducing fossil fuel use and greenhouse gas emissions generation, will provide immediate health and environmental benefits. Additionally, by investing in sustainable transportation and supporting alternatives to single-vehicle occupancy, such as ride sharing, hospitals help protect public and environmental health.

Climate-smart health care can be both environmentally protective and economically beneficial. Fluctuating energy costs from factors such as fuel supply, transmission failures, and weather variations introduce financial risk<sup>36</sup>; environmental stability is protective against these fluctuating costs. Energy efficiency measures conserve precious health care dollars. US hospitals could save close to \$1 billion during 5 years by implementing simple energy-saving operational and equipment improvements.<sup>37</sup> If all US hospitals implemented programs to reduce energy and waste and achieved operating room supply efficiency at the same cost savings as Practice Greenhealth's highest-performing hospitals, the cost savings to the entire US health care sector could exceed \$5.4 billion during 5 years and \$15 billion during 10 years.<sup>37</sup>

Another objective of climate-smart health care is resilience strategies to withstand extreme weather events.<sup>8</sup> They are increasing in frequency and can disrupt hospital infrastructure critical to maintaining access to emergency services and health care, as well as utilities, transportation, and communication systems.<sup>38</sup> Hospital supply chains might be disrupted, leading to shortages of essential pharmaceuticals, medical devices, and supplies, such as intravenous fluids.<sup>39</sup> Hospitals and health systems are recognizing the importance of remaining open, operational, and able to serve their communities during extreme weather events, and are investing in resilience strategies. Health leaders can help to preserve their organization's financial stability by making a commitment to climate resilience.<sup>40</sup> As experts in disaster medicine, emergency providers understand the importance of preparedness and their role in developing health care climate-related disaster plans.

## WHAT YOU CAN DO

### Waste

Sustainable waste management is a component of climate-smart health care. It can be achieved by source reduction, reuse, and proper waste segregation. Because the ED likely does not determine waste management strategy

for the hospital, it should play an advocacy role for best practices within the overall hospital waste management program. There is an online tool for estimating emissions from hospital wastes that can help guide waste management decisions.<sup>41</sup>

**Waste reduction.** Minimizing the amount of waste is the primary goal.<sup>42</sup> Preventing waste production can be accomplished by source reduction, which is achieved by sustainable procurement practices.<sup>43</sup> Ways to change purchasing patterns include working with suppliers to request and support development of environmentally preferred products<sup>8</sup> and redesigning products to minimize waste (eg, using medical procedure kits that include fewer materials). Staff education is a critical component of the waste reduction program.<sup>42</sup>

**Reuse practices.** Reuse practices can help minimize the amount of substances entering the health care waste stream. Decreasing disposable single-use devices in favor of reusable medical equipment can decrease waste and reduce the need for additional procurement. An ED example is use of reusable laryngoscopes rather than single-use disposable devices.<sup>44</sup>

**Recycling.** Although recycling might be an element of climate-smart health care, its overall contribution is not major<sup>45</sup>; simply stated, we cannot recycle our way out of this situation. However, although less desirable than primary reduction and reuse because it requires energy input and transportation to off-site recycling centers,<sup>42</sup> recycling helps minimize the total volume of landfill waste produced by an ED.

**Waste segregation.** Proper waste segregation is critical to avoid unnecessary transport and treatment. Red bag waste should be minimized, containing only components that must be disposed of in this manner.<sup>43</sup> Including unnecessary items in red bags, perhaps because of lack of education, increases the volume of waste that must be treated before disposal through methods such as autoclaving or chemical disinfection. Regulated medical waste also costs, on average, 10 times more to dispose of than solid waste.<sup>46</sup> Staff education and strategic size and location of red disposal bags and containers are recommended interventions.

## Supply Chain and Purchasing

Educate your department and supply chain leaders about opportunities for environmentally preferable purchasing. Encourage your hospital to adopt an environmentally preferable purchasing policy and use Practice Greenhealth's Sustainable Procurement Specifications and Resources Toolkit.<sup>47</sup> This tool kit can be integrated with existing supply-chain product

considerations to guide sustainable purchasing. Also refer to the Greenhealth Total Cost of Ownership Toolkit for procurement guidance.<sup>48</sup> Seek ED representation on your hospital's value analysis committee.

When product alternatives are compared, life cycle assessment and life cycle cost models should be considered. Life cycle assessment measures the total environmental impact of a product from sourcing of raw materials to final outputs at end of life, and life cycle cost measures total cost of product ownership from acquisition to final disposal.<sup>44</sup>

## Chemicals

Table 2 provides information about minimization of and alternatives to harmful chemicals.

## Pharmaceuticals

Through purchasing, prescribing, and disposal practices, physicians can take steps to reduce the problem of pharmaceutical pollution. They can minimize use of pharmaceuticals by limiting medication quantity and refills, making evidence-based prescribing decisions, and using nonpharmaceutical therapeutic recommendations when appropriate. Physicians can advocate proper medication disposal in health care settings and educate patients about proper household medication disposal. They can learn how to take action from a guidance document published by Health Care Without Harm Europe.<sup>49</sup>

## Food

EDs can work with their food service department to encourage sustainable food procurement and food waste reduction. Research supports plant-based diets as the single biggest action to reduce greenhouse gas emissions and achieve other environmental cobenefits, such as reduction of land and water use.<sup>50</sup> Opportunities exist to reduce the effect of food operations by reducing meat and dairy; procuring organic, sustainably produced, antibiotic-free food; serving more plant-based food; using climate-friendly packaging; reducing food and landfill waste; using energy-efficient technologies for cooking and dishwashing; and procuring sustainable serviceware.

According to the Environmental Protection Agency's Food Recovery Hierarchy, strategies to reduce food waste include source reduction, food donations, diversion of food scraps to animal feed, conversion of waste oils to fuels, and composting.<sup>51</sup> The ED should encourage hospitals to deploy these strategies.



**Table 2.** Description of resources to help minimize the use of harmful chemicals.

Chemical of Concern	Definition	Health Effects	Where These Chemicals Are Found	Safer Alternatives
Mercury	A naturally occurring element that comes in many forms, the most potent of which is methyl-mercury <sup>57</sup>	A potent neurotoxin that affects fetuses in utero and young children. Considered by WHO as one of the top 10 chemicals or groups of chemicals of major public health concern. <sup>57</sup>	Used throughout health care in laboratory reagents, thermometers, sphygmomanometers, dental amalgam, and more <sup>58</sup>	Practice Greenhealth, Healthier Hospitals Initiative, and Health Care Without Harm offer guidance on how to eliminate mercury in health care settings. <sup>58</sup> Many cost-effective, mercury-free alternatives exist for all mercury-containing products.
DEHP	DEHP is a phthalate used to soften plastics, such as PVC in medical products. <sup>59</sup>	An antiandrogenic endocrine-disrupting chemical. Medical devices made of PVC plastic, such as IV fluid bags, can leach DEHP into patients. <sup>59</sup>	Breast pumps and accessories, enteral nutrition products, enteral tubes, parenteral infusion devices and sets, vascular catheters, respiratory therapy products, urologic catheters, and gloves <sup>60</sup>	Replace neonatal resuscitation cart supplies with items that are DEHP free. Consider having a stock of DEHP-free IV bags, tubing, endotracheal tubes, etc. Consider changing all infusion equipment to DEHP-free materials.
Chemicals in furnishings	Various chemicals used in furniture and furnishings <sup>61</sup>	Flame retardants: leach into dust, air, water Perfluorinated compounds PVC Antimicrobials: added to furnishings to reduce health care-associated infections without evidence to support efficacy <sup>61</sup>	Furnishings, mattresses, storage units, shelving, curtains, window coverings, panels, partitions	Refer to Healthier Hospitals safer chemicals recommendations. <sup>62</sup> Advocate building codes that do not require chemical flame retardants. Purchase only furniture without such chemicals. Eliminate chemical antimicrobials from soaps.
Cleaning materials	Materials used to clean, disinfect, or sterilize infrastructure and supplies	Increase the rates of respiratory diseases, <sup>63</sup> promotion of antimicrobial resistance, and disruption of the endocrine system through skin contact or leaching into water supplies.	Disinfecting agents, cleaning solutions and materials	Use approved environmentally friendly, effective, third-party-certified green cleaning products (GreenSeal Certified, EcoLogo). <sup>64</sup>

WHO, World Health Organization; DEHP, bis(2-ethylhexyl) phthalate; PVC, polyvinyl chloride; IV, intravenous.

## Energy

Hospitals nationwide are reporting and benchmarking energy performance through Energy Star Portfolio Manager.<sup>52</sup> Find out if your hospital is participating and learn about any hospital-sponsored energy-saving measures. An energy audit can be used to identify potential savings opportunities.

There are many opportunities for hospitals to promote energy efficiency and reduce dependence on fossil fuels, including transitioning to renewable energy sources. Some leading US health systems have committed to transition to 100% renewable energy.<sup>53</sup> Other energy conservation programs include upgrades for lighting; upgrades for heating, ventilation, and air conditioning systems; and use of energy-efficient equipment, electronics, and medical equipment.

The ED as an integral part of the hospital should independently and collaboratively identify ways to improve energy efficiency and use renewable energy sources. Actions can be taken at 3 levels: institutional advocacy, department infrastructure and process, and individual behavior change (Figure 1).

## Water

Hospitals can conserve water by upgrading to efficient plumbing fixtures and appliances, monitoring and preventing leaks, using water-sparing cleaning techniques, and establishing drought-tolerant landscaping.<sup>54</sup> Find out if your hospital is tracking water use and setting efficiency goals. Energy Star Portfolio Manager also provides water use benchmarking for hospitals.<sup>52</sup>

Institution	Department	Individual
Ask leadership if the hospital is tracking energy use and setting efficiency and renewable energy goals.	Assess energy demands of commonly used equipment.	Promote energy conservation by establishing an energy-saving campaign among ED staff.
Advocate clean and lean energy to support hospital resilience and community health.	Evaluate opportunities to power down idle machines, computers, and unused patient care suites.	

**Figure 1.** Description of actions that can be taken on institutional, departmental, and individual levels to improve energy efficiency and use renewable energy resources.

An ED might evaluate opportunities to upgrade to water-efficient plumbing fixtures and equipment. Decreasing and optimizing linen use is another water-conservation opportunity.

Water conservation can be pursued at 3 levels: institutional advocacy, department infrastructure and processes, and individual action (Figure 2).

### Transportation

Sustainable transportation achieves reduction of fossil fuel use by reducing the number of vehicle trips, increasing fuel efficiency, and providing incentive for use of electric and alternative-fuel vehicles (Figure 3). EDs are frequently the only hospital department with their own fleet: ambulances. These can be improved by changing fuel mix, considering hybrid or electric vehicles, and changing ambulance idling policies. Additional improvements include decreased vehicle idling near the hospital, avoiding trips to the hospital by using telemedicine if appropriate, and advocating improved public transportation.

Ask ED and hospital leadership what sustainable transportation programs and policies are in place. If a transportation department is available, contact it to learn how you can take advantage of incentives and support new programs.

### DISCUSSION

Every ED should be a climate-smart ED. Figure 4 shows preliminary steps to transform into a climate-smart ED. It can be modified to fit the unique features of any particular ED.

The 2017 joint report<sup>8</sup> by the World Bank Group and Health Care Without Harm, which defined climate-smart health care, illustrates 3 broad phases (Table 3) that an ED can work through to become climate smart (Table 4). These phases emphasize low-carbon procurement, waste management, and building and energy strategies.

It can be difficult to implement initiatives in isolation in the ED without engaging the hospital. In most hospitals and health systems, initiatives such as recycling are implemented hospital- or systemwide and not just in one clinical department. Although there are initiatives, such as paper reduction, RMW reduction, or a “turn off lights when not in use” campaign, that can be accomplished in a single department, more often than not, meaningful initiatives need to be initiated hospital- and health system-wide.

Creating a climate-smart ED is achieved through 3 major approaches: hospital operations, department initiatives, and individual actions.

- Hospital operations: Physicians drive evidence-based change in the hospital setting, and can leverage their

Institution	Department	Individual
Ask leadership if your hospital is tracking water use and setting efficiency goals.	Assess water demands of commonly used equipment.	Promote water conservation among peers.
Advocate water conservation and support of sustainable water infrastructure.	Evaluate opportunities to conserve water through measures such as regular checks for faucet leaks.	Establish water-saving behaviors campaign among ED staff.
Investigate sterilizer use to determine whether these devices have idle modes with decreased water flow.		

**Figure 2.** Description of actions that can be taken on institutional, departmental, and individual levels to encourage water conservation.

Employee Commute	Patient Commute	EMS Vehicle Travel	Hospital Fleet and Delivery Vehicles
Provide incentive for alternative transportation, such as carpools, public transit, biking, or walking. Allow telecommuting. Provide incentive for electric and hybrid vehicle use.	Consider telemedicine visits. Promote alternative transportation options to the hospital.	Institute a no-idling policy for emergency vehicles. Provide incentive for electric, hybrid, and biodiesel vehicles. Consider adding fuel-efficient vehicles, such as motorcycle EMS, to the emergency fleet. Minimize air (helicopter) ambulance transport of patients; use ground vehicles when safe and appropriate.	Institute a no-idling policy at the hospital. Provide incentive for suppliers to become an EPA SmartWay shipper. <sup>65</sup> Work with suppliers to bundle deliveries and reduce trips to the hospital. Provide incentive for use of alternative-fuel and electric vehicles.

EMS, Emergency medical services.

**Figure 3.** Examples of methods to encourage sustainable transportation programs and minimize use of fossil-fuel-based transportation.

influence and health expertise to achieve organizational change.

- Department initiatives: At the ED level, sustainability initiatives can be implemented with a departmental green team or with a quality or excellence committee. Implementation requires support and oversight of

department leadership. Follow a standard process improvement model: choose one initiative at a time, fully implement the project, measure the effect, and establish a continuity plan.

- Individual actions: Practice and encourage sustainable actions to foster a culture of sustainability. Peer

#### Getting Started to Become a Climate-Smart ED:

- Find out if your hospital or health care system has a commitment to sustainability.
  - Does it have a green team?
  - Does it have a sustainability lead?
  - Is it a member of Practice Greenhealth?
  - Does it track and report environmental performance?
  - Has it established sustainability goals?
  - If your hospital has a green team, have someone from the ED join the team. If it does not, encourage it (or the health care system) to form a sustainability committee.
- Form a cross-functional ED green team, using guidance from Practice Greenhealth (<https://practicegreenhealth.org/sites/default/files/pubs/epp/GuideGreenTeams.pdf>).
  - Recommended committee members:
    - Physicians, nurses, advanced practice providers, technicians, and support staff
    - Senior departmental nursing and physician leadership (highly recommended)
    - Collaboration with director-level stakeholders from environmental services, purchasing, food services, pharmacy, facilities management, human resources, disaster management, and engineering (highly recommended)
  - Obtain baseline data.
  - Identify opportunities by using Practice Greenhealth's Eco-checklist ([https://practicegreenhealth.org/sites/default/files/upload-files/ecochecklist\\_r5.pdf](https://practicegreenhealth.org/sites/default/files/upload-files/ecochecklist_r5.pdf)).
  - Establish goals and benchmarks.
  - Track data.
  - Report and celebrate successes.

**Figure 4.** Step-by-step process to work toward becoming a climate-smart ED.



**Table 3.** Description of the 3 phases necessary to work through to become a climate-smart ED.<sup>8</sup>

Phase	Actions	Tips
First	Formulate an initial assessment of an ED's baseline state in regard to waste and resource use (eg, water, energy).	Possible areas of focus: Reducing, managing, and appropriately segregating waste Developing a low-carbon supply chain for supplies, pharmaceuticals, and food Improving water supply and conservation Increasing energy efficiency and transitioning to renewable energy sources
Second	Implement the specific changes.	Changes should encourage the following: Mitigation of climate change factors in health care Resilience strategies Adaptation to climate changes that are already happening
Third	Monitor, update, and find new areas of focus for improvement. Measure influence and outcomes of the ED's sustainability initiatives.	Communicate your successes and add ED sustainability performance to standard work and quality audits to begin establishing sustainability as best practice.

pressure drives behavior change,<sup>55</sup> whereas personal actions build critical staff and leadership buy-in for ED and hospital initiatives.

Table 4 illustrates actions that can be taken by hospitals, EDs, and individuals to minimize health care contribution to pollution and climate change.

Climate change and environmental pollution from health care present urgent and complex challenges to the US health care sector, of which emergency medicine is an essential component. The health care sector has many opportunities to use its ethical, political, and economic influence to promote climate solutions and

**Table 4.** Descriptions of actions that can be taken to be a more climate-smart ED.

Category	Hospital Operations	ED Initiatives	Individual Action
Waste	Find out if the hospital tracks waste by weight and cost. Learn about hospital waste reduction and segregation efforts. Advocate for waste considerations to be included in hospital purchasing decisions. Advocate for hospital to implement comprehensive sustainable waste program including recycling, RMW reduction, pharmaceutical waste management program, single-use device reprocessing, and food waste reduction. Encourage hospital to establish a waste reduction goal.	Perform a visual audit of department waste bins; assess sort quality, waste volume, and type, and evaluate waste reduction, waste segregation, and recycling opportunities. Educate staff on proper waste segregation. Prevent paper waste: set printers to 2-sided default and place reminders on computer monitors to encourage print reductions. Institute a red bag waste reduction program.	Learn hospital waste segregation guidelines for regulated, pharmaceutical, and solid waste, and practice good segregation. Avoid bringing unnecessary medical supplies to the patient bedside. Avoid unnecessary printing. Use reusable containers and cutlery for personal food and beverages.
Purchasing	Find out whether the hospital has an environmentally preferred purchasing policy or program. If not, encourage it to adopt a policy or program. Advocate using a sustainability scorecard to evaluate products. Join a hospital value-based analysis or purchasing committee and advocate green purchasing. Encourage the hospital to use Practice Greenhealth purchasing resources, including the Greenhealth Cost of Ownership Toolkit. <sup>48</sup>	Review prepackaged procedure kits for unnecessary products and remove these products. Evaluate opportunities to reprocess single-use disposable medical devices. Evaluate the opportunity to use reusable medical supplies. Consider environmental performance when making purchasing decisions (eg, reusable vs single-use disposable suture kits).	Choose reusable or reprocessible medical supplies when available.

**Table 4.** Continued.

Category	Hospital Operations	ED Initiatives	Individual Action
Chemicals	Advocate for your hospital or health system to: Purchase certified green cleaning products Purchase DEHP- and PVC-free products Implement a mercury elimination plan and become mercury free Purchase soaps without triclosan and triclocarban Purchase products without flame retardants where codes permit	Conduct an audit of mercury-containing devices and products in your department. Inventory the cleaning products and hand soaps used in your department. Inventory PVC- and DEHP-containing products in your department.	
Pharmaceuticals	Advocate a hospitalwide, comprehensive pharmaceutical waste management program. Encourage the hospital to host a community medication take-back event.	Provide staff education about proper medication disposal. Include information about proper medication disposal, community take-back events, and locations for medication disposal in your community in discharge instructions.	Make evidence-based prescribing decisions, limit prescription quantities and refills, and recommend nonpharmaceutical interventions when appropriate. Learn about pharmaceutical take-back events and locations in your community. Educate friends, family, and coworkers about proper medication disposal.
Food	Find out whether the hospital has a healthy, sustainable food policy and programs. Advocate purchase of antibiotic-free meats and poultry, and local, organic, sustainable food. Advocate more plant-centered offerings in cafeteria and patient menus. Advocate healthy snacks and beverages. Encourage food waste prevention strategies such as donation of surplus meals and composting. Advocate sustainable serveware. Advocate an on-site farmer's market or community-supported agriculture program.	Evaluate patient and staff food provisions for waste prevention opportunities. Promote healthy, sustainable staff and patient provisions. Educate staff on the link between diet, health, and climate. Request sustainable food options for group meetings and functions.	Follow a healthy, sustainable diet and encourage peers to do the same. Educate patients about the link between diet, health, and climate and health benefits of a plant-based diet.
Energy	Find out whether the hospital has established a comprehensive energy reduction plan. Advocate benchmarking on Energy Star and setting efficiency targets. Advocate investment in renewable energy.	Evaluate efficiency opportunities, such as motion sensors and LED bulbs for lighting. Set computers and printers to engage sleep mode when not in use. Evaluate noncritical medical equipment to power down between uses. Institute a departmental "turn off the lights when not in use" campaign.	Turn off lights when rooms are not in use. Take the stairs instead of the elevator.
Water	Find out whether the hospital is tracking water use and has established a water reduction goal. Encourage your hospital or health system to get guidance from WaterSense. <sup>66</sup> Advocate for hospital or health system to: Purchase and upgrade to water-efficient products Evaluate for water-efficient processes Use water-conserving irrigation systems Use nonpotable water	Evaluate opportunities for water efficiency upgrades such as motion sensors, low-flow fixtures, and water-efficient equipment. Conserve hospital linen; establish best practices for preventing loss and overuse of linen. Institute a program to report leaks.	Turn off sinks when not in use.

**Table 4.** Continued.

Category	Hospital Operations	ED Initiatives	Individual Action
Transportation	Advocate low-emission emergency and fleet vehicles: hybrids and alternative fuel vehicles, and smaller vehicles, such as motorcycles. Advocate incentives for employees who drive low-emission vehicles or take public transport. Advocate a no-idling policy for hospital fleet and delivery vehicles.	Institute a no-idle policy for nonexempt hospital fleet and delivery vehicles. Set a department green commute goal.	Adopt an alternative transportation commute.
Climate	Find out whether the hospital is tracking GHG emissions and has set a GHG reduction goal. If not, encourage this. Advocate climate-smart energy, waste, transportation, water, and purchasing policies. Educate staff and the public on the link between climate and health through grand rounds and inhospital communications and events. Encourage your leadership to join the Health Care Climate Challenge. <sup>67</sup> Encourage your nurses to join the Nurses Climate Challenge. <sup>68</sup>	Educate ED staff and clinicians about climate-related illness, extreme weather events, and the environmental impact of health care. Create a patient education flyer or brochure about the health effects of climate change. Educate staff and the public on the link between climate and health through grand rounds and inhospital communications and events.	Adopt a plant-based diet and commit to at least 1 individual lifestyle action.
Resilience	Find out whether your hospital has a plan for health care delivery during extreme weather events such as hurricanes and wildfires. If not, develop a plan. Find out whether your hospital has evaluated building and operational vulnerabilities related to climate change and extreme weather events. If not, encourage the hospital to do so.	Educate staff about climate and extreme weather threats in your and their communities.	Learn about the climate and extreme weather threats in your community.

LED, Light-emitting diode; GHG, greenhouse gas.

reduce the environmental impact of health care delivery.<sup>6</sup>

It is emergency medicine's opportunity and responsibility to provide climate solutions. It is our fervent hope that emergency providers use the tools provided to take action in their own ED. Our patients, communities, and planet depend on action to survive. Let us lead the way.

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