

The Hidden Cost of Chronic Pain: A Narrative Review of the Environmental Impact of Outpatient Spine and Musculoskeletal Care

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Introduction

Global warming has been identified by multiple public health experts as the most important challenge to human health in the 21st century¹

Healthcare facilities account for 8-10% of greenhouse gas emissions (GHG) in the United States^{2,3} and 4-6% of GHG emissions globally⁴

Beyond direct contributions to global GHG emissions, the healthcare sector is responsible for a significant amount of waste production. In the United States alone, healthcare produces 6600 tons of waste per day and 4 billion pounds of waste annually, making it the second largest source of industrial waste^{2,5}. Much of this waste is related to the procedural setting, with surgery and labor and delivery comprising 70% of total production⁵

Methods

Literature review included systematic searches in PubMed, Web of Science, and Google Scholar databases using terms “sustainability” or “carbon footprint” or “environmental impact” combined with “health care” or “medicine” or “physical medicine and rehabilitation” or other relevant terms including “orthopedics,” “spine”, “musculoskeletal medicine” or “outpatient medicine.”

55 peer-reviewed articles were reviewed and discussed, and an additional 8 government and consultant reports were reviewed

Results

Building Optimization	
Retro and continuous commissioning	- Partner with institutional leadership to ensure selection of clinic offices with energy efficient construction or updating current buildings with modern HVAC systems, triple pane windows, robust insulation, and smart monitoring devices
Heating and Cooling	- Set liberal thermostat settings when clinical spaces are not in use. <ul style="list-style-type: none">o 68 degrees in the winter months and 74 in summer months - Outfit thermostats with automated occupancy sensors. - Decrease hot water temperature as little as 10 degrees if not necessary for clinical operations.
Lighting	- Educate staff regarding the importance of turning off office lights after hours. - Replace older lightbulbs with more efficient LED bulbs - Install smart monitors to automatically reduce time spent lighting unoccupied spaces.
Plug-load devices	- Power down devices such as computers, ultrasounds, and fluoroscopy machines after business hours if they are not essential for emergency overnight operations to avoid “phantom loads” - Update appliances in workrooms to those with Energy Star certification
Diagnostics and Treatment	
Diagnostic imaging	- Carefully select CT and MRI studies for patients that have red-flag symptoms or warrant pre-surgical or pre-procedural planning - Utilize ultrasound for musculoskeletal diagnostics rather than MRI and CT when indicated
Disease management	- Early referral to physical therapy and psychology providers - Utilization of telehealth when appropriate - Careful selection of patients for procedural intervention
Pharmacologic treatment	- Reduce inappropriate prescription of NSAIDs, opiates, and agents for neuropathic pain - Counsel patients regarding the appropriate indications, risks, and potential environmental impacts of common over the counter analgesics - Educate patients about appropriate medication disposal methods

Strategies for reducing energy use and carbon footprint in outpatient clinical settings.

Conclusions

Healthcare is a major contributor to greenhouse gas emissions and waste production.

Outpatient spine and musculoskeletal complaints comprise a significant proportion of outpatient care utilization and physiatrists are often situated as first or second line providers in managing such conditions.

Although data is limited, publications both directly and indirectly related to the topic support a multi-pronged approach to environmental sustainability that includes interventions at the individual and institutional level to reduce energy utilization and waste generation. More research is needed to better define carbon footprint and waste production across relevant clinical settings to optimize strategies for environmental sustainability in our field.

Physiatrists can play an integral role in advocacy to drive discussions regarding sustainability efforts that will benefit our patients and planet.

Literature cited

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Further information

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For more information, full paper is currently under review and will likely be published in *PM&R: the journal of injury, function, and rehabilitation* in the coming months.