

Moving Towards Sustainable Dentistry in the US

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Background and Significance

Environmental pollution adversely impacts human health, most notably through the release of pollutants that increase the risk of cardiovascular disease, respiratory disease, and organ damage, contributing to the global burden of disease.¹ These consequences only capture the direct effects since pollution can also have toxic downstream impacts such as heavy metal contamination of food.^{2,3}

A contributor to pollution is the delivery of dental services, as use of restorative materials, protective barriers, and radiographs all create a significant amount of waste.^{4,5} In response, the World Dental Federation published a document entitled “Sustainability in Dentistry” in 2017.⁶ The authors noted that the prevention of oral disease not only promotes health but can also contribute to environmental goals by reducing the amount of waste produced. Thus, oral health professionals are uniquely positioned to enhance the well-being of people and the planet.⁶

Oral health professionals can also address waste generated by their field in addition to maximizing preventative care in patients. As oral health systems around the world expand, it is critical that the oral health community actively minimizes the amount of waste generated and recognizes the importance of proper waste management.⁴ This paper describes initiatives undertaken by oral health professionals and their colleagues from the Harvard School of Dental Medicine (HSDM) and Boston College (BC) in the US in order to reduce the environmental consequences of oral health services.

HSDM Sustainability Committee

In 2019, a group of HSDM students and faculty founded the HSDM Sustainability Committee. Committee members collaborated through their shared passion for a greener future in oral health care. Understanding that implementing change required the collaborative support of key stakeholders at HSDM, they built an interdisciplinary team with members from the offices of Student Affairs, Facilities and Operations, Environmental Health and Safety, and Environmental Services. The team embarked on their mission “to empower HSDM to institutionalize sustainability

practices and foster a community that values and pursues sustainable efforts to work towards a better future for our patients, our profession, and our world.”⁷ Members contribute diverse perspectives, knowledge, and expertise, which in turn empower the committee to engage the wider HSDM community and implement action towards sustainable practices at HSDM and beyond.

Initiatives

From 2019 to 2021, alumna Dr. Jennifer Lee (Class of 2021) led the Sustainability Committee. Under Dr. Lee’s leadership, the committee accomplished an agenda focused on waste management. Committee members conducted a waste audit of the HSDM preclinical teaching space and hosted a school-wide event to announce the launch of the committee, publicize its mission, and share its waste audit findings with the entire HSDM community. The waste audit provided a baseline for HSDM’s waste management and revealed that the most significant sources of waste were disposable gowns, gloves, and face masks. These statistics motivated members of the community to do their part in safely reducing waste and enabled long-term tracking of progress on waste reduction. The committee also conducted a waste audit of the paper cups used in the HSDM kitchen spaces during Tea Time (a time when community members traditionally converse while enjoying beverages and snacks) and found that on average, students, faculty, and staff discarded over 150 paper cups every day. In response to these findings, the committee hosted a special Tea Time during which community members brought their own reusable mugs from home. The committee encouraged community members to incorporate other sustainable behaviors in their lives, such as using reusable cutlery and shopping bags, bringing their own lunch in reusable containers, reusing masks outside of school, and participating in “Meatless Mondays.”⁸ To further reduce waste, committee members successfully advocated for the placement of recycling and composting bins in non-clinical areas of the school. Additionally, they implemented energy-saving measures and waste reduction measures in the school’s clinics, such as installing solar-powered automatic sinks in the clinic, turning off dental chairs and computers at the end of every day, using reusable scrub caps, taking only the needed supplies for a procedure, and switching from plastic to paper patient take-home bags. In the HSDM laboratory spaces, the team installed fume hood sensors that minimized unnecessary energy consumption.

Currently, Lilia Tabassian and Nicki Gershberg (Class of 2022) lead the Sustainability Committee. The committee, which had five members in 2019, now has fourteen members that represent an interdisciplinary team of staff and faculty members, as well as pre-doctoral, post-doctoral, and other graduate students. Recently, the committee expanded their focus to decreasing personal dental waste produced by the HSDM community as well as the HSDM patient population. The American Dental Association recommends replacing toothbrushes every three to four months,⁹ and the US population discards over 1 billion plastic toothbrushes annually.¹⁰ In response, the committee implemented an oral care recycling program in collaboration with Crest and Oral-B’s Recycle on Us Program.¹¹ The committee installed collection bins in high traffic areas throughout the dental school and clinic to collect products including toothbrushes, toothbrush heads, toothpaste tubes, mouthwash containers, floss containers, floss string, and floss picks.¹¹

Committee members periodically send these products to Oral-B for sanitization and recycling.¹¹ While finding sustainable alternatives for oral care products is ultimately important, this initiative helps immediately offset some of the community waste produced.

Additionally, committee members promoted healthy and sustainable personal habits. In collaboration with the HSDM American Student Dental Association chapter, they implemented a “Step Challenge” that encouraged students, faculty, and staff to walk to HSDM, rather than drive or take public transportation. Throughout October 2021, participants recorded their daily steps and competed for thematic prizes such as bamboo toothbrushes and reusable utensils. Participants reported over one million steps in total, which is approximately equivalent to 708 miles (1139.42 kilometers). This challenge prevented the release of 0.28 metric tons of carbon dioxide equivalents, which is the amount of carbon dioxide emissions traveling by car for the same distance would produce.¹² The committee also encouraged participants to submit pictures of themselves on their walk, which were then shared on social media to raise awareness for the environmental and health benefits of walking. Walking not only reduces transportation-related fossil fuel emissions, but it also decreases stress and serves as a form of exercise that improves overall health.¹³

Challenges

The HSDM Sustainability Committee faced inevitable challenges as they encouraged sustainable choices. They mainly faced institutional barriers including the lack of dedicated and reliable funding and the lack of infrastructure to implement large-scale changes in the school and clinic. Committee members have a limited budget provided by HSDM and thus must identify alternative sources of funding such as grants. For example, a grant from the Harvard University Office of Sustainability supported the Tea Time event and allowed the committee to purchase prizes for the Step Challenge.

Although most sustainable products likely save money for the institution in the future, the start-up costs of such initiatives are often high. The committee suggested using reusable sterilization pouches and presented this idea to the HSDM materials department in hopes of implementing this change in the school’s teaching clinic. The department rejected this idea due to the high start-up costs and safety concerns. Similarly, the committee has not yet been able to implement the use of reusable gowns in pre-clinical and clinical settings.

The COVID-19 pandemic added additional layers of complication to the committee’s initiatives. As committee members learned to navigate this new terrain, they had to limit their events due to safety concerns. In addition to the other waste being produced in the clinical setting, the use of single-use masks, face-shields, hair nets, and N95 masks increased. Despite these challenges, the committee encouraged sustainable practices throughout the pandemic, such as the use of reusable scrub caps in clinic and the use of cloth face masks when not at school.

Research

Members of the HSDM Sustainability Committee conduct research on various topics in the realm of sustainable dentistry. In 2021, members conducted the first-ever study to assess students' perceptions regarding pre-doctoral training in Environmental Sustainability in Dentistry (ESD) in US dental schools to assess dental students' interest and attitudes regarding ESD training during their dental education.¹⁴ Researchers found that while 83% of surveyed students stated that ESD is important, only 5% of the students received ESD content in their dental education.¹⁵ These findings suggest that US dental students consider ESD important to their education and highlight the gaps in ESD training in US dental school curricula.¹⁵

Currently, students from the HSDM Sustainability Committee are seeking Institutional Review Board approval for a study that will quantify the greenhouse gas emissions produced by travel to and from HSDM by students, faculty and staff prior to and during the COVID-19 pandemic. The proposed study will be the first-ever study to quantify the greenhouse gas emissions attributable to travel to and from a dental school in the US.¹⁶

Members of the HSDM Sustainability Committee also engage in international research collaborations. In 2019, students and faculty from HSDM, BC, and the University of Rwanda investigated waste in dental systems around the world, with an emphasis on Rwanda's emerging dental training system. They reviewed the literature concerning the management of dental waste and aimed to synthesize best practices, identify gaps in the knowledge base, and analyze instances where theory and practice do not meet. They also considered waste management options for low- and middle-income countries as they tackle the most common non-communicable disease, oral disease, by launching and expanding dental systems.¹⁷ They presented their findings in a conference panel titled "Climate Change, the Environment, and Oral Health"¹⁸ and an associated poster¹⁹ during Harvard University Worldwide Week. They also summarized their findings in two policy briefs about waste management considerations for oral health professionals in Rwanda²⁰ and around the world.²¹

In 2021, researchers from BC and HSDM investigated the existing literature regarding the possible influence of climate change on dental fluorosis in Nairobi, Kenya. After compiling 28 peer-reviewed publications, the team concluded that while the publications suggested a possible association between climate change and dental fluorosis in Nairobi, there is a need for more research on the topic. The team presented its findings in a poster during BC's conference titled "Rising Global Cancer Pandemic: Health, Ethics, and Social Justice."²²

Outreach

The HSDM Sustainability Committee conducts outreach locally, nationally, and globally. In order to boost communication with the entire HSDM community, the committee releases a periodic digital newsletter that informs community members of upcoming events and encourages them to incorporate sustainable behaviors in their lives. During the aforementioned Step Challenge, the

committee released a newsletter on the environmental and health benefits of walking, in an effort to motivate students, faculty, and staff to walk to the dental school during their daily commute. During the Covid-19 pandemic, the committee's newsletter described various ways to live more sustainably during a pandemic. To communicate with the broader Harvard University and US dental communities, the committee uses Instagram and maintains a web page (<https://green.harvard.edu/schools-units/dental-hsdm>) to provide further information on its goals, initiatives, and research projects.

Members of the HSDM Sustainability Committee also conduct international outreach. Recently, a team of students, dentists, and professors at HSDM, BC, and Copperbelt University began a collaborative project that aims to create a novel competency-based dental waste management course for Copperbelt University School of Dentistry, Zambia.

Conclusion and Next Steps

This paper detailed sustainable dental initiatives undertaken by HSDM and BC, which can serve as a starting point to expand upon in the US and beyond. As dental systems around the world continue to grow, it is imperative that the oral health community takes action to prevent, reduce, and responsibly manage waste.⁴ In this way, oral health professionals can simultaneously protect the health of their patients and the planet.⁴

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