

Barriers to environmentally sustainable initiatives in oral health care clinical settings

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ABSTRACT

Human health is linked to environmental health. Pollutants or disease-causing microbes released into the environment through human activity or natural disasters affect communities' air quality, water or food supply, and, ultimately, the livelihoods of residents. Oral health care (OHC) professionals, including dental hygienists (DHs), use vast amounts of resources in their daily clinical operations, which contribute to the global pollution burden and climate change. Canadian OHC professionals are largely missing from the environmental sustainability dialogue, despite their commitment to the holistic well-being of their clients and communities they support. **Objective:** This literature review explores the barriers to adopting environmentally sustainable (ES) initiatives in the clinical setting as perceived by OHC professionals, particularly DHs. **Results:** Eight studies reviewed highlight 4 key barriers—infrastructural, institutional, educational, and individual—to the adoption of ES initiatives by OHC professionals in the clinical setting. **Conclusion:** OHC professionals who adopt ES initiatives to curb the potential environmental impacts of their clinical practices support the population health of the communities they serve and, thus, the well-being of future generations. Further research may guide the development of education, protocol, policy, and infrastructure changes to facilitate the adoption of ES initiatives by OHC professionals even amidst ever-changing global conditions. Adopting ES initiatives not only benefits the environment, but it may also aid in improving client outcomes due to long-term practice savings that can be diverted to enhancing client care.

RÉSUMÉ

La santé humaine est liée à celle de l'environnement. Les polluants ou les microbes pathogènes libérés dans l'environnement par l'entremise de l'activité humaine ou des désastres naturels influencent la qualité de l'air, l'approvisionnement en eau ou en aliments, et ultimement, le moyen de subsistance des habitants d'une communauté. Les professionnels de soins de santé buccodentaire (SSB), y compris les hygiénistes dentaires (HD) utilisent d'importantes quantités de ressources dans leurs activités cliniques quotidiennes, ce qui contribue au fardeau de pollution et de changement climatique global. Les professionnels de SSB canadiens sont grandement absents du dialogue sur la durabilité environnementale, malgré leur engagement envers le bien-être holistique de leurs clients et des communautés qu'ils appuient. **Objectif :** Cette analyse documentaire explore les barrières à l'adoption d'initiatives environnementales durables (ED) du milieu clinique comme perçues par les professionnels de SSB, particulièrement les HD. **Résultats :** Huit des études examinées soulignent 4 barrières clés : infrastructurelles, institutionnelles, éducatives et individuelles, à l'adoption d'initiatives ED par les professionnels de SSB de milieux cliniques. **Conclusion :** Les professionnels de SSB qui adoptent des initiatives ED pour contrer les effets environnementaux potentiels de leur exercice clinique appuient la santé de la population des communautés qu'ils servent et ainsi le bien-être des générations futures. Des recherches plus approfondies peuvent orienter le développement de l'éducation, des protocoles, des politiques et des changements d'infrastructure pour faciliter l'adoption des initiatives ED par les professionnels de SSB, malgré la situation mondiale toujours changeante. L'adoption des initiatives ED est non seulement avantageuse pour l'environnement, mais elle aide aussi à l'amélioration des résultats des clients en raison des économies réalisées à long terme par les cabinets qui peuvent être dirigées vers les soins du client.

Keywords: best practices; biomedical waste; dental hygiene; dentistry; eco-friendly; environmentally sustainable; green; recycling; refuse disposal; waste management

INTRODUCTION

Without a healthy environment, economic and social stability cannot be achieved by societies.¹ Human health is linked to the environments in which communities are established.²⁻⁵ Pollutants, carcinogens, and disease-

causing microbes released into the environment through human activity or natural disasters affect communities' air quality, water and food supply, and livability.²⁻⁵ As concern for the well-being of the environment and

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the effects of climate change mounts, environmentally sustainable (ES) actions on national and international levels are urgently needed to mitigate the climate crisis.²⁻⁵ As a United Nations member, Canada has adopted and developed national and international ES commitments such as carbon taxes, zero-waste initiatives, and climate action policies to protect both the well-being of the environment and of future generations.^{2-4,6,7}

Environmental impacts of the oral health care field

Environmental sustainability is overlooked by health care professions, including oral health care (OHC) professionals such as dental hygienists (DHs).⁸⁻¹¹ The OHC field is a resource-intensive industry with heavy demands on supplies, energy, water, fuel, and more to sustain daily clinical activities.^{8-10,11-19} Resource consumption unavoidably contributes to environmental pollution and climate change through greenhouse gas emissions.^{8-10,11-19} In the United Kingdom, the OHC field contributed about 3% or 675 kilotonnes to the National Health Service's total carbon footprint between 2014 and 2015.⁵ Dental hygiene is a profession that champions ethical principles such as beneficence and non-maleficence, which can be extended to the environment humans inhabit, supporting population health promotion and disease prevention.^{11,20} Adopting ES initiatives and technologies in OHC clinical settings not only benefits the environment, but may also improve client outcomes by allowing for long-term economic savings in private or public practices that can divert labour, time, and physical resources towards improving client deliverables.^{8-10,17,18}

State of the literature

The mandate of Canadian OHC governing bodies is to protect the public who receive care from licensed OHC professionals. However, little attention is paid to the impact of this care on the environment. Apart from infection prevention and control protocols to avert microbial or amalgam cross-contamination, and separating sharps from landfills, there is a paucity of guidelines, education, incentives, and infrastructure to support OHC professionals who are interested in ES initiatives.^{8-10,12-19,21,22} Studies on ES practices among professionals in the OHC field are scarce and tend to focus almost exclusively on dentists and dental students. There is no known published research on this topic originating from Canada. This literature review investigates the barriers to adopting ES initiatives perceived by OHC professionals in the clinical setting.

METHODS

Academic databases and search engines used to retrieve quantitative, qualitative or mixed-method studies of environmental sustainability in the OHC clinical setting within Canada were PubMed, Web of Science/Clarivate, Google Scholar, CINAHL, and Ovid/MEDLINE. The search was restricted to peer-reviewed open access articles

published in English between January 2009 and November 2019. Keywords and MeSH terms consisted of a combination of best practices; biomedical waste; dentistry; dental, dental hygienist; eco-friendly; environmentally sustainable; green; health knowledge, attitudes, practice; medical waste; recycling; refuse disposal; sustainable; sustainable development; waste management. The references of articles retrieved, Canadian practice guidelines, and policy documents were also reviewed for relevant content.^{6,7,21,22} The 8 articles selected for final review included 4 quantitative cross-sectional surveys, 1 case study, 1 qualitative interview, and 2 mixed-methods studies (a descriptive survey and an action research approach).¹²⁻¹⁹

RESULTS

A breadth of perspectives was gleaned from OHC professionals on the barriers to adopting ES initiatives in clinical practice, particularly through open-ended interviews, surveys, and action research approaches. These studies offer a deeper insight into the identified barriers and their interplay with the participants' demographics through data saturation, triangulation, and member checking. The barriers identified can be categorized broadly as infrastructural, institutional, educational, and individual. No published studies conducted among Canadian OHC professionals were found during this search. The studies selected primarily surveyed dentists or dental students from India, Jordan, Saudi Arabia, Thailand, and the United States. Only 2 studies from England expanded their participant pools to include other OHC professionals such as DHs.

DISCUSSION

Infrastructural barriers

Costs are incurred when incorporating ES infrastructure into publicly and privately built environments. Study participants bemoaned the initial high cost of implementing ES technology as financial returns would not be seen for years, especially for private dental practices.^{11-13,17,19} Long-established clinics have to be retrofitted to incorporate ES infrastructure such as automatic sensor lights, faucets, and thermostats.⁹⁻¹⁰ Other building considerations noted were installing heat-loss minimizing windows, amalgam separators, and dry vacuum pumps.⁹⁻¹⁰ Although installing ES technology is a burden for sole proprietorship, the financial returns are still significant in the long term, which can then be allocated towards improving client deliverables.^{8-10,17,18}

Furthermore, municipal infrastructure in developing countries may not provide adequate waste management or accessible recycling facilities, particularly in areas experiencing rapid urbanization and with uncoordinated city planning.^{14,15,19} The studies also explored how the structure of the survey questions and the differences in resources, infrastructure or government incentives for the surveyed population could confound the results if

the research design was not adapted to the context of interest.^{12,13,17} ES initiatives already in practice, such as digital radiography or electronic charting, may account for the participants' low reporting of recycling paper products or analog radiography-related chemicals.^{12,13,17}

Suppliers and manufacturers dictate the environmental sustainability of supply procurement, delivery, and availability.^{15,19} Sourcing supplies locally decreases fuel costs of procurement, and reducing excess packaging prevents further waste.¹⁵ Differences in material preferences among clinicians influence industrial demand. OHC educational institutions are hesitant to use bulk materials, preferring single-dose materials to prevent cross-contamination.¹⁸ Some study participants preferred amalgam over alternatives despite its potential to contaminate the environment during sourcing or disposal.¹⁹ Should OHC professionals express greater interest in ES alternatives, industry standards may change.

Institutional barriers

Participants reported confusion over conflicting protocols between municipal waste management and professional infection control standards.^{15,16} Infection control protocols set out by professional colleges are primarily concerned with protecting the public from diseases or injuries incurred from infectious substances, biomedical, toxic or radiographic processing of wastes, and sharps injuries.^{21,22} As such, environmentally conscious OHC professionals were frustrated by rigid infection control protocols that undermined environmental sustainability in an effort to protect the public from perceived immediate dangers.^{13,15-18} For example, paper products deemed to be clinical waste by said protocols may actually belong to general recycling, yet OHC professionals must abide in the interest of preventing cross-contamination or for fear of external audits.^{15,16} Participants suggested that having an environmental sustainability authority would alleviate confusion among their teams.¹⁶ OHC professionals enabled to collaboratively choose ES initiatives given available resources were more likely to implement and maintain them.¹⁵ Simple recommendations, the ability to test recommendations, and the opportunity to observe immediate benefits from their application increased the acceptance of new initiatives.¹⁹

Further confusion stemmed from mixed messages about the importance of environmental sustainability due to the decentralized efforts of federal and state authorities, professional colleges, and other entities.¹⁸ Participants felt that professional ES protocols were more applicable to hospital settings, preventing the extrapolation of such practices to OHC settings.¹⁹ The lack of governmental tax incentives and exemptions for duties on purchases also deterred participants from considering ES initiatives.^{13,17} Collaboration between the OHC sector and governing bodies will help in the development of guidelines and protocols specific to OHC clinical settings and related industry activities.

Educational barriers

All studies highlighted the international gap in knowledge among participants about ES practices in OHC clinical settings.¹²⁻¹⁹ Many participants were unaware of appropriate waste segregation methods or of recycling facilities.^{12,14,19} Additionally, participants appeared unaware of the life course of materials after disposal, the purpose of segregation methods, and toxic gases emitted from incineration.^{12,15} However, one study found that dentists surveyed possessed adequate knowledge of ES initiatives, yet other barriers prevented their adoption.¹³

The absence of ES curricula in formal and continuing education was noted by OHC professionals as a major barrier in both training and practice.¹²⁻¹⁹ Dental students surveyed expressed interest in incorporating ES learning objectives into the curriculum.¹⁸ Education during undergraduate training and through professional development activities may encourage ES initiatives for future practice and clarify confusion.¹³

Individual perspectives

Participants cited time constraints as the most important barrier.^{13,15,16,18} Another barrier was the lack of knowledge of the consequences of unsustainable practices. Varying interpretations of infection control protocols and ES guidelines hindered cohesive interprofessional and intraprofessional group culture, especially among teams where values were fragmented.^{15,16}

Individually held beliefs and feelings about environmental sustainability ranged from enthusiasm to indifference to denial.^{15,16,18,19} Some studies reported participants had positive attitudes towards adopting ES initiatives, while others reported participants had poor attitudes.^{14,15,18,19} Attitudes reportedly differed depending on age; younger dental students were more likely to support renewable energy sources and to attribute climate change to human activity.^{15,18} Conversely, other studies reported that younger dentists were less concerned for the environment than their senior counterparts.¹⁹ Junior staff reported simply following current office practices to avoid disturbing the existing group culture.¹⁶ With the variety of perspectives that could exist in one clinical setting, the coordinated adoption of ES practices may prove to be challenging.

Dental hygiene and environmental sustainability

The dental hygiene profession subscribes to ethical principles, paradigms, and competencies that guide DHs to care for clients, communities, and populations by considering environmental risk factors that undermine health and quality of life.^{11,20,23,24} Ethical principles such as beneficence and non-maleficence, the social determinants of health, and Yura and Walsh's Human Needs Conceptual Model (1988, cited by Darby¹¹) relate human health directly to environmental issues.^{11,20,23,24} Considering clients holistically along with their environments enables DHs to

engage in activities championing social justice, health promotion, and disease prevention, thereby embodying do no harm, and doing good.^{11,20}

Although dentists dictate much of the operation and protocols within their clinical practices, DHs and dental assistants are heavily involved in practice management. DHs are key members of OHC clinical practice teams, capable of proposing and leading new initiatives. Evidence shows that climate inaction and pollution of the environment harm the health of current and future generations.¹⁻¹⁰ As the mandate of the dental hygiene profession revolves around preventive health care, it is in the interest of DHs to adopt and encourage the adoption by others of ES initiatives. Gathering the insight of DHs is pertinent to understanding the barriers to and facilitators of ES practices.¹²

Future directions

It is necessary that environmental sustainability efforts adapt to dynamic global conditions. The COVID-19 pandemic has demonstrated the impact that highly infectious diseases have should they spread.²⁵⁻²⁷ To mitigate transmission of COVID-19, high-level infection prevention and control protocols have increased demand for personal protective equipment, barriers, single-use disposables, single-dose materials, and stringent adherence to disinfection and sterilization methods.²⁷⁻³² Increased pollution is expected as the general public and non-health care industries make use of masks, gloves, and various disinfectant methods for everyday protection.³³ Because of physical distancing requirements and essential service-only orders around the globe, ES initiatives have been halted, including summits, enforcement, monitoring, and protests.³⁴⁻³⁶ Moving forward, an opportunity exists for OHC professionals to define their roles as stewards of both human and environmental health.

Further research will improve the understanding of the barriers to and facilitators of the adoption of ES initiatives in the OHC clinical setting. Research in the Canadian context, especially among DHs, will fill this gap in the literature. Gathering insights from all members of the OHC team, including DHs, will inform the development of education, incentives, protocols, and infrastructure to enable all OHC professionals to collaboratively choose ES practices applicable to their clinical settings.

CONCLUSION

The OHC field is a resource-intensive industry with heavy demands on supply, energy, water, and more.^{8-10,11-19} The success of implementing ES initiatives in the OHC clinical setting relies on a multidimensional, high-technology, and collaborative approach to mitigate greenhouse gas emissions and pollution. Current barriers to environmental sustainability in OHC clinical practice are infrastructural, institutional, educational, and individual. Further research and collaboration may guide the development of education,

protocol, policy, and infrastructure changes to facilitate the adoption of ES initiatives by OHC professionals amidst ever-changing global conditions. ES initiatives embody holistic and preventive approaches to which the dental hygiene profession subscribes. When DHs adopt ES initiatives to curb the potential environmental impacts of their work, they support population health promotion and disease prevention and thus the well-being of future generations.

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CONFLICTS OF INTEREST

None declared.

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