EDITORIAL

The use of technology to address access-to-care barriers in remote and rural communities

Despite many advances in the field of dentistry and oral health, challenges continue to exist in addressing the unmet oral health care needs of equity-deserving populations. This includes seniors, children, low-income populations, people with special needs, 2SLGBTQQIA+ communities, people on social welfare, people experiencing homelessness, Indigenous people, new immigrants, refugees, and others. While developed countries' overall oral health care measures rank above average compared to other countries worldwide, inequities in oral care persist. Vulnerable populations situated at the lower end of the social gradient face unique and complex access to oral health care challenges primarily attributed to social determinants of health. For example, the Canadian Health Measures Survey revealed fair or poor self-perceived oral health for those without access to regular dental care, signaling the importance of access to safe and patient-centered oral care in improving oral health outcomes.[1] In the United States, the rates of caries and untreated tooth decay were two to three times higher among African American and Mexican American children, adolescents, and young adults aged 2 to 19 years compared to their non-Hispanic white peers, as pointed out by the Centers for Disease Control and prevention.[2] Globally, similar trends persist in marginalized groups, such as rural dwellers and other underrepresented communities.[3]

Priority populations suffer disproportionately from oral health inequities including high unmet dental treatment needs. These inequities are the result of complex and multifaceted societal and environmental factors. Particularly, accessing oral health care services in rural and remote communities poses several challenges. Not only children, but all age groups suffer disproportionately in different ways due to lack of access to dental services. There are multiple challenges including, but not limited to, geographic barriers, limited availability of dental professionals, financial constraints, cultural barriers, lack of oral health education, and historical and systemic factors. For instance, many Indigenous communities in Canada are in rural and remote areas, far from dental clinics and other health care facilities. The vast distances, limited transportation options, and inadequate infrastructure make it difficult for community members to access oral health services regularly. A visit to the dentist may require several hours of travel on gravel roads, which, during severe weather conditions, may be undrivable. In some cases, individuals need to plan an overnight trip just to receive oral health care. Also, there is a shortage of dental professionals in many rural and remote communities. This shortage contributes to long waiting times for appointments and limited access to preventive and treatment services. Additionally, limited oral health education and awareness programs in these locations further contribute to disparities. Many community members may not have sufficient knowledge about proper oral hygiene practices, preventive measures, and the importance of regular dental check-ups. This lack of awareness coupled with multifaceted access to care challenges can lead to a higher prevalence of oral health problems.

The access to care challenges faced by rural and remote communities are ongoing, despite the urgency raised for decades to address these issues. There is a strong need nowadays to explore and implement the emerging tools such as teledentistry, artificial intelligence, wearable devices, virtual reality, and mobile clinics, which hold transformative potential for oral health care. Combined with a collaborative approach and interdisciplinary partnerships, the integration of these methods holds the potential to address some of the ongoing issues that contribute to oral health disparities. Even though full-blown dental treatment may not yet be possible with the use of technology, we can still effectively find ways to enhance screening and education measures and establish care pathways, which can be impactful and sustainable interventions to improve access to care and potentially lower the oral disease burden.

By using digital communication technologies to connect patients with dental providers remotely, teledentistry allows for consultations, screenings, treatment planning, and follow-ups without requiring in-person visits. These are especially vital in areas with limited oral health care provider access. For example, in the United States, teledentistry programs have been used successfully to screen school-age children for oral health conditions, with referrals provided for those in need.[4] Similarly,

in Australia, teledentistry services have connected patients in Indigenous communities to oral health providers, improving access to preventive care and treatment options. These programs demonstrate measurable results: increased preventive care, early detection of oral diseases, and better patient engagement. Moreover, telehealth can potentially help reduce the costs associated with long-distance travel, offering patients in geographically isolated areas affordable alternatives to traditional visits.[4]

Mobile health units equipped for dentistry are another example of how technology can address geographical inequities. These services, which include mobile clinics outfitted with portable equipment, travel directly to underserved communities to provide preventive and restorative care. They have been particularly successful in areas lacking nearby dental clinics or where transportation is a barrier. For instance, the province of Quebec in Canada implemented mobile oral health programs for dependent elderly and people with disabilities, leading to improvements in access to timely oral health care. These mobile units provide check-ups, treatment, and increase public awareness about oral hygiene practices, and have the potential to foster long-term oral health improvements.[5]

By predicting risk factors, optimizing treatment plans, and identifying patterns in underserved populations, artificial intelligence (AI) and advanced data analysis are also transforming oral health care. AI algorithms can detect early-stage diseases using radiographic images, allowing providers to intervene earlier and mitigate progression. Data analysis can help identify geographic areas that require improved dental care access, and identify vulnerable groups by looking at dental indices and disease prevalence. Globally, AI has been applied in both private practice and public health settings to improve diagnostics in underserved areas with limited access to specialists. For example, AI-driven diagnostic tools have been integrated into screening programs in parts of Europe and Asia, enabling earlier detection of conditions such as oral cancer and premalignant oral disorders.[6]

Looking forward, the integration of wearable health devices, virtual reality for patient education, and blockchain for secure data sharing may further strengthen efforts to reduce health disparities. These technologies could also personalize care, making oral health interventions accessible and tailored to individual patient needs and behaviors. There may be benefits to combining these technological modalities to improve access to care for priority populations.

Technology has proven its ability to level the playing field in numerous health areas. However, continued investment, innovation, and policy changes are necessary to scale these efforts globally and ensure they are inclusive. Governments, non-governmental organizations, and private sectors must collaborate to expand access to telehealth, mobile clinics, AI diagnostics, and other emerging technologies. While technology can address some systemic inequities that exist in oral health care, the question is whether we can harness their full potential through coordinated, equitable efforts to ensure no group is left behind.

Successfully implementing technologies to address gaps in access to oral health care requires respecting and integrating the unique contexts of minority groups, decolonizing oral health promotion, embracing traditional Indigenous health and healing practices, and employing community development approaches to foster the adoption of evidence-based oral health promotion strategies.[7,8] It is critical for these initiatives to be community-driven and community-led, ensuring that service delivery and design provide culturally safe oral health care. It is vital that the communities feel seen, understood, and actively involved in their oral health journey at every step. By leveraging technological innovation to improve access to care, we can make significant progress toward reducing disparities and achieving equitable oral health care for all.

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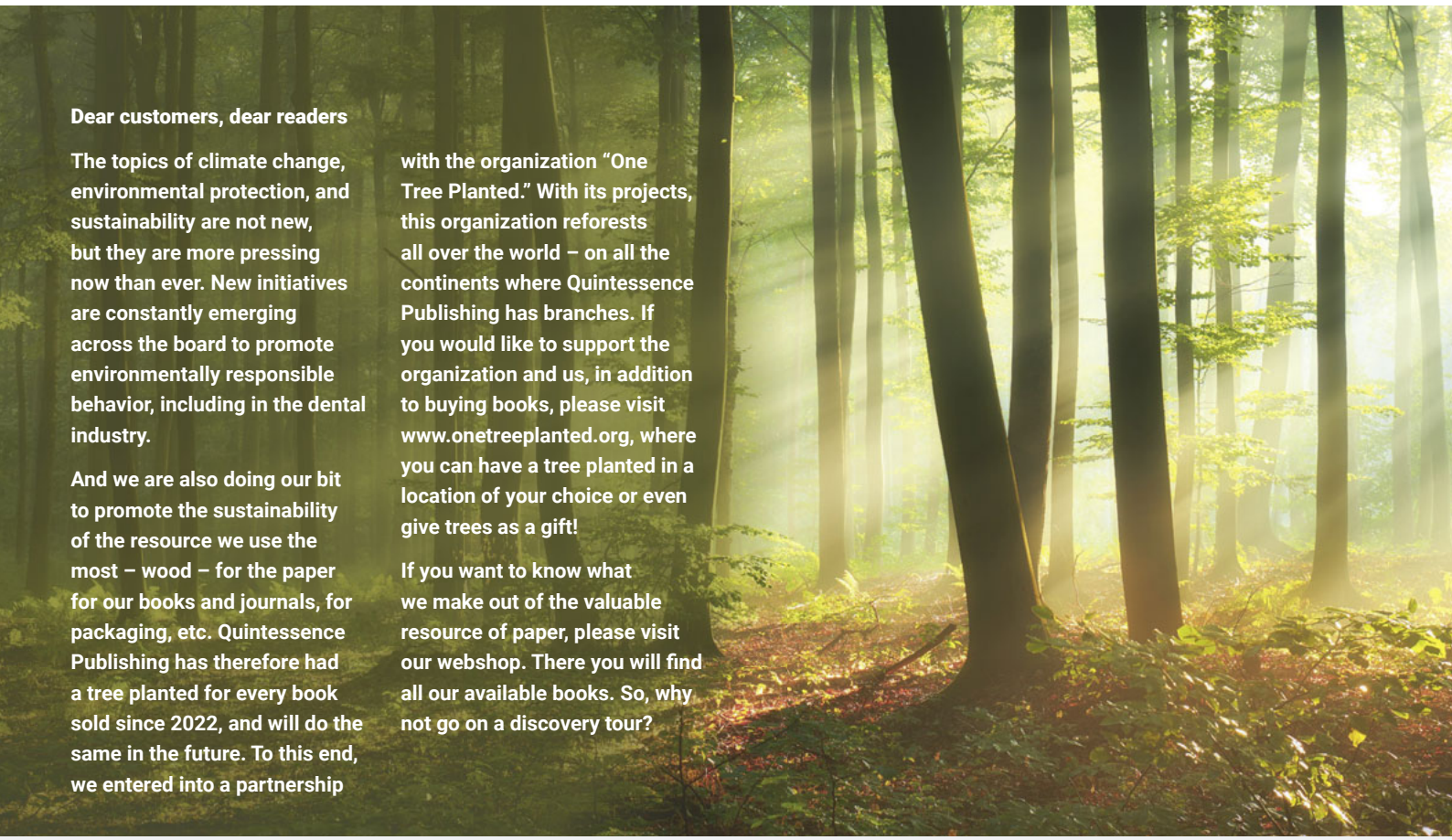

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