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Bacterial contamination in bristles of charcoal toothbrushes versus non-charcoal toothbrushes

Queering the health care system

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EDITORIAL

Canada's changing demographics and its oral health care implications

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The mission of the *Canadian Journal of Dental Hygiene* is to publish high-quality, credible, and accessible research to inform practice, education and policy, and promote the oral health and well-being of the public.

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The *Canadian Journal of Dental Hygiene* is the official peer-reviewed publication of the Canadian Dental Hygienists Association (CDHA). Published in February, June, and October, the journal invites submissions of original research, literature reviews, case studies, and short communications of scientific and professional interest to dental hygienists and other oral health professionals. Bilingual *Guidelines for Authors* are available at www.cdha.ca/cjdh.

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The baby boomer takeover: Canada's changing demographics and its oral health care implications

Salme Lavigne, PhD, RDH

Salme Lavigne

According to Statistics Canada, for the first time ever, there are more people in Canada over 65 years of age than those under the age of 15.[1,2] If this trend continues, Statistics Canada projects that seniors will outnumber children in Canada by a factor of 3 to 2 in the next 20 years.[2] Even more surprising is that the number of Canadian women in their late 60s who are still in the workforce has tripled in the last 15 years.[1] These changing demographics come as no surprise since we have been hearing projections about the aging "baby boom" generation for several decades. Statistics Canada defines baby boomers as those individuals who were born in the 2 decades following the Second World War.[3] This rapidly aging group now encompasses those between 50 and 69 years of age and makes up 27% of our current population.[4]

Another demographic trend is that seniors are now living much longer than they did a decade ago. The 2016 census reported 8,230 centenarians in Canada, a 41.3% increase over the 2011 figures.[2] One-third of older seniors, ages 85 years and older, live in nursing homes and residences for senior citizens. For centenarians, that figure increases to 66.5%.[5] These new figures should not be taken lightly.

The question of whether there will be enough pension funding remaining to support Canada's aging population is only one of many concerns. In 2010, the median income for senior women was about one-third less than for men ($19,500 for women, compared to $28,900 for men).[6] The largest discrepancy was with respect to median income from private pensions and RRSPs. The $8,000 received by women was barely half of the $15,200 received by men.[6]

Another pressing concern is the health needs of the baby boomers as they age. In 2008, 76% of seniors were reported to have at least 1 of 11 chronic health conditions; 25% had 3 or more of these conditions. This finding is significant as increased demand on the health care system has been related to the number of chronic diseases and not age.[7]

Of particular importance to our profession among these health concerns are the dental needs of older adults. Tooth loss, difficulty or pain on eating, loss of taste sensation, increased root caries, periodontal disease, increased denture-related lesions, and oral cancer are just some of the problems experienced by this cohort. In fact, the rates of periodontal disease among older adults in one recent Canadian study was reported to be 66%.[8] Compounding the situation is the high rate of dementia among this demographic, often resulting in either an inability or a resistance to performing adequate oral hygiene. Given the growing evidence of links between oral and systemic health, maintaining good oral hygiene practices as one ages is paramount to sustaining good overall health.

With their retirement looming, not only will the baby boomers in Canada lose a large portion of their income, but many will also lose their dental insurance at a time when they most need it. According to Statistics Canada, dental utilization rates are lowest among seniors and, in a report from the Canadian Institute for Health Information a decade ago,[9] only 29% of seniors had dental insurance. Given that people are keeping their natural teeth longer than ever—edentulism rates have dropped from 27% in 1972 to 6% in 2009 as reported in the most recent Canadian Health Measures Survey[10]—the ability to pay for regular dental and dental hygiene care is crucial. Although the baby boomer generation on average tends to be much healthier than previous generations as evidenced by the increase in life expectancy,[5] lack of dental insurance coverage and lower income may prevent them from accessing much-needed dental services.

Access to dental care is considered one of the major determinants of oral health, yet lack of access to care for this vulnerable age group is continuing to increase in magnitude. The access issue is even more problematic for seniors with disabilities and those living in institutions where dental services are limited at best. On the bright

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side, the age of admission to nursing homes has increased significantly and is now, on average, 85 years of age. Yet, upon admission to a nursing home, many older adults experience a dramatic increase in drug prescribing, both in Canada[11] and the US,[12] averaging around 8 medications per resident.[11,12] From a dental perspective, polypharmacy is problematic, as a side effect of many prescription medications is xerostomia. Reduced salivary flow can lead to multiple problems such as root caries, periodontal disease, inability to chew food properly, loss of taste sensation, and often ultimate tooth loss. For those living in nursing homes, lack of adherence to daily oral care by nursing home staff, which has been well-documented, further magnifies the oral health problems associated with this population group.[13]

As primary health care professionals, dental hygienists must take these matters very seriously and actively seek solutions to address these problems. Elected officials and policy makers should be encouraged to develop new ways to provide access to dental care for Canada's aging population both in the community and in residential facilities. Such advocacy work should become a top priority for the profession as the baby boomer cohort reaches retirement age. The time to act is now!

REFERENCES

1. CBC News. More Canadians are 65 and over than under age 15, StatsCan says [Internet]. 2015 Sept 29 [cited 2017 May 28]. Available from: www.cbc.ca/news/business/statistics-canada-seniors-1.3248295
2. Grenier E. Canadian seniors now outnumber children for 1st time, 2016 census shows [Internet]. CBC News, 2017 May 3 [cited 2017 May 28]. Available from: www.cbc.ca/news/politics/2016-census-age-gender-1.4095360
3. Statistics Canada. Generations in Canada [Internet]. Catalogue no. 98-311-X2011003 [cited 2017 May 28]. Available from: www12.statcan.gc.ca/census-recensement/2011/as-sa/98-311-x/98-311-x2011003_2-eng.cfm
4. Parkinson D, McFarland J, McKenna B. Boom, bust and economic headache. *The Globe and Mail*. 2017 Jan 5. Available from: www.theglobeandmail.com/globe-investor/retirement/the-boomer-shift-how-canadas-economy-is-headed-for-majorchange/article27159892/
5. Statistics Canada. A portrait of the population aged 85 and older in 2016 in Canada [Internet]. 2017 May 3 [cited 2017 May 28]. Available from: www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016004/98-200-x2016004-eng.cfm
6. HRSDC calculations based on Statistics Canada. Income of individuals, by sex, age group and income source, 2010 (CANSIM Table 202-0407). Ottawa: Statistics Canada; 2012.
7. Canadian Institute for Health Information. *Health care in Canada, 2011: A focus on seniors and aging.* Ottawa: CIHI; 2011.
8. Matthews DC, Clovis JB, Brillant MGS, Filiaggi MJ, McNally ME, et al. Oral health status of long-term care residents—a vulnerable population. *J Can Dent Assoc.* 2012;78(1):c3.
9. Canadian Institute for Health Information. *Exploring the 70/30 split. How Canada's health care system is financed.* Ottawa: CIHI; 2005.
10. Health Canada. *Report on the findings of the oral health component of the Canadian health measures survey 2007–2009.* Ottawa: Health Canada; 2010.
11. Doupe M, Brownell M, Kozyrskyj A, Dik N, Burchill C, Dahl M, et al. *Using administrative data to develop indicators of quality care in personal care homes.* Winnipeg, MB: Manitoba Centre for Health Policy; October 2006 [revised 2007 Jan 19, pp 35-36 only]. Available from: http://mchp-appserv.cpe.umanitoba.ca/reference/pch.qi.pdf
12. Jablonski RA. Examining oral health in nursing home residents and overcoming mouth care-resistive behaviors. *Ann Longterm Care.* 2010;18(1):1–12.
13. Lavigne SE. Effects of power toothbrushing on oral inflammation, caregiver adherence, and systemic inflammation in a sample of nursing home residents [PhD dissertation]. Winnipeg, MB: University of Manitoba; 2015. Available from: http://hdl.handle.net/1993/30403

ISSUE AT A GLANCE

In addition to a short communication by **Brett Hastings** and **Serena Yee** on how to create environmentally friendly dental offices (pp. 90–93), this issue includes reviews of *Medical Emergencies in Dental Practice* by **Brittany R Stumpf** and **Cory Stumpf** (pp. 97) and *Promoting the Oral Health of Children: Theory & Practice* by **Karen Gallagher** (pp. 99–101). The June issue also features the following research articles.

Lee J, Palaniappan K, Hwai TT, Kit CW, Dicksit DD, Kalyan CG, Muttalib DKA, Ramachandra SS. Comparison of bacterial contamination in bristles of charcoal toothbrushes versus non-charcoal toothbrushes. *Can J Dent Hyg.* **2017;51(2):69–74.**
Manufacturers claim that charcoal toothbrushes have antimicrobial properties that reduce the potential for bacterial contamination, which can contribute to oral diseases. This study compared the levels of bacteria in charcoal and non-charcoal bristles of used toothbrushes. Ninety university students participated in the study, brushing their teeth twice daily with a charcoal toothbrush for one week, and then (after a one-week break), brushing twice daily with a non-charcoal toothbrush for one week. The number of colony forming units in the charcoal toothbrushes was substantially less when compared with non-charcoal toothbrushes. However, the difference was not statistically significant. Further studies should be conducted with a larger sample size in order to determine the effectiveness of charcoal as a bacteria-resistant material for toothbrushes.

Aboytes DB, Calleros C. Learners' perceptions of practices in local anesthesia education. *Can J Dent Hyg.* **2017;51(2):75–79.**
This descriptive study evaluates student perceptions of local anesthesia education and identifies practices that would aid in increasing and improving clinical confidence and performance. Participants were randomly assigned into test and control groups and were surveyed on their learning preferences both before and after training. The pretest survey revealed that 91% of participants felt prepared to begin the clinical portion of their local anesthesia course, and 96% felt the student-to-student model was critical in learning how to administer local anesthesia injections. While pretest results showed that 74% of participants preferred that their first local anesthesia injection be on a model/typodont, posttest results demonstrated a clear shift in opinion. Practising injections of local anesthesia shaped the students' perceptions, regardless of the model used. After practice, a statistically significant number of students expressed a preference for the student-to-student local administration model. Dental hygienists who are seeking to increase their scope to include local anesthesia administration should expect to learn via this traditional method.

Lee A, Kanji Z. Queering the health care system: Experiences of the lesbian, gay, bisexual, transgender community. *Can J Dent Hyg.* **2017;51(2):80–89.**
Discrimination, assumptions about gender and sexuality, and ignorance of lesbian, gay, bisexual, transgender (LGBT) issues shape the health care experiences of the LGBT community in North America. As a result, many members of this community delay or discontinue care, engage in risky health behaviours, conceal their sexuality or gender identity, and internalize stigma. This article examines the health care experiences of the LGBT community and argues that increasing awareness of barriers faced by the LGBT community, using inclusive language and positive space signage, and strengthening the cultural sensitivity training of health care professionals should improve the health care experiences of this population. As primary health care providers, dental hygienists can use the information presented in this review to ensure that they are always offering safe, inclusive, and individualized care to their clients.

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Comparison of bacterial contamination in bristles of charcoal toothbrushes versus non-charcoal toothbrushes

Janice Lee*, BDS; **Keethadevi Palaniappan***, BDS; **Tang Tee Hwai***, BDS; **Cheah Wen Kit***, BDS; **Daniel Devaprakash Dicksit**[§], BDS, MPH; **Kalyan CG**[‡], BDS, MDPH; **Datuk Dr. Khairiyah Abd Muttalib**[Δ], BDS, DPH(Dent); **Srinivas Sulugodu Ramachandra**[‡], MDS

WHY THIS ARTICLE IS IMPORTANT TO DENTAL HYGIENISTS

- Micro-organisms have been shown to adhere to and survive on toothbrushes.
- Bacterial contamination of toothbrushes contributes to oral diseases.
- Identifying materials that reduce bacterial contamination of toothbrush bristles may improve oral health.

ABSTRACT

Objective: Charcoal toothbrushes have been marketed widely with manufacturers' claims of lesser bacterial contamination owing to the presence of activated charcoal. The aim of this study was to evaluate the bacterial contamination of charcoal bristles compared to non-charcoal bristles in used toothbrushes. **Material and methods:** Ninety participants were involved in the study. They were given standard brushing instructions on the use of a charcoal toothbrush, and were asked to return the used brushes after 1 week of usage. After a 1-week washout period, the participants were then provided with similar brushing instructions and a non-charcoal toothbrush, and were instructed to return the brush after another week of usage. Bristles of the used toothbrushes were sectioned and placed in a nutrient broth. A pipette was used to extract 0.1 mL of nutrient broth to smear on agar plates. A colony counter was used to measure colony forming units (CFU) after 24 hours of incubation. Data collected were analysed using a paired sample t-test. **Results:** The mean CFU count for non-charcoal bristles was almost double (106.3; 95% CI 53.39, 159.28) that of charcoal bristles (58.8; 95% CI 15.09, 102.55). However, there was no statistically significant difference between the two groups (p = 0.198). **Conclusion:** This study shows no statistically significant difference in bacterial counts between bristle types, despite substantially lower CFUs in the charcoal bristles compared with non-charcoal bristles after 1 week of use.

RÉSUMÉ

Objectif : La mise en marché des brosses à dents au charbon a été largement axée par les fabricants sur la réduction de la contamination bactérienne en raison de la présence du charbon activé. La présente étude avait pour objectif l'évaluation de la contamination bactérienne des poils de charbon par rapport aux poils sans charbon des brosses à dents usagées. **Matériau et méthodes :** Quatre-vingt-dix participants ont pris part à l'étude. Les participants ont reçu les instructions habituelles de brossage sur l'utilisation d'une brosse à dents à poils de charbon et ont été invités à retourner les brosses à dents usagées après une semaine d'utilisation. Après une période sans traitement d'une semaine, les participants ont reçu des instructions de brossage semblables et une brosse à dents à poils sans charbon. Ils ont été invités à retourner la brosse après une autre semaine d'utilisation. Les poils des brosses à dents usagées ont été sectionnés et placés dans un bouillon de culture. Une pipette a été utilisée pour extraire 0,1 mL de bouillon de culture et l'étaler sur des plaques de gélose. Un compteur de colonies bactériennes a été utilisé pour mesurer les unités formatrices de colonies (UFC) après 24 heures d'incubation. Les données recueillies ont été analysées au moyen de test t pour échantillons appariés. **Résultats :** La concentration moyenne d'UFC présente sur les poils sans charbon était presque le double (106,3; 95 % CI 53,39, 159,28) de celle présente sur les poils de charbon (58,8; 95 % CI 15,09, 102,55). Toutefois, il n'y avait aucune différence statistiquement significative entre les deux groupes (p = 0,198). **Conclusion :** Cette étude ne révèle aucune différence statistiquement significative dans le compte de bactéries entre les types de poils, malgré la présence d'un nombre nettement plus faible d'UFC sur les poils de charbon comparativement aux poils sans charbon après une semaine d'utilisation.

Key words: bacterial contamination, charcoal bristles, used toothbrushes

INTRODUCTION

Toothbrushes become contaminated with pathogenic bacteria from dental plaque, the environment or a combination of factors. Mehta et al.[1] studied the effectiveness of various methods of reducing bacterial contamination of toothbrushes, including covering the toothbrush head with a plastic cap, overnight immersion of toothbrushes in Listerine®, and overnight immersion of brushes in chlorhexidine. Each method was tested for a 1-week

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Figure 1. Non-charcoal and charcoal toothbrushes used in this study

period. The results revealed that overnight immersion of a toothbrush in 0.2% chlorhexidine gluconate was more effective than overnight immersion in Listerine or covering the toothbrush head with a plastic cap.[1] This study also concluded that 70% of the used toothbrushes were heavily contaminated with different pathogenic microorganisms.[1] Several other studies have also investigated various methods of brush decontamination.[2-6]

A new variant of toothbrushes, charcoal toothbrushes, has been introduced into the market; these toothbrushes are popular in South-East Asian countries like Malaysia, Singapore, and Indonesia.[7] Consumers can also buy these products through online vendors.[7] Bristles of charcoal toothbrushes are black in colour and are prepared by blending binchotan charcoal into nylon bristles. Manufacturers of these toothbrushes claim that they have antimicrobial properties thanks to the charcoal in them, resulting in less bacterial contamination.[7] However, there is no scientific evidence to support these claims.

It has been well-established that micro-organisms adhere, accumulate, and survive on toothbrushes.[2] Furthermore, these microbes have been shown to be capable of transmission to the individual, which in turn can cause diseases.[8] Decontamination of toothbrushes should be a priority in order to eliminate the transmission of pathogenic micro-organisms from the oral cavity or from other toothbrushes stored nearby or from the storage area itself.[9] Various materials have been incorporated into toothbrush bristles with the aim of reducing bacterial contamination.[2] Since it has been suggested that charcoal may have bacterial resistant properties, toothbrushes have been created with charcoal infused into the bristles. The aim of this study was to evaluate the bacterial contamination of charcoal bristles compared to non-charcoal bristles in used toothbrushes by comparing the microbial counts present in the bristles.

Figure 2. Used charcoal and non-charcoal toothbrushes returned in sterile pouches

MATERIAL AND METHODS

This crossover clinical trial was approved by the Institutional Ethics Committee of SEGi University. Students who attended the SEGi Oral Health Centre from June 2015 to August 2015 formed the sampling frame. Those ages 18–25 years with toothbrushing frequency of 2 times daily were eligible for inclusion in the study. Students selected for the study had basic periodontal examination (BPE) scores of 1 and 2[10]; students with BPE scores of 3 and 4 were excluded. Likewise, students with International Caries Detection and Assessment system (ICDAS)[11] scores of ≥3 were excluded from the study. Students with open carious lesions, poor plaque scores (plaque index scores of >2),[12] severe gingivitis (gingival index score >2),[12] throat infections, irregular brushing frequency, as well as those unwilling to use a charcoal toothbrush, those using mouthwash and/or antibacterial toothpastes, smokers or those medically compromised were excluded from the study. All the students who participated in the study were manual brush users. From the name list of 200 students

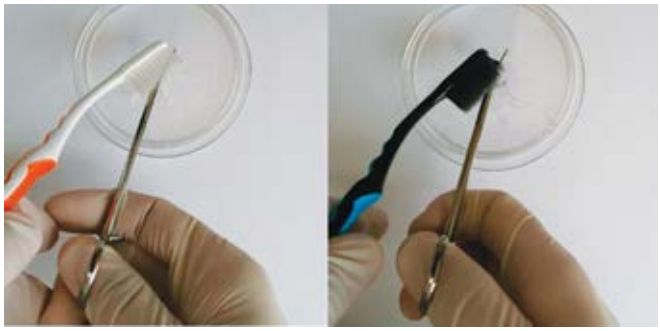

Figure 3. Bristles collected in sterile petri dishes

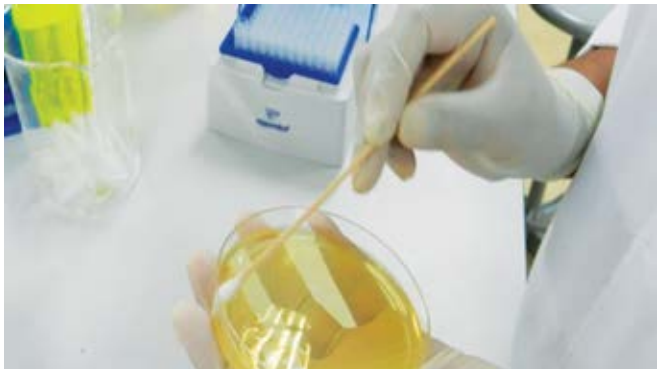

Figure 4. Nutrient broth containing used toothbrush bristles is smeared on the nutrient agar plate

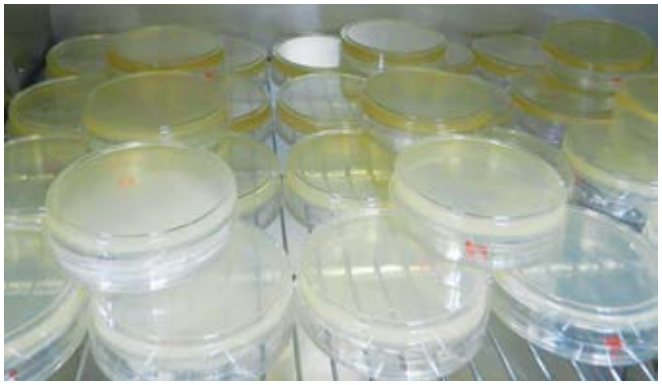

Figure 5. Smeared nutrient agar plates placed for incubation

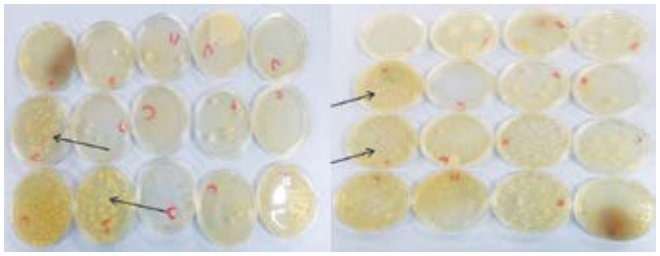

Figure 6. Microbial growth noticed after 24 hours incubation (plates marked "c" contain charcoal bristles; plates marked "n" contain non-charcoal bristles)

(provided by the course coordinator of the university) who met the inclusion criteria, 90 participants were randomly chosen. All 90 participants were informed about the study and signed the consent form prior to participation.

All participants were given standard instructions on toothbrushing and toothbrush storage to minimize bias in the study. Standard brushing instructions included brushing twice daily (once each in the morning and night) for 2 minutes.[13] Students were instructed to place the brush at a 45-degree angle to the gums and gently move the brush back and forth in short strokes. Participants were instructed to brush the outer surfaces, the inner surfaces, and the chewing surfaces of all teeth. They were also instructed to clean the inside surface of the front teeth, tilting the brush vertically and making several up-and-down strokes.[13] They were also advised not to use any type of mouthwash, to wash the toothbrush bristles under running water without using their fingers to clean the bristles, not to cover the toothbrush bristles with a cap, and to place the toothbrush upright after use with the bristles on top at least 2 feet away from the toilet. Researchers from the University of Alabama found that brushes stored in the bathroom are very likely to have faecal matter lingering in the bristles.[14] Toilet flushing was shown to produce an aerosol spray of bacterium tainted water which can contaminate the bristles.[14] Thus, study participants were instructed to keep the toothbrushes at least 2 feet away from the toilet. Students were asked to document their daily 2-minute brushings on a standardized recording sheet provided to them.

Each participant was then given a charcoal toothbrush and asked to return the toothbrush after 1 week of use. After a wash-out period of 1 week, non-charcoal toothbrushes were given to the participants and again, they were asked to use the brushes for 1 week and to return the non-charcoal toothbrushes after the week. Both the charcoal and non-charcoal brushes were similar in design with a compact head, soft bristles, and a bristle tip that was less than 0.01 mm (Figure 1; Colgate® Slim Soft Charcoal Toothbrush). The participants received individual sterile pouches into which to place each used toothbrush for return (Figure 2).

On return of the toothbrushes, one-third of the bristles were cut and collected on separate sterile petri dishes (Figure 3). Using sterile forceps, the study assistant placed the toothbrush bristles in separate test tubes containing a nutrient broth and swirled. A sterile pipette was used to extract 0.1 mL of the nutrient broth, which was poured onto a nutrient agar plate. A sterile cotton bud was used to smear the solution on the agar plate (Figure 4). The agar plates were then placed in the incubator for 24 hours (Figure 5), after which colonies of microbial growth were noted (Figure 6). Colony counters (Fisher Scientific brand, model F22 0360/10R) were used to measure the colony forming units (CFU) present on each agar plate

(Figure 7). Data obtained were tabulated and statistically analysed using MedCalc ver 12. A paired sample t-test was conducted to compare the number of CFUs for charcoal and non-charcoal bristles. The significance level was set at $p < 0.05$. Mean values for CFU counts and 95% confidence intervals for the mean were determined for the 2 groups.

RESULTS

Of the 90 participants, 3 did not return one of their toothbrushes. Five participants did not properly place their toothbrushes in the sterile pouches provided and these (5 x 2 brushes) were excluded from the study. A final count of 164 toothbrushes—82 charcoal and 82 non-charcoal—were collected from participants. Out of 164 agar plates (82 charcoal and 82 non-charcoal), 102 plates (51 charcoal and 51 non-charcoal) were seen to have microbial colonies and included in the analysis. There were no growths seen in 62 plates after 24 hours of incubation. Using the colony counters, higher counts of CFUs were seen on the agar plates from used non-charcoal brushes compared with those from used charcoal brushes.

Table 1 presents the results of the paired sample t-test comparing the number of CFUs between the 2 types of bristles. The mean CFUs for non-charcoal bristles were almost double (106.3; 95% CI 53.39, 159.28) those of the charcoal bristles (58.8; 95% CI 15.09, 102.55). However, there was no significant difference between the 2 products ($p = 0.198$).

DISCUSSION

Results revealed substantially lower CFU counts in agar plates for used charcoal bristles compared with used non-charcoal bristles. This difference, however, was not statistically significant. This is most likely due to the high variability of CFUs demonstrated by the standard deviations found in both products. A power analysis was not performed prior to study commencement. A post-study power analysis revealed a sample size of 209 brushes was required (alpha value of 0.05, beta value of 0.20) to obtain a statistically significant difference between means. To date, there is a dearth of scientific literature on toothbrushes with charcoal infused bristles. Manufacturers' claim that charcoal toothbrushes control micro-organisms, inhibit mouth odour, effectively remove plaque, and whiten teeth, yet such claims are not supported by scientific evidence on bacterial inhibition. Charcoal in itself has the property of being absorbent, neutralising toxins, poisons, and noxious gases.[3] However, it continues to be a matter of speculation as to whether these properties contribute to lesser contamination of used charcoal-infused bristles in toothbrushes.

Additions of antiplaque and antimicrobial substances to toothbrush bristles in attempts to reduce contamination of used toothbrushes are not a new phenomenon. Turner et al. conducted a study to determine the effectiveness of chlorhexidine-coated toothbrush filaments in reducing quantities of bacteria.[3] The study concluded that there was no statistically significant difference in the quantity of bacteria surviving on chlorhexidine-coated filaments compared with the control group after 30 days of use.[3] The manufacturer of the chlorhexidine-coated toothbrush, however, suggested that chlorhexidine-coated filaments were only effective for a 30-day period, after which time the toothbrush should be replaced.[3] Al–Ahmad et al. studied the antimicrobial effect of silver-coated toothbrush heads in-vitro.[4] The organisms investigated were *Streptococcus oralis, Streptococcus mutans, Streptococcus sanguis, Actinomyces viscosus, Lactobacillus casei* and *Candida albicans*. The study concluded that there was no significant reduction in the CFUs by silver-coated toothbrushes for the above-mentioned tested organisms.[4] On the contrary, the CFU counts for *S. sanguis* ($p = 0.02$) and *C. albicans* ($p = 0.01$) were significantly higher on silver-coated toothbrushes compared with the controls.[4] This current study did not investigate specific organisms; only microbial counts were made.

In 2014, Tomar et al. evaluated the sanitization potential of UV-rays and 0.2% chlorhexidine (CHX) solution for disinfection of used toothbrushes.[5] Toothbrushes were collected after 7 days of use and placed into 3 groups: Group I brushes were soaked in 0.2% CHX mouthwash

Table 1. CFU differences between charcoal and non-charcoal toothbrush bristles

	Used charcoal brushes n = 51	Used non-charcoal brushes n = 51
CFU mean (SD)	58.8235 (155.48)	106.3333 (188.23)
Standard error of the mean	21.7720	26.3580
Mean difference (SD)	47.5098 (259.92)	
95% CI	–25.5938 to 120.6134	
2-tailed probability	$p = 0.198$	

Paired sample t-test significant if $p < 0.05$

for 12 hours, Group II brushes were placed in UV-light toothbrush holders for 7 minutes, and Group III brushes were soaked in normal saline for 12 hours. Microbial analysis and mean bacterial counts showed that all 3 methods were effective in reducing the bacterial counts on the toothbrushes tested ($p < 0.007$). However, UV ray treatment was more effective ($p = 0.001$) when compared with CHX and normal saline.[5] The authors suggested that UV light is capable of deactivating the micro-organisms by disrupting the chemical bonds that hold the DNA atom.[5] Studies have suggested that longer exposure to UV light can further lead to complete deactivation of micro-organisms.[5]

Basman et al. studied toothbrush disinfection using 0.12% chlorhexidine gluconate, 2% sodium hypochlorite (NaOCl), a mouthrinse containing essential oils and alcohol, and 50% white vinegar.[6] The most effective method for elimination of all tested bacterial species was found to be 50% white vinegar ($p = 0.000$), followed by 2% NaOCl, mouthrinse containing essential oils and alcohol, 0.12% chlorhexidine gluconate, dishwasher use, and tap water (control).[6]

Some studies in rural populations have reported abrasion on the labial surfaces of teeth due to use of charcoal powder for toothbrushing.[15] Although no direct comparison can be made between abrasiveness of charcoal powder and the charcoal-infused toothbrush bristles used in this study, further studies could be done over a longer duration to explore whether charcoal brushes damage the tooth structure. Toothbrush trauma results in portals of entry for micro-organisms, leading to infection.[16] Contaminated toothbrushes can easily be a source of such infections.[16] As a result, various products that claim lesser contamination of used toothbrushes have been developed.[17]

Limitations of the study

One limitation was the lack of analysis of the types of bacteria present. It is possible that anaerobic bacteria may be harboured differently from aerobic bacteria. In future studies, specific types of bacterial growth (aerobic/anaerobic) should be studied. A major study limitation was the lack of an initial power analysis which would have revealed the necessity of using a larger sample size. To compare the effectiveness of the 2 products, studies with a larger sample size will need to be conducted. Additionally, the manufacturers of charcoal toothbrushes have not provided information regarding the concentration of the charcoal in the brush. Thus, the concentration of charcoal at baseline or after a certain period of use cannot be examined with the currently marketed brushes.

Figure 7. Colony counter (Fisher Scientific brand, model F22 0360/10R) used to measure the total colony forming units

CONCLUSION

Our study showed the number of CFUs in charcoal toothbrushes was substantially less when compared with non-charcoal toothbrushes after 1 week of usage. However, the difference in these microbial counts was not statistically significant between the 2 products. Further studies should be conducted with a larger sample size, longer duration of use, and with identification of specific micro-organisms in the bristles.

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CONFLICT OF INTEREST

The authors have declared no conflicts of interest in connection with this article.

REFERENCES

1. Mehta A, Sequeira PS, Bhat G. Bacterial contamination and decontamination of toothbrushes after use. *N Y State Dent J.* 2007;73(3):20–22.
2. Richards D. How clean is your toothbrush? *Evid Based Dent.* 2012;13(4):111.
3. Turner LA, McCombs GB, Hynes WL, Tolle SL. A novel approach to controlling bacterial contamination on toothbrushes: chlorhexidine coating. *Int J Dent Hyg.* 2009;7(4):241–45.
4. Al-Ahmad A, Wiedmann-Al-Ahmad M, Deimling D, Jaser C, Pelz K, Wittmer A, Ratka-Krüger P. An antimicrobial effect from silver-coated toothbrush heads. *Am J Dent.* 2010;23(5):251–54.
5. Tomar P, Hongal S, Saxena V, Jain M, Rana K, Ganavadiya R. Evaluating sanitization of toothbrushes using ultra violet rays and 0.2% chlorhexidine solution: A comparative clinical study. *J Basic Clin Pharm.* 2014;6(1):12–18.
6. Basman A, Peker I, Akca G, Alkurt MT, Sarikir C, Celik I. Evaluation of toothbrush disinfection via different methods. *Braz Oral Res.* 2016;30(1).
7. Ramachandra SS, Dicksit DD, Gundavarapu KC. Oral health: charcoal brushes. *Br Dent J.* 2014;217(1):3.
8. Zautner AE, Hage A, Schneider K, Schlösser K, Zimmermann O, Hornecker E, et al. Effects of easy-to-perform procedures to reduce bacterial colonization with Streptococcus mutans and Staphylococcus aureus on toothbrushes. *Eur J Microbiol Immunol.* 2013;3(3):204–210.
9. Konidala U, Nuvvula S, Mohapatra A, Nirmala SVSG. Efficacy of various disinfectants on microbially contaminated toothbrushes due to brushing. *Contemp Clin Dent.* 2011;2(4):302–307.
10. The British Society of Periodontology. *Basic periodontal examination (BPE).* Selby (UK): BSP; 2016 [cited 2016 Dec 21]. Available from: www.bsperio.org.uk.
11. ICDAS Foundation. International caries detection and assessment system [internet] [cited 2016 Dec 21]. Available from www.icdas.org.
12. Löe H. The Gingival Index, the Plaque Index and the Retention Index systems. *J Periodontol.* 1967 Nov-Dec;38(6):Suppl:610–16.
13. American Dental Association. Brushing your teeth: How to brush your teeth [internet] [cited 2016 Nov 18]. Available from: www.mouthhealthy.org/en/az-topics/b/brushing-your-teeth.
14. Protection from toothbrush contamination in a snap second [product news]. *Br Dent J.* 2016;221(1):44.
15. Yaacob HB, Park AW. Dental abrasion pattern in a selected group of Malaysians. *J Nihon Univ Sch Dent.* 1990;32(3):175–80.
16. Ankola AV, Hebbal M, Eshwar S. How clean is the toothbrush that cleans your tooth? *Int J Dent Hyg.* 2009;7(4):237–40.
17. Culter R. Alternatives to toothpaste. *Br Dent J.* 1992;173(1):9–10.

Learners' perceptions of practices in local anesthesia education

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WHY THIS ARTICLE IS IMPORTANT TO DENTAL HYGIENISTS

- The student-to-student model is used worldwide as a teaching method for the administration of local anesthesia.
- While students in this study expressed initial reservations about performing their first injection on a human model, they came to prefer a human model over a typodont after practising the procedure.

ABSTRACT

Background: The purpose of this descriptive study was to evaluate perceptions of local anesthesia learners and to identify practices that would aid in increasing and improving clinical confidence and performance. **Methods:** A convenience sample of 23 dental hygiene students in a baccalaureate degree program was given a pretest survey upon completion of the didactic component of their local anesthesia course. Participants were randomly assigned into test and control groups and given a practice device. After a practice session, a posttest survey was administered and a descriptive statistical analysis was performed. **Results:** The pretest survey revealed that 91% of participants felt prepared to begin the clinical portion of their local anesthesia course, and 96% felt the student-to-student model was critical in learning how to administer local anesthesia injections. Posttest results remained unchanged in both test and control groups ($p < 1.0$). Pretest results also showed that 74% of participants preferred that their first local anesthesia injection be on a model/typodont. Posttest results demonstrated a statistically significant shift in this preference ($p < 0.02$), with 67% in the test group and 63% in the control group preferring a human subject for their first injection. **Discussion:** In this study, the practice itself was the cause of changing perceptions rather than the device; thus the experience alone shaped the students' perceptions. **Conclusion:** Adjuncts to local anesthesia education contribute to learning, but are unlikely to replace the student-to-student model. Those seeking to increase their scope to include local anesthesia administration should expect to learn via this traditional method.

RÉSUMÉ

Contexte : La présente étude descriptive visait à évaluer la perception des apprenants qui suivent un cours sur l'anesthésie locale et à cerner les techniques qui pourraient contribuer à augmenter la confiance et à améliorer la performance. **Méthodes :** Un échantillon de commodité de 23 étudiants du programme d'hygiène dentaire de niveau baccalauréat a participé à un sondage prétest après avoir complété le volet didactique de leur cours d'anesthésie locale. Les participants ont été affectés au hasard à un groupe test ou à un groupe témoin, et ils ont reçu un mannequin d'entraînement. Après une séance d'exercice, un sondage posttest et une analyse statistique descriptive ont été réalisés. **Résultats :** Le sondage prétest a révélé que 91 % des participants se sentaient prêts à commencer la partie clinique de leur cours d'anesthésie locale et 96 % croyaient que l'entraînement entre étudiants était essentiel pour apprendre comment administrer des injections d'anesthésie locale. Les résultats posttests du groupe test et du groupe de contrôle sont demeurés inchangés ($p < 1.0$). Les résultats prétests ont aussi démontré que 74 % des participants préféraient administrer leur première injection d'anesthésie locale sur un mannequin. Les résultats posttests ont indiqué que la préférence des sujets a été modifiée de manière statistiquement significative ($p < 0.02$), puisque 67 % des participants du groupe test et 63 % des participants du groupe de contrôle ont préféré que leur première injection soit effectuée sur un sujet humain. **Discussion :** Dans cette étude, l'exercice en soi était responsable du changement de perception, plutôt que le choix du sujet utilisé. L'expérience en elle-même a façonné la perception des étudiants. **Conclusion :** Les compléments à la formation en anesthésie locale contribuent à l'apprentissage, mais ils ne remplacent vraisemblablement pas l'entraînement entre étudiants. Ceux qui cherchent à augmenter leur champ d'exercice et à y inclure l'administration de l'anesthésie locale devraient s'attendre à apprendre au moyen de cette méthode traditionnelle.

Key words: dental anesthesia, dental hygiene, education, injection, local anesthesia, oral hygiene, perceptions

INTRODUCTION

Local anesthesia is an essential component of the dental hygiene profession. A first-time learner will experience the current educational modalities of local anesthesia, either as a student in a program or as a practising dental hygienist looking to increase his or her scope of practice. Local anesthesia education consists of a didactic course on pain management, neurophysiology, neuroanatomy, head and neck anatomy, pharmacology, and local and systemic complications.[1] Didactic hours for each component of the course can vary greatly across educational platforms. Before the introduction of the dental syringe, student dental hygienists often practise on skulls, using

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cotton-tipped applicators to aid in visualizing the anatomy, needle advancement, and proper angulation. This method has traditionally paved the way for the clinical administration of local anesthetics.

Several modalities are used throughout the clinical teaching of local anesthesia. Students are introduced to the dental syringe, cartridge, and needle, and often begin with the use of inanimate objects for their first local anesthesia injection. These objects range from oranges, tomatoes, plums, and clear bar soap to hotdogs or other meats with casings. Cadavers are utilized in programs with such resources. A survey of European dental schools conducted by Brand et al. revealed that 37% of dental schools used non-human objects for practice prior to injecting anesthetic in humans.[2] Customarily, the student-to-student administration model has been used to transition from inanimate objects to clients. In fact, it has often been referred to as a "rite of passage."[3,4] Reports of the student-to-student method of teaching local anesthesia date back to the 1970s.[5,6] The literature confirms 61%[7]of dental schools in Europe, 73% of dental schools in Turkey,[8] and 97% of dental schools in the United States[3] use this teaching method.

Table 1. Summary of pretest results

Pretest survey question	Response			
Do you feel the student-to-student administration model is critical in learning how to administer local anesthesia injections?	Yes 22 (96%)		No 1 (4%)	
How would you prefer to administer your first injection?	Model/typodont 17 (74%)		Human subject 6 (26%)	
	Yes	No	Yes	No
Do you feel your preferred method would decrease your overall anxiety?	14 (82%)	3 (18%)	3 (50%)	3 (50%)
Do you feel your preferred method would improve first injection performance?	17 (100%)	0	5 (83%)	1 (17%)

Although the student-to-student model is accepted, the practice is not without controversy. Opposition to this model stems from ethical issues and medico-legal considerations.[3] The student receiving the injection does not benefit and is subject to an unnecessary procedure, and the administration of a drug in the absence of clinical need is carried out without informed consent. A study by Rosenberg reported that the majority of dental schools that use this model do not seek informed consent prior to the administration of local anesthesia.[3] Regardless, students and faculty remain strong proponents of this method. A study conducted by Hossani surveyed faculty and students at 3 statewide dental schools.[4] The majority of the participants in that study believed that students should practice on each other prior to administering anesthesia to a client. At a minimum, programs that continue to use this model should gather informed consent from their students.[3] Informed consent can be obtained as either a stipulation of enrollment in a dental hygiene program or continuing education course or sought at any time prior to the administration of local anesthetics. Those students who are unwilling or unable to participate should seek alternative methods to the student-to-student model.

Alternatives to the student-to-student administration model are available. Electronic training models for teaching local anesthesia education have been available for decades.[6,7] Low fidelity devices include typodonts, which create audible feedback when the optimal site of deposition is reached. More sophisticated high fidelity models include devices such as simulators capable of providing feedback and virtual reality technology. Research on low fidelity training models has failed to demonstrate their superiority over traditional teaching methods. Despite these advances in technology, the student-to-student model continues to be the primary method of teaching clinical local anesthesia.[7] In fact, many educators report they are satisfied with the current curriculum.[7,8]

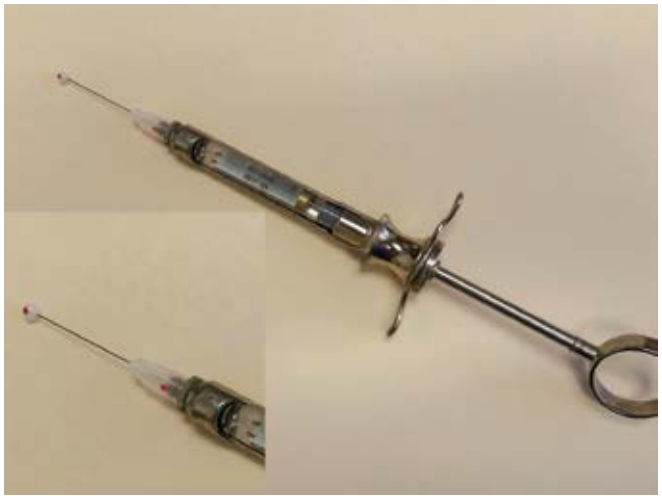
A majority of the research on this topic focusses on the opinions of the educators rather than those of the students. Consideration of student preferences is vital, as collaboration enhances engagement and learning. Studies reporting student dental hygienists' perceptions of their local anesthesia education have not been conducted. Thus, the purpose of this study was to 1) determine student dental hygienists' perceptions of their local anesthesia education; and 2) determine their preferred method for performing their first local anesthesia injection, and how this method influences anxiety and performance.

METHODS

Twenty-three senior dental hygiene students from a baccalaureate degree program were enrolled in this descriptive study. All successfully completed an 8-week didactic local anesthesia course and were planning to begin the clinical portion. The University of New Mexico Human Research Protections Office (HRPO) granted approval for the study. Study numbers were assigned to all participants and informed consent was obtained.

Participants watched an instructional video demonstrating the inferior alveolar nerve block (IANB) technique using the Halstead method.[9] The video demonstrated proper assembly of armamentarium including the dental syringe, cartridge, and needle. A pretest survey, completed using the university's learning management

Figure1. Safe-D-Needle™ attached to a dental syringe



system, asked participants if they felt prepared to begin the clinical portion of their training and confident in delivering a successful IANB. The survey also asked them if they believed that student-to-student administration of local anesthesia was critical in learning how to administer injections. Finally, participants were asked whether they would prefer a model/typodont or a human subject for their first injection and whether or not they felt their preferred method would decrease their overall anxiety and improve their overall performance of their first injection.

Participants were randomly assigned using the RANDBETWEEN function in Microsoft Excel, which generated a whole number for each participant within the boundaries of numbers 1 and 2. Based on these randomly generated numbers participants were then assigned to either the control group or the test group. The control group was given a cotton-tipped applicator, and the test group was given a standard dental syringe with a new device known as the Safe-D-Needle™ (9425 Smithson Lane, Brentwood, TN 37027) (Figure 1). The device attaches to the dental syringe in the same way a regular needle does, therefore students did not require additional instruction on how to use this device. Each group practised with their assigned device for 15 minutes on a student dental hygienist partner not yet enrolled in the local anesthesia course. A posttest survey was conducted; the test and control groups were asked if they now felt more confident in delivering a successful IANB and if their opinion had changed on student-to-student administration or their preferred method for a first injection. Survey results were extracted from the electronic survey program within the university's learning management system and transferred into Microsoft Excel. Descriptive statistics were generated using the add-in Data Analysis Tool pack. Fisher's exact test was used to compare between group differences as well as pretest and posttest results.

RESULTS

Twenty-three subjects participated in the study. The group comprised 22 female students and 1 male student ranging in age from 21 years to 49 years. Median age was 27.3 years. After being randomly assigned, 12 subjects made up the test group and 11 the control group. Following analysis, pretest descriptive statistics revealed 91% of participants felt prepared to begin the clinical portion of their local anesthesia course, while only 9% felt confident in delivering a successful IANB (Figure 2). Pretest results also revealed that, while 96% of students considered the student-to-student administration model to be critical in learning how to do injections, 74% preferred their first local anesthesia injection to be on a model/typodont (Table 1). Eighty-two percent of this group (n = 17) reported that this preferred method would decrease their overall anxiety, and all (100%) felt it would improve their first injection performance. Six students (26%) reported that they preferred a human subject for their first injection; of this group 50% felt it would decrease their overall anxiety and 83% felt it would improve their first injection performance (Table 1).

Regardless of the device used for practice, posttest results revealed that student opinions did not significantly change regarding the student-to-student administration model ($p < 1.0$). Ninety-two percent of the test group and 100% of the control group felt that this teaching model was critical in learning how to administer local anesthesia injections (Table 2). Unlike pretest results, however, post-test results revealed a statisticaly significant difference ($p < 0.02$) in opinions, where 65% preferred to administer their first injection on a human subject compared with 26% at pretest. (Table 3 and Figure 3).

DISCUSSION

A majority of the study participants reported that the didactic component prepared them for the clinical component of training. In contrast, there are mixed results in the literature regarding dental students' feelings of preparedness upon completion of their didactic

Figure 2. Percentage of student preparedness and confidence

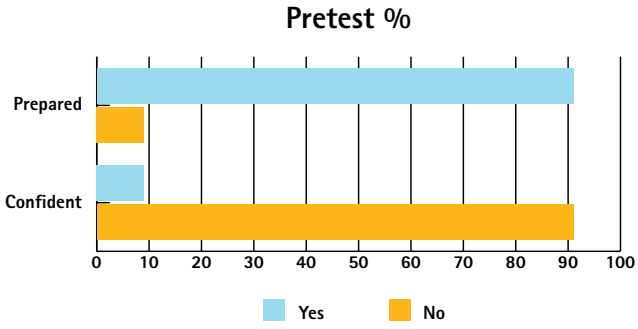


Table 2. Summary of posttest results between groups

Posttest survey question	Response				Group differences
	Test group (training device) n = 12		Control group (cotton tipped applicator) n = 11		*p* value[a]
Do you feel the student-to-student administration model is critical in learning how to administer local anesthesia injections?	Yes	No	Yes	No	
	11 (92%)	1 (8%)	11 (100%)	0	1.0
How would you prefer to administer your first injection?	Human subject	Model/ typodont	Human subject	Model/ typodont	
	8 (67%)	4 (33%)	7 (63%)	4 (37%)	1.0

[a]Statistically significant differences between groups ($p < 0.05$)

component.[10,11] In fact, a study conducted by Levine reported that even newly qualified general dentists felt inadequately prepared following completion of their local anesthesia course.[10] This discrepancy may be caused by the variations in how the administration of anesthesia is taught to dental and dental hygiene students. Dental school curricula include nitrous oxide and alternative forms of sedation, both conscious and unconscious, whereas the breadth and scope of anesthesia instruction is much narrower for dental hygienists, typically focusing solely on the administration of local anesthesia. It was evident in this study that, although students felt that the didactic component prepared them to begin the clinical component of their training, it did not instill confidence in their ability to deliver a successful inferior alveolar injection.

Students have different perceptions of how they learn and what they need to be successful. Most respondents in this study initially preferred to use a model/typodont for their first local anesthesia injection. This finding confirms past reports in which students preferred simulation models for their first local anesthesia exercise.[12] They felt this would improve their performance, as well as decrease their anxiety. Reducing anxiety among students positively affects their performance,[13,14] which in turn boosts confidence. Studies on the effectiveness of non-human training models demonstrated that those who used a typodont were viewed as "more confident" by those receiving the injections.[2,11]

In this current study, posttest results revealed a shift in the participants' preferred method of administering their first injection. After practising with their assigned device, the majority of students came to prefer a human rather than a typodont for administering their first injection. Authors acknowledge the practice itself was the cause of this shift rather than the device used, meaning that the experience alone shaped the students' perceptions. The device used during the practice session proved irrelevant as both groups demonstrated the same shift in preference.

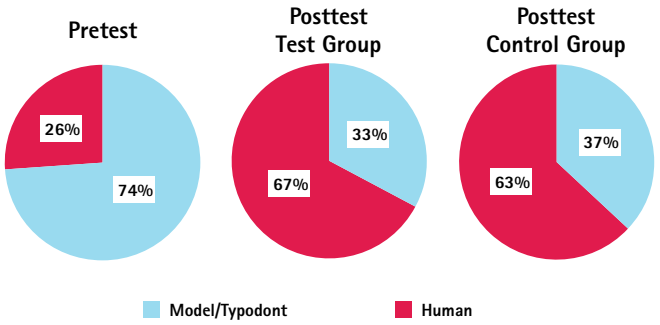
The student-to-student administration model continues to be the primary teaching method used worldwide. Although adjuncts are used as part of the transition from didactic to clinical education, educators and students alike

Table 3. Differences between pretest and posttest responses

Questions	Pretest responses (n = 23)	Posttest responses (n = 23)	*p* value
Do you feel the student-to-student administration model is critical in learning how to administer local anesthesia injections?	Yes 22 (96%)	Yes 22 (96%)	1.0
How would you prefer to administer your first injection?	Human subject 6 (26%)	Human subject 15 (65%)	0.02[a]

[a]Statistically significant differences between groups ($p < 0.05$)

Figure 3. Pretest and posttest results of preferred method



are aware that eventually anesthesia must be completed on a human. This awareness appeared evident as respondents of this study reported that the use of the student-to-student administration model was critical in learning how to perform local anesthesia injections. These findings corroborate other research reports that demonstrate satisfaction with this model.[4,7]

Limitations of the study

The authors acknowledge the limitations of this study. This convenience sample cannot be generalized to all dental hygiene local anesthesia learners. An additional limitation is that categorical values to describe anxiety were not used. Anxiety analysis tools could have been used to measure the level of anxiety perceived by learners thus reducing subjectivity. Few published articles on dental hygiene local anesthesia education and practices exist. Articles published to date focus on dental school education. More research is necessary to evaluate the needs of the dental hygiene local anesthesia learner.

CONCLUSION

The student-to-student model remains relevant to local anesthesia learners, as they perceive it as a critical component in learning how to administer injections. Adjuncts to local anesthesia education contribute to learning, but are unlikely to soon replace the student-to-student model. Those seeking to increase their scope to include local anesthesia administration should expect to learn via this traditional method.

CONFLICT OF INTEREST

The authors have declared no conflicts of interest.

REFERENCES

1. Logothetis DD. *Local anesthesia for the dental hygienist.* 2nd Ed. St. Louis (MO): Elsevier; 2017. 768 p.
2. Brand HS, Baart JA, Maas NE, Bachet I. Effect of a training model in local anesthesia teaching. *J Dent Educ.* 2010;74(8):876–79.
3. Rosenberg M, Orr DL, Starley ED, Jensen DR. Student-to-student local anesthesia injections in dental education: Moral, ethical, and legal issues. *J Dent Educ.* 2009;73(1):127–32.
4. Hossaini M. Teaching local anesthesia in dental schools: Opinions about the student-to-student administration model. *J Dent Educ.* 2011;75(9):1263–69.
5. Hiatt NW. Correlation of teaching local anesthesia, neuroanatomy, pharmacology, and psychology. *J Dent Educ.* 1970;34(2):179–81.
6. Milgrom PM, Weinstein P, Kaufman E. Student difficulties in achieving local anesthesia. *J Dent Educ* [Internet]. 1984 [cited 2016 Jul 30];48(3). Available from: https://iths.pure.elsevier.com/en/publications/student-difficulties-in-achieving-local-anesthesia
7. Brand HS, Kuin D, Baart JA. A survey of local anaesthesia education in European dental schools. *Eur J Dent Educ.* 2008;12(2):85–88.
8. Tomruk CÖ, Oktay İ, Sençift K. A survey of local anesthesia education in Turkish dental schools. *J Dent Educ.* 2013;77(3):348–50.
9. Darby ML, Walsh M, Saunders. Procedure videos. Dental hygiene: theory and practice. 4th Ed. St. Louis (MO): Elsevier; 2014.
10. Levine RS. Experience, skill and knowledge gained by newly qualified dentists during their first year of general practice. *Br Dent J.* 1992;172(3):97–102.
11. Lee JS, Graham R, Bassiur JP, Lichtenthal RM. Evaluation of a local anesthesia simulation model with dental students as novice clinicians. *J Dent Educ.* 2015;79(12):1411–17.
12. Chandrasekaran B, Cugati N, Kumaresan R. Dental students' perception and anxiety levels during their first local anesthetic injection. *Malays J Med Sci MJMS.* 2014;21(6):45–51.
13. Afolayan JA, Donald B, Onasoga O. Relationship between anxiety and academic performance of nursing students. *Adv Appl Sci Res.* 2013;4(5):25–33.
14. Cassady JC, Johnson RE. Cognitive test anxiety and academic performance. *Contemp Educ Psychol.* 2002;27(2):270–95.

Queering the health care system: Experiences of the lesbian, gay, bisexual, transgender community

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WHY THIS ARTICLE IS IMPORTANT TO DENTAL HYGIENISTS

- Increasing familiarity with the terminologies and language used within the LGBT community can help to create safer, more inclusive practice environments.
- Understanding the barriers to health care faced by the LGBT community may reduce the likelihood of perpetuating discriminatory behaviours.

ABSTRACT

The lesbian, gay, bisexual, transgender (LGBT) community represents a population of people diverse in gender, sex, and sexual orientation. This literature review explores the current research on the health care experiences of LGBT individuals in North America in an attempt to identify the barriers to care that they face and develop strategies to increase their overall health. The health care experiences of LGBT individuals were explored across 7 dimensions: existence, bodily integrity, emotional integrity, worth, uniqueness, expression, and power. The LGBT community has unique health concerns and is at higher risk for mental health conditions, substance use, and suicide. These health disparities have been associated with social discrimination, ignorance, and assumptions made about gender, sex, and sexuality. Such barriers encountered by this population have also led to delayed or discontinued care, non-disclosure of sexuality or gender identity, increased negative health behaviours, and internalized stigma. The experiences that were identified reveal a strong need to reassess and strengthen the cultural sensitivity training and LGBT education provided to health care professionals.

RÉSUMÉ

La communauté lesbienne, gaie, bisexuelle et transsexuelle (LGBT) représente une population diversifiée de gens en ce qui a trait au genre, au sexe et à l'orientation sexuelle. Cette revue de la littérature explore la recherche actuelle sur l'expérience des personnes LGBT en Amérique du Nord en matière de santé, afin de tenter de cerner les obstacles aux soins auxquels elles font face et élaborer des stratégies pour améliorer la santé globale de cette communauté. L'expérience des gens de la communauté LGBT en matière de soins a été étudiée en fonction de 7 dimensions : l'existence, l'intégrité physique et émotionnelle, la valeur de soi, l'individualité, l'expression et le pouvoir. La communauté LGBT a des préoccupations uniques en matière de santé et elle est à risques plus élevés de problèmes de santé mentale, de l'usage de substances et de suicide. Ces inégalités en matière de santé ont été associées à la discrimination sociale, à l'ignorance et aux présomptions attribuées au genre, au sexe et à la sexualité. Telles barrières auxquelles cette population est confrontée ont aussi mené à des soins remis à plus tard ou abandonnés, à la non-divulgation de la sexualité ou de l'identité sexuelle, à la hausse de comportements négatifs en matière de santé, et à la stigmatisation intérieure. Les expériences qui ont été identifiées révèlent un important besoin de réévaluer et de renforcer la formation sur la sensibilisation aux réalités culturelles et sur l'éducation LGBT qui est fournie aux professionnels de soins de la santé.

Key words: barriers, bisexual, discrimination, gay, health care experience, health care providers, lesbian, queer, transgender

INTRODUCTION

The lesbian, gay, bisexual, transgender (LGBT) community refers to a broad spectrum of individuals who do not identify with conventional social norms of gender, sex, and sexuality.[1,2] One of the more comprehensive and inclusive versions of this acronym includes queer, questioning, intersex, pansexual, Two-Spirit, and asexual groups, but LGBTQQIP2SA and other variations have been received with much criticism and confusion, so the community has been often referred to more simply as LGBT.[3,4] As a way of bringing unity to the community, LGBT individuals have begun to reclaim the word "queer" as a more inclusive term for all individuals who identify with the LGBT community.[2-5] In this article, the terms LGBT and queer will be used interchangeably.

Until 1973, the American Psychiatric Association classified homosexuality as a mental illness.[6-8] Even today, while North America has made strides towards LGBT equality, LGBT relationships are considered a criminal offence in 73 countries and are punishable by death in 13 of these countries.[9] The 2014 Canadian Community

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Health Survey revealed that 3% of Canadians identified themselves as homosexual or bisexual.[10] Comparatively, in 2012, an estimated 3.5% of Americans identified as lesbian, gay, bisexual or transgender.[11] These percentages are likely underestimates as only those who are comfortable self-identifying and completing these surveys would be captured in the final reports. Although discussion of gender, sex, and sexuality has become more commonplace over the years, particularly within North America, there is still a significant lack of education and awareness of these topics; progress in reducing stigmatization has been slow.[2,12-15] Queer-identifying individuals have historically been subject to discrimination, social stigmatization, harassment, and violence, and continue to confront these barriers today.[2,6,8,16-18] These experiences have been associated with higher rates of substance and alcohol use, disease, mental illness, psychological distress, and suicide among LGBT individuals compared to non-queer-identifying individuals.[2,12,17-25]

The LGBT community comprises groups that are diverse in gender, sex, sexuality, age, race, ethnicity, socioeconomic status, and literacy.[2,18,19,26] The health and health care needs of LGBT persons are affected by behavioural, structural, and social factors including stigma, discrimination, and inadequate health insurance coverage.[2,6,14,16,17,21,22] The unique experiences and needs of this community should be routinely considered in health care policies and practices to improve their overall health and quality of life and reduce health disparities. This literature review explores the health care experiences of LGBT individuals in North America in an attempt to identify barriers to care and to help develop strategies to improve their experiences in the health care system. Identifying the unique experiences of this population will allow health care professionals to recognize the gaps in their current cultural knowledge and avoid perpetuating discriminatory behaviours. Understanding how queer individuals perceive and experience the health care system may help primary health care providers, including dental hygienists, determine appropriate approaches to providing the LGBT community with safe, individualized, and comprehensive care.

METHODS

Articles were retrieved from PubMed, CINAHL, and Google Scholar using the key words lesbian, gay, bisexual, transgender, queer, health care providers, health care experience, discrimination, and barriers. Only full-text articles written in English and available online were included in this review. There were no restrictions placed on the date of publication in order to identify changes over time. Twenty-eight research studies utilizing phenomenological, ethnographic, and case study approaches were included, as well as 1 systematic review, 1 literature review, 1 report, and 2 books.

Defining and understanding the terminology

Before delving into the research on this topic, it is important to understand the terminology used within this community. Clarifying these terms will help to inform a larger cultural understanding of queer issues (Table 1).

Gender

Gender is a social construct of masculinity and femininity based on conventional behavioural and cultural norms.[2,4,5,18,27,28] Gender is often understood as synonymous with "sex," yet sex is a biological classification based on physical anatomy. Gender identity, in contrast, refers to an individual's internal sense of and connection to a certain gender.[2-5,7,27,28] Therefore, gender identity is a construct that only individuals can determine for themselves, and it may be congruent or incongruent with the sex they were assigned at birth.[7] Cis or cisgender describes someone whose gender identity aligns with the sex assigned at birth.[3-5,29] Trans or transgender refers to an individual whose gender identity is incongruent with the sex assigned at birth.[2-5,7,16,29] For example, if an individual is recognized biologically as female at birth and identifies as a woman, then this individual would be considered a cis woman or cisgender woman. If an individual is recognized as a female at birth but identifies as a man, then this individual would be considered a trans man or transgender man. Trans is a broad term used to describe people who are not cis, and includes those who identify as non-binary in addition to trans men and trans women.[29] Non-binary is an umbrella term for those who do not identify with the static, binary classifications of gender.[29] Non-binary individuals may identify with an intermediate gender (e.g., genderqueer), have multiple genders (e.g., bigender, polygender), have a shifting gender (e.g., genderfluid) or have no gender at all (e.g., agender).[3-5,16,29] There is also the concept of "gender expression" which is how people outwardly present their gender through behaviour and physical appearance.[3,4,28,29] Gender expression is often viewed on a spectrum from masculine to feminine.[29]

Sex

Sex is the biological classification of people as female, male or intersex based on their physical body and reproductive capacity.[29] Physical characteristics used to determine sex include primary reproductive organs, chromosomes, and hormonal profile.[2,4,5,18,27,29] Intersex is a term that describes a variety of conditions in which a person's sexual or reproductive anatomy does not conform to the typical configuration of either male or female.[4,5,30] An example of this could be a person who is born with genitalia that appear to be in-between the typical male and female presentation, or a person who presents with mosaic genetics in which both XY and XX chromosomes are expressed.[30] The term intersex has replaced the term hermaphrodite, which is now widely considered to be outdated, inaccurate, and offensive.[4,30]

Sexual orientation

Sexual orientation is a term used to describe one's sexual, romantic, and/or emotional attraction to another person. Currently, there is ambivalence in the literature regarding whether sexual orientation is based on one's gender, sex or a combination of both relative to one's partner.[2,4,5,7,27,31] In order to minimize confusion, this article defines sexual orientation in terms of gender. The authors recognize that the following definitions of heterosexuality and homosexuality are based on the presumption that an individual identifies with one of the traditional binary gender identities. People may be attracted to the same gender (homosexuality), the opposite gender (heterosexuality), multiple genders (e.g., bisexuality, pansexuality) or experience no sexual attraction to others in general (asexuality).[4]

Coming out

Coming out is a phrase used to describe the process of acceptance and acknowledgement of one's own queer identity and also encompasses the process of disclosing this identity to others.[3-5] The terms "closeted" or being "in the closet" refer to a person who is secretive about their identity or is simply not "out" yet.[5] Coming out should be thought of as a continuous, lifelong process as opposed to a single event in time.

Critical theory[32,33]

Examining critical theory in depth is beyond the scope of this article. However, briefly introducing critical theory as it pertains to queer theory is appropriate. The foundations of critical theory lie in the deconstruction and critiquing of institutions, laws, policies, organizations, definitions, and practices to screen for power inequities. Over time, dominant perspectives are taken as truth. Views

Table 1. LGBT terminology

Term	Definition
Gender	The social construction of concepts such as masculinity and femininity in a specific culture at a specific time.
Gender identity	One's internal and psychological sense of one's own gender. Since gender identity is internal, it may not be visible to others.
Gender expression	The use of behaviour, clothing, hairstyle, voice, body characteristics, etc., to outwardly express one's gender. One's gender expression may not necessarily reflect one's gender identity.
Cis or cisgender	Having a non-transgender identity. Used to describe someone whose gender identity aligns with the sex assigned at birth. The prefix cis means "in alignment with" or "on the same side."
Trans or transgender	An umbrella term for people who are not cis. Trans is used to describe someone whose gender identity does not align with the sex assigned at birth.
Non-binary	An umbrella term for those who do not identify with the static, binary (male/female) classifications of gender.
Two-Spirit	A cultural and spiritual identity used by some First Nations people to describe having both masculine and feminine spirits. It can be used to describe people with diverse gender identities, gender expressions, gender roles, and sexual orientation.
Sex	The biological classification of people as male, female or intersex. It is determined by characteristics such as sexual and reproductive anatomy and genetic make-up.
Sexual orientation	Refers to a person's physical, romantic and/or emotional attraction to another person.
Queer	A term becoming more widely used by the LGBT community because of its inclusiveness. "Queer" can refer to a broad range of non-heterosexual and/or non-cisgender identities. It is sometimes used in place of the acronym LGBT. However, this is a reclaimed term that was once and is still used in a derogatory fashion, thus it may make some people feel uncomfortable.
Coming out	The process of becoming aware of one's own queer identity, accepting it, and telling others about it. Coming out, also known as "coming out of the closet," is an ongoing process that may not include everybody in all aspects of one's life. "Coming out" usually occurs in stages and an individual may be "out" in only some situations or to only certain individuals.

that are different from those expressed by the dominant culture are othered (categorized as deviant) and are subsequently oppressed. The purpose of critical theory and critical inquiry is to raise consciousness and correct injustices resulting from ignorance and misconceived ideas by fostering fundamental social change. Such critical paradigms include feminist theory, critical race theory, disability theory, and queer theory. For example, the goal of queer theory is to challenge and shift the normative structure with regard to gender and sexuality. Tenets of queer theory include a belief that society's current understanding of gender and sexuality privileges those who identify as cisgender and heterosexual and marginalizes people in the LGBT community. Since these dynamics are so engrained in the fabric of a society's systems and practices, they are not recognized by most people, particularly members of the dominant majority culture. To address inequities experienced by people in the LGBT community, queer theorists believe that the unique stories of people from this community must be recounted, and researchers must use their findings to create a more just society.

Dimensions of health care experiences

The challenges experienced by LGBT persons when navigating the health care system can be grouped under 7 dimensions, as identified by the foundational work of Stevens.[34] Stevens' dimensional framework has been selected because of its holistic and integrative capacity to summarize complex ideas within multiple health care settings. In addition, its unique narrative study design captures the authentic accounts of health care experiences from a queer perspective.

Existence

The first dimension, existence, concerns the degree to which individuals believe they are treated as human beings.[34] Several researchers have interviewed LGBT persons and discovered that many members of this community feel alienated by and invisible to their health care professionals because of their queer identity.[6,8,34-36] Non-verbal cues such as facial expressions and body positioning were identified as the primary sources of individual discomfort.[34,35] In contrast, positive health care experiences occurred when the health professional's behaviour reflected compassion and empathy, such as the tilting of their head, direct eye contact, and animated speech.[34,37] In a study by Taylor, trans men reported their identity being challenged, feeling unheard, and feeling like a research tool, all of which strained the client–provider relationship.[14]

Bodily integrity

Bodily integrity refers to the level of dignity individuals feel during health care procedures that involve the crossing of personal boundaries, such as during a gynecological exam.[34] When health care providers were respectful of the individual in their vulnerable state and explained every step before and during the invasive procedure, clients reported a positive experience.[34] Negative experiences were mainly described by women who reported rough physical handling by their health care provider, precipitating feelings of violation and trauma.[34,38]

Emotional integrity

Many LGBT persons interviewed in different studies emphasized the importance of emotional integrity.[17,24,34] This dimension describes how safe individuals feel when disclosing information to their health care provider and whether or not they feel that their concerns and feelings are validated.[34] One of the most commonly reported barriers to health care for LGBT people was coming out and experiencing discrimination from their provider.[15,17,26,35] This event was described as stressful, as it placed the individual in a state of emotional vulnerability.[24] The overall quality of the LGBT person's experience was heavily determined by the health professional's reaction to disclosure.[6,24] Acceptance of their identity was rated as extremely important to LGBT individuals and was a determining factor in how they defined a good health care practitioner.[24] In order to preserve their emotional integrity and prevent recurrence of trauma, lesbian and bisexual women reported a preference for seeking medical care from queer health care practitioners.[13]

Worth

Worth is the degree to which individuals feel valued during their health care experience.[34] LGBT persons face social discrimination daily, and some have internalized that stigma.[2,17,24] As a result of these frequent experiences, many LGBT individuals believe that they are not worthy of being helped.[2,17] Consequently, having positive, worth-affirming interactions with health care providers was important in establishing trusting and open client–provider relationships.[2,24,34,37] Minimizing client concerns and avoiding physical contact were viewed as a form of abandonment.[34] Trans men have reported feeling less deserving of gender-affirming interventions due to their androgynous gender expression.[14]

Uniqueness

This dimension explores how deeply the individuality and diversity of one's life experience is recognized by health care providers.[34] If assumptions or offhand judgments based on queer stereotypes were made, then those experiences with health care professionals were reported as negative.[6,13,34,36] It was important for LGBT individuals to have the multidimensional character of their lives recognized and to have their health care provider see them as more than just their gender, sex or sexual orientation.[6,14]

Expression

This dimension focuses on how comfortable individuals feel when expressing themselves, their thoughts, and concerns.[34] It is very closely related to emotional integrity, but a large component of this dimension is determined by the assumptions made by health professionals.[24,34-36] Negative experiences occurred when health care professionals assumed that their clients were heterosexual.[16] Lack of gender-neutral language (written and verbal) also contributed to decreased freedom of expression.[16,37]

Power

This dimension explores the power relationship between client and provider.[34] LGBT individuals reported that being involved in their health care decisions was an important part of feeling empowered and forming a positive relationship with their health care provider.[34,35] Health care professionals who took the time to explain findings and procedures and worked together with their clients created positive experiences, while those who dominated and were insensitive were perceived as cruel.[14,34,35]

Barriers to accessing and receiving care

The literature reviewed identifies 3 barriers that prevent LGBT individuals from accessing health care: discrimination, ignorance, and assumptions.

Discrimination

Discrimination against the queer community prevents many LGBT individuals from utilizing health care services.[19,26] Many study participants felt that coming out to their health care providers would change the quality of care they received due to discrimination.[16] In some cases LGBT individuals may have been at risk for compounded discrimination due to their affiliation with multiple marginalized groups, such as Two-Spirit individuals who identify with both the Aboriginal and LGBT communities.[6,17] The reported reactions of health care providers to an individual's coming out ranged from embarrassment to excessive curiosity, hostile displays, direct rejection, unwarranted pity, condescension, and denial of care.[6,14,15,35,36,39,40]

Two main types of discrimination have been identified: actual and anticipated.[26] Actual discrimination was experienced when health care providers made judgmental or homophobic/transphobic remarks and failed to acknowledge partners as family members during visiting hours.[2,26,36] Same-sex partners would sometimes identify themselves as friends or roommates in order to avoid being treated differently.[26] Participants in the research reviewed also expressed challenges in seeking mental health care as some inexperienced providers viewed homosexuality and being transgender as a mental illness.[36,39] Anticipated discrimination was the expectation of being discriminated against due to existing social stigma and/or prior negative experiences with health care providers.[2,6,19,22,25,26] This form of discrimination had an effect on individuals' willingness to reveal their gender identity and/or sexual orientation and utilize health care services.[6,19,25,26] Both forms of discrimination pose a threat to the health of LGBT individuals and result in emotional distress, inadequate care, and lack of appropriate medical attention.[6,19,26]

In addition, insurance policies and an individual's own sense of self may prevent them from accessing appropriate care.[2,39] For example, some trans men reported difficulty in accessing gynecological care due to lack of insurance coverage and/or body dysphoria.[38,39] For these individuals, receiving a pap smear or breast exam may be emotionally debilitating and dysphoric, so some choose to avoid gynecological care altogether.[39]

Ignorance and lack of knowledge

Lack of knowledge of LGBT-specific health issues and judgmental attitudes of health care professionals were another barrier to health care for LGBT populations.[2,14,36] Some health care professionals appeared unversed in queer terminology, which added to the stress of individuals who felt responsible for educating their health care provider and justifying their identity.[6,12,14,16,19,36] Many queer individuals noted that their health care provider seemed unprepared and acted awkwardly after they came out, avoiding discussion of issues related to sexual orientation when making care plans.[26,35] A study conducted at McGill University on LGBT seniors revealed a "don't ask, don't tell" approach towards sexual orientation in the health care system.[8] This notable discomfort from health care providers made the individuals feel uncomfortable and unable to speak openly about their health concerns.[35,36] There were also reports of a general lack of knowledge of transgender-related health care services, such as hormone therapy.[2,12,14,16,39]

Assumptions made by health care providers

LGBT individuals reported that assumptions about sexual orientation, sex, and gender pervaded health care environments.[34,37] These assumptions manifested in the language used by the health care providers, in written documents, and in pictures and pamphlets around clinical and medical offices.[16,34,35,40] The use of heteronormative language negatively affected the client–provider relationship and created feelings of discomfort and distress among LGBT individuals.[6,8,34-36] LGBT respondents reported that the assumption that everyone is heterosexual and cisgender was a major barrier to forming a trusting relationship with their health care provider.[35,37] Studies revealed that transgender individuals found it challenging to disclose their gender identity since the initial intake forms only offered binary gender options of the traditional notions of male or female.[16,35,39] Furthermore, for trans individuals, having government-issued identification that did not match their gender identity and gender expression was a significant barrier to care.[41]

Impact of barriers

These barriers are associated with several key negative health consequences.

Delayed or discontinued care

Previous negative experiences or perceptions of discrimination within the health care system have caused LGBT individuals to delay seeking health care.[6,16,17,22,31,42] Research has shown that LGBT people are less likely to seek medical care compared to their non-queer counterparts. [2,13,16,19-21,24,39,43,44] LGBT persons also have lower participation rates in preventive health programs.[22,24,37] It was also found that lesbians and bisexual women are less likely to have a family physician and receive regular pap smears and breast examinations.[13,20,21,31] In a recent study of transgender and non-binary individuals, 28% of respondents reported being harassed in health care settings and postponed care due to discrimination.[15]

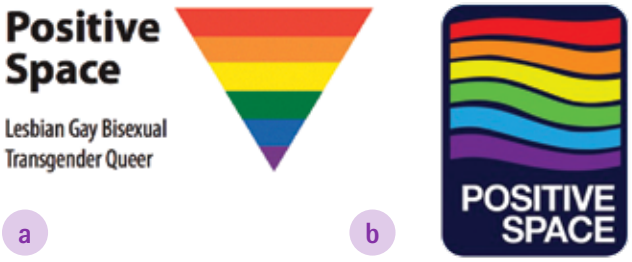
Increased negative health behaviours

Difficulty in accessing health care services for unique LGBT needs, such as information on safe sex practices, has resulted in a higher prevalence of negative health behaviours among LGBT individuals.[17-21,24,25] LGBT individuals have higher rates of smoking, drinking, and substance use.[17-20,24,25] Sexual minorities are also at high risk for sexually transmitted diseases.[18] For transgender individuals, self-medicating with "street therapies" was commonly reported when they could not obtain appropriate hormone therapies from their physician.[39] Particularly for queer men, regular HIV screening was challenging due to the fear of being found positive and suffering from dual stigma related to HIV and being queer.[12,39]

Non-disclosure of gender identity and sexual orientation

The ability of health care providers to enable LGBT individuals to come out and feel safe in the health care environment is essential.[7,17,35,40,42,43] Being out to one's health care provider improves the likelihood of receiving appropriate care and education, including information related to safe sex practices and recommendations for appropriate medical testing.[6,7,24] Research has shown an increased use of medical services from lesbians who have come out to their doctor.[7,31] LGBT persons were reluctant to disclose their sexual orientation for fear of repeated negative experiences or fear that coming out would bias their care.[2,13,16,18,19,22,24,31,35,37,42] Individuals reported extreme anxiety related to coming out in health care settings and feared that disclosure would make them vulnerable to mistreatment and denial of care.[19,24,35,43] Some thought that disclosing their sexuality was risky unless it was clearly relevant.[24,35] Some would not even disclose their identity when it seemed relevant in order to protect their well-being.[19]

Figure 1. Images from the Positive Space Campaign at a) the University of Toronto and b) the University of British Columbia



Feelings of internalized stigma

Experiences of discrimination led individuals to feel unsafe in the health care environment and reinforced feelings of stigma.[2,19] This feeling may cause queer individuals to believe that they are undeserving not only of respect from their health care providers, but also of the same access to care as non-queer individuals.[2] Internalized stigma may also be associated with higher risk of negative health behaviours and consequences such as substance and alcohol use, smoking, suicide, and mental illnesses such as depression and eating disorders.[2,12,17-21,24,25,31]

Strategies for change

Creating a sense of safety for LGBT individuals within health care environments is of primary importance. Not only should general health programs be made more inclusive, but participants in various studies also attested to the value of and need for LGBT-specific health programs and services.[17,40,43] In a study by Brotman et al. on the care of Two-Spirit individuals, the need for more LGBT-supportive individuals in the health care system was stressed.[17] Health professionals should reflect on their own feelings and assumptions regarding gender identity and sexuality and try to assess their own reactions and biases, as well as the potential gaps in their knowledge in order to improve their understanding of LGBT health needs.[8,13,20] LGBT individuals stressed the importance of preparing health care providers to deliver queer-friendly care and use inclusive language.[1,8,13,20,35] A study by Barnoff et al. focused on the health care experiences of lesbians diagnosed with cancer and found that participants wanted the opportunity to connect specifically with other lesbians in the same situation.[43] The need for more LGBT-specific health support programs and information requires further advocacy.[43]

The use of positive space signage and other inclusive signage was also suggested as a way of showing support for the LGBT community.[1,17,19,37,40,45] The rainbow triangle shown in Figure 1 combines two common images used in LGBT communities. The rainbow flag has become a symbol of pride for gender and sexual minorities across the world. An inverted pink triangle was worn by gay prisoners in the

Figure 2. Heteronormative signage used by the Vancouver Park Board in 2014

Nazi concentration camps, and has become a mark of remembrance and pride.[46] Figure 2 is an example of heteronormative signage that defines a family unit as a man and a woman thereby normalizing heterosexuality and excluding or othering those who have same-sex partners. Figure 3 provides an example of more inclusive signage adopted by the Vancouver Park Board that replaced the signage shown in Figure 2.

Participants from various studies emphasized the importance of cultural sensitivity training for health care professionals especially pertaining to LGBT persons who may have experienced trauma in their past.[16,19,35] They also stressed the need for health care providers to collaborate and network with one another to increase their knowledge and skills in working with the LGBT community.[14] A study of LGBT youth also recommended that health care providers remind their clients of professional confidentiality requirements at every appointment, as coming out is a significant issue of safety.[37] In the future, more comprehensive education focused on LGBT health and cultural competency should be integrated into health science and human service entry-to-practice programs.[14,17,20] Understanding the impact of stigma and one's ability to demonstrate empathy through awareness and validation are critical in forming a trusting client–provider relationship.[8,16] Such knowledge can facilitate the development of educational programs, policies, and interventions to decrease the health disparities of the LGBT community.

The Canadian Human Rights Act has prohibited discrimination on the basis of sexual orientation since 1996.[47] Bill C-16, currently undergoing assessment, proposes amendments to the Act to include gender identity and gender expression as prohibited grounds of discrimination.[48] There are currently 7 provinces and 1 territory that recognize gender identity and gender expression in their human rights legislation (Table 2).[49-53] Health care providers must recognize their legal obligation to provide safe and inclusive care to all and the importance of improving their understanding of the health care experiences of the LGBT community.

Gaps in the research

The main limitation or challenge to exploring experiences of the LGBT population is that researchers are only able to study people who are comfortable self-identifying, which excludes the large population of closeted individuals. Additionally, there seems to be a lack of research on other sexual minorities such as pansexuals and asexuals. Most of the research to date has explored the experiences of gay and lesbian individuals. There is a paucity of research addressing the experiences of the bisexual and transgender communities. There is also a notable lack of qualitative and longitudinal studies, which makes understanding shifts in perceptions and experiences over time challenging.

Currently, research suggests a shift from outright discrimination by health care professionals, such as the denial of care, to subtler forms of discrimination, such as the use of non-inclusive language. Overcoming the fear of coming out to their health care providers continues to be a barrier for LGBT individuals in accessing appropriate health care. There is also a paucity of research on the impact of queer stigmatization on the health and well-being of LGBT individuals, particularly in the Canadian setting.[17] Furthermore, none of the reviewed literature touched on the experiences of queer individuals in the dental setting. Most of the qualitative research has focused on experiences with physicians and nurses. Little if any information is known as to how queer people experience oral health care services. Further investigation to determine the differences in disparities across subsets of queer identities (e.g., age, race, culture) would also be valuable in order to identify other barriers to care associated with compounded discrimination.[31]

Figure 3. Revised inclusive signage adopted by the Vancouver Park Board in 2016

a

b

CONCLUSION

This article provides a glimpse into the health care experiences of the LGBT community in North America, as they pertain to existence, bodily integrity, emotional integrity, worth, uniqueness, expression, and power. Barriers to care include discrimination informed by ignorance and assumptions made by health care providers resulting in delayed or discontinued care, increased negative health behaviours, non-disclosure, and internalized stigma. Further qualitative investigation into the experiences of individuals who identify with lesser known sexualities and non-binary gender identities should be conducted. The health care experiences of queer people of colour as well as different ages and races also require further investigation. LGBT individuals are at a disproportionate risk for a wide range of medical concerns as well as mental and psychological distress resulting from deep-rooted social discrimination. Findings from the research reviewed reveal an urgent need to analyse and reform the cultural competency education provided to health care professionals in regards to caring for members of the LGBT community. Efforts to minimize suffering and increase feelings of comfort and safety within health care environments should be made in order to improve the overall health and quality of life of this community.

CONFLICT OF INTEREST

The authors have declared no conflicts of interest.

Table 2. Human rights legislation in Canada

	Prohibited grounds of discrimination		
Jurisdiction	**Sexual orientation**	**Gender identity**	**Gender expression**
British Columbia	1992	2016	2016
Alberta	2009	2015	2015
Saskatchewan	1993	2014	–
Manitoba	1987	2012	–
Ontario	1986	2012	2012
Quebec	1977	2016	2016
New Brunswick	1992	–	–
Nova Scotia	1991	2012	2012
Prince Edward Island	1998	2013	2013
Newfoundland and Labrador	1995	2013	2013
Yukon	1987	–	–
Northwest Territories	2002	2002	–
Nunavut	1999	2017	2017
Canada	1996	Bill C-16	Bill C-16

REFERENCES

1. Ard KL, Makadon HJ. *Improving the health care of lesbian, gay, bisexual and transgender people: Understanding and eliminating health disparities.* Boston: The Fenway Institute; 2012.
2. Committee on Lesbian, Gay, Bisexual, and Transgender Health Issues and Research Gaps and Opportunities. *The health of lesbian, gay, bisexual, and transgender people: Building a foundation for better understanding.* Washington, DC: National Academies Press; 2011.
3. Loyola University Maryland. LGBTQ terms and definitions [Internet]. Available from: www.loyola.edu/club/spectrum/lgbtq-terms-and-definitions
4. Qmunity. *Queer terminology from A to Q.* Vancouver, BC: Qmunity; 2013. Available from: qmunity.ca/wp-content/uploads/2015/03/Queer_Terminology_Web_Version__Sept_2013__Cover_and_pages_.pdf
5. University of California at Berkeley, Gender Equity Resource Center. Definition of terms [Internet]. Berkeley, CA: UC Berkeley; 2013. Available from: geneq.berkeley.edu/lgbt_resources_definiton_of_terms#agender
6. Brotman S, Ryan B, Jalbert Y, Rowe B. The impact of coming out on health and health care access: The experiences of gay, lesbian, bisexual and Two-Spirit people. *J Health Soc Policy.* 2002;15(1):1–29.
7. Bradford JB, Cahill S, Grasso C, Makadon HJ. Policy focus: *Why gather data on sexual orientation and gender identity in clinical settings.* Boston: The Fenway Institute; 2012. Available from: www.lgbthealtheducation.org/wp-content/uploads/policy_brief_why_gather.pdf
8. Brotman S, Ryan B, Cormier R. The health and social service needs of gay and lesbian elders and their families in Canada. *Gerontologist.* 2003;43(2):192–202.
9. Carroll A. *State-sponsored homophobia. A world survey of sexual orientation laws: Criminalisation, protection and recognition.* Geneva: International Lesbian, Gay, Bisexual, Trans and Intersex Association (ILGA); May 2016. Available from: http://ilga.org/downloads/02_ILGA_State_Sponsored_Homophobia_2016_ENG_WEB_150516.pdf
10. Statistics Canada. Same-sex couples and sexual orientation... by the numbers [Internet]. 2014. Available from: www.statcan.gc.ca/eng/dai/smr08/2015/smr08_203_2015#a3
11. Gates GJ, Newport F. LGBT percentage highest in DC, lowest in North Dakota. Gallup [Internet]. 2013. Available from: www.gallup.com/poll/160517/lgbt-percentage-highest-lowest-north-dakota.aspx
12. Finkenauer S, Sherratt J, Marlow J, Brodey A. When injustice gets old: A systematic review of trans aging. *J Gay Lesbian Soc Serv.* 2012;24(4):311–30.
13. Barbara AM, Quandt SA, Anderson RT. Experiences of lesbians in the health care environment. *Women & Health.* 2001;34(1):45–62.
14. Taylor ET. Transmen's health care experiences: Ethical social work practice beyond the binary. *J Gay Lesbian Soc Serv.* 2013;25(1):102–20.
15. Cornelius JB, Carrick J. A survey of nursing students' knowledge of and attitudes toward LGBT health care concerns. *Nurs Educ Perspect.* 2015;36(3):176–78.
16. Bauer GR, Scheim AI, Deutsch MB, Massarella C. Reported emergency department avoidance, use, and experiences of transgender persons in Ontario, Canada: Results from a respondent-driven sampling survey. *Ann Emerg Med.* 2014;63(6):713–20.e1.
17. Brotman S, Ryan B, Jalbert Y, Rowe B. Reclaiming space-regaining health: The health care experiences of Two-Spirited people in Canada. *J Gay Lesbian Soc Serv.* 2002;14(1):67–87.
18. Rawat R. Multi-dimensional burden of lesbian, gay, bisexual, and transgender (LGBT) community: Health perspective. *AASCIT.* 2015;2(6):320–25.
19. Quinn GP, Sutton SK, Winfield B, Breen S, Canales J, Shetty G, et al. Lesbian, gay, bisexual, transgender, queer/questioning (LGBTQ) perceptions and health care experiences. *J Gay Lesbian Soc Serv.* 2015;27(2):246–61.
20. Diamant AL, Wold C, Spritzer K, Gelberg L. Health behaviors, health status, and access to and use of health care: A population-based study of lesbian, bisexual, and heterosexual women. *Arch Fam Med.* 2000;9(10):1043–51.
21. Aaron D, Markovic N, Danielson M, Honnold J, Janosky J, Schmidt N. Behavioral risk factors for disease and preventive health practices among lesbians. *Am J Public Health.* 2001;91(6):972–75.
22. Mitra S, Globerman J. Facilitators and barriers to health care for lesbian, gay and bisexual (LGB) people. *Rapid Review #79.* Toronto, ON: Ontario HIV Treatment Network; 2014.
23. Joint United Nations Programme on HIV/AIDS (UNAIDS). Ending violence and discrimination against lesbian, gay, bisexual, transgender and intersex people [press statement]. Geneva: UNAIDS; 2015. Available from: www.unaids.org/en/resources/presscentre/pressreleaseandstatementarchive/2015/september/20150929_LGBTI#_ftnref1
24. Durso LE, Meyer IH. Patterns and predictors of disclosure of sexual orientation to healthcare providers among lesbians, gay men, and bisexuals. *Sex Res Social Policy.* 2013;10(1):35–42.
25. Alvy LM, McKirnan D, Du Bois SN, Jones K, Ritchie N, Fingerhut D. Health care disparities and behavioral health among men who have sex with men. *J Gay Lesbian Soc Serv.* 2011;23(4):507–22.
26. Zuccaro L. The health care experiences of LGBT seniors. *Transition* (a publication of The Vanier Institute of the Family). 2014;44(3):14–15.
27. van Anders SM. Beyond sexual orientation: Integrating gender/sex and diverse sexualities via sexual configurations theory. *Arch Sexual Behav.* 2015;44(5):1177–1213.
28. Rainbow Health Ontario. Media reference guide discussing trans and gender-diverse people [Internet]. Available from: www.rainbowhealthontario.ca/wp-content/uploads/2016/01/Media-Reference-Guide-Trans-and-Gender-Diverse-People1.pdf
29. Trans Primary Care. Language and terminology [Internet]. Available from: www.rainbowhealthontario.ca/TransHealthGuide/intro-terms.html
30. Intersex Society of North America. What is intersex? [Internet]. Available from: www.isna.org/faq/what_is_intersex
31. Tjepkema M. Health care use among gay, lesbian and bisexual Canadians. *Health Reports.* 2008;19(1):53–64.
32. Evans NJ, Forney DS, Guido FM, Patton LD, Renn KA. *Student development in college: Theory, research, and practice.* 2nd ed. San Francisco, CA: Jossey-Bass; 2010.

33. Sullivan, Nikki. *A critical introduction to queer theory.* New York, NY: NYU Press; 2003.

34. Stevens PE. Lesbians' health-related experiences of care and noncare. *West J Nurs Res.* 1994;16(6):639–59.

35. Harbin A, Beagan B, Goldberg L. Discomfort, judgment, and health care for queers. *J Bioeth Inq.* 2012;9(2):149–60.

36. Saulnier CF. Deciding who to see: Lesbians discuss their preferences in health and mental health care providers. *Social Work.* 2002;47(4):355–65.

37. Law M, Mathai A, Veinot P, Webster F, Mylopoulos M. Exploring lesbian, gay, bisexual, and queer (LGBQ) people's experiences with disclosure of sexual identity to primary care physicians: A qualitative study. *BMC Fam Pract.* 2015;16:175.

38. Lambda Legal. *When health care isn't caring: Lambda Legal's survey on discrimination against LGBT people and people living with HIV.* New York, NY: Lambda Legal; 2010. Available from: www.lambdalegal.org/sites/default/files/publications/downloads/whcic-report_when-health-care-isnt-caring.pdf

39. Xavier J, Bradford J, Hendricks M, Safford L, McKee R, Martin E, et al. Transgender health care access in Virginia: A qualitative study. *Int J Transgend.* 2013;14(1):3–17.

40. MacDonnell JA, Daley A. Examining the development of positive space in health and social service organizations: A Canadian exploratory study. *J Gay Lesbian Soc Serv.* 2015;27(3):263.

41. Bauer GR, Zong X, Scheim AI, Hammond R, Thind A. Factors impacting transgender patients' discomfort with their family physicians: A respondent-driven sampling survey. *PLoS One.* 2015:1–16.

42. van Dam MAA, Koh AS, Dibble SL. Lesbian Disclosure to Health Care Providers and Delay of Care. *J Gay Lesbian Med Assoc.* 2001;5(1):11–19.

43. Barnoff L, Sinding C, Grassau P. Listening to the voices of lesbians diagnosed with cancer: Recommendations for change in cancer support services. *J Gay Lesbian Soc Serv.* 2005;18(1):17–35.

44. Grant JM, Mottet LA, Tanis J, Harrison J, Herman JL, Keisling M. Injustice at every turn: A report of the national transgender discrimination survey [Internet]. Washington, DC: National Center for Transgender Equality and National Gay and Lesbian Task Force; 2011. Available from: www.transequality.org/sites/default/files/docs/resources/NTDS_Report.pdf

45. Eliason MJ, Schope R. Does "don't ask don't tell" apply to health care? Lesbian, gay, and bisexual people's disclosure to health care providers. *J Gay Lesbian Med Assoc.* 2001;5(4):125–34.

46. Positive Space, University of Toronto. Posters & stickers [Internet]. 2015. Available from: positivespace.utoronto.ca/resourcesposters/posters/

47. Hurley MC. *Sexual orientation and legal rights.* Ottawa: Library of Parliament; 2007. Available from: www.lop.parl.gc.ca/content/lop/researchpublications/921-e.pdf

48. Bill C-16. *An act to amend the Canadian Human Rights Act and Criminal Code.* 1st Sess, 42nd Parl, 64-65 Elizabeth II, 2015–2016 (as passed by the House of Commons, 18 Nov 2016). Available from: www.parl.gc.ca/HousePublications/Publication.aspx?DocId=8609176&Language=E&Mode=1

49. Spencer C. A brief Canadian history of laws affecting and gays and lesbians [Internet]. 2008. Available from: www.canadianelderlaw.ca/Gay%20Timeline.htm

50. Cossman B. Bill C-16 – No, it's not about criminalizing pronoun misuse [Internet]. 2016. Available from: sds.utoronto.ca/blog/bill-c-16-no-its-not-about-criminalizing-pronoun-misuse/

51. Ministry of Justice, Government of British Columbia. BC Human Rights Code to include explicit protection for gender identity, expression [news release]. 2016 Jul 25. Available from: https://news.gov.bc.ca/releases/2016JAG0025-001352

52. Bill 103. *An Act to strengthen the fight against transphobia and improve the situation of transgender minors in particular.* 1st Sess, 41st Leg, 2016 (Chapter 19). Quebec: Québec Official Publisher; 10p. Available from: www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=5&file=2016C19A.PDF

53. Ostroff J. Nunavut protects transgender rights in unanimous vote [Internet]. *The Huffington Post Canada.* 2017 Mar 15. Available from: www.huffingtonpost.ca/2017/03/15/nunavut-transgender-rights_n_15386394.html

EnviroDental practice: The future is in your hands

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ABSTRACT

The earth's resources, as we know them, are depleting and extremely limited. The amount of medical waste accumulated from a single operator within a dental office and collectively as a profession places dentistry and dental hygiene in a culpable position for the detrimental impacts on our natural environment. Being "envirodentally friendly" involves conscientious and sustainable strategies that encourage dental professionals to reduce consumption of energy and production of waste. This short communication reviews the literature on this topic. Raising environmental consciousness for dental professionals in North America and suggestions for "green" approaches are explored. Four main areas of research discussed in this article are the 4 Rs of waste reduction; going digital in the dental office; wet versus dry vacuum systems; and infection control methods.

RÉSUMÉ

Les ressources de la terre, telles que nous les connaissons, s'épuisent et sont extrêmement limitées. Le volume de déchets médicaux, qu'il soit accumulé par un seul clinicien en cabinet dentaire ou collectivement par l'entremise de la profession, rend la dentisterie et l'hygiène dentaire responsables des répercussions négatives sur notre environnement naturel. Être « respectueux de l'environnedent » consiste à adopter des stratégies consciencieuses et renouvelables qui incitent les professionnels dentaires à réduire la consommation d'énergie et la production de déchets. Ce bref article passe en revue la documentation sur ce sujet. L'éveil de la conscience écologique des professionnels dentaires en Amérique du Nord et les propositions d'approches « vertes » sont explorés. Les 4 domaines de recherches discutés dans cet article sont les 4 « R » de la réduction des déchets, l'adoption du numérique dans les cabinets dentaires, l'utilisation des systèmes d'aspirateurs humides au lieu de secs, et la révision des méthodes d'asepsie.

Key words: dental waste, dentistry, eco-friendly, environment, green, medical waste, products, recycling

INTRODUCTION

The first Earth Day took place in 1970, yet environmental consciousness can be traced back to the 1800s when the concept of conserving natural resources began.[1] Environmental awareness and accountability have become priorities in the 21st century. The effects of global warming, the consumption of diminishing natural resources, air and water pollution, and landfills are all increasing[1] as a direct consequence of human activity and economic development.[2] Medical waste makes up a large portion of the planet's total waste. For the dental profession, one of the greatest and least talked about challenges we are facing is managing waste without hindering productivity, efficiency, and infection control. Unfortunately, waste from dental offices is often non-biodegradable and causes toxic chemicals to enter our streams, sewers, and landfills.[2]

According to the Eco-Dentistry Association (EDA), "going green" involves a person, family or group changing life practices to help reduce waste or be more energy efficient because they have become more conscious about the destruction of the environment.[1] This philosophy encourages renewability, sustainability, energy efficiency, non-toxicity, and reduction of our carbon footprint.[3] It is paramount to conceptualize how dentistry is negatively affecting the environment and develop strategies to make dental practices more eco-friendly.

One of the very first eco-friendly changes adopted by dental practices was the use of amalgam separators. Amalgam containing mercury has been used in dentistry for more than 150 years.[2] Mercury is a toxic and bioaccumulative metal that is discharged into the environment at a rate of 20,000 tons to 30,000 tons per year from human activity.[2] This is a serious environmental and human health concern as the mercury is found in drinking, irrigation, and fishing waters.[1] The amalgam separator captures up to 99% of the amalgam waste from the water collected in the suction hoses, which is too fine to be caught by a trap before it is discharged into the sewer.[2]

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ENVIRODENTAL PRACTICE

As of 2014, the EDA reports that the waste generated annually by dental practices in the United States alone includes 4.8 million lead foils, 28 million litres of toxic x-ray fixer, 1.7 billion sterilization pouches, and 680 million chair barriers, light handle covers, and client bibs, all of which end up in landfills or water systems.[3,4] In order to effectively decrease the dental profession's impact on the environment, it is imperative to tackle the 4 processes that are most responsible for dental practice waste: 1) consumption of natural and disposable resources, 2) conventional office management and radiography practices; 3) vacuum systems; and 4) infection control methods.

Four Rs of waste reduction

Waste reduction and "green" dentistry encompass the 4 Rs: reduce, reuse, recycle, and rethink.[1] Embracing these 4 objectives is one of the easiest ways to develop a waste reduction plan.

First, dental practices can decrease their environmental impact by reducing the amount of resources consumed. This reduction can be achieved through saving water, using fewer disposable items, and going paperless in the office.[1]

The next step in the 4 R plan is to reuse. Choosing reusable products instead of one-time-use products not only keeps them out of the landfills, but also saves on costs and the energy required to manufacture new products. Reusable products include autoclavable high and low volume suctions, glass irrigation syringes, and autoclavable cotton cassette wraps that can also serve as client bibs.[1,5]

Another viable option is to invest in instrument cassettes. Instrument cassettes are reusable, and the sterile paper wraps can be recycled, consequently eliminating usage of plastic. Transitioning from paper sterile wraps to cloth sterile (0.R cotton) wraps allows for dual repurposing as the cloth wraps can be used as the client bib once removed from the clean cassette.[5] After usage as a bib, the cloth wrap can be cleaned of debris through a heavy-duty laundry service or autoclaved, and then reused to wrap cassettes.[5] This approach can dramatically decrease the paper and plastic waste in a dental office, as one conventional client bib comprises 1- 2- or even 3-ply paper in addition to 1-ply plastic. The average number of client bibs used per day is 26, which amounts to 5,100 pieces of paper discarded into landfills each year of practice. Consequently, over a 30-year career, a dental professional may add between 150,000 to 300,000 bibs to landfill sites.[5]

The recycling triangle involves collecting materials to be recycled, remanufacturing them, and then reselling the resulting recycled materials.[1] Ways to recycle in the dental office include using manufacturer recycling programs for old instruments, using recycled toner and inkjet cartridges, and sorting hard plastics from soft.[1] With the growing concern for greater efficiency and higher productivity, a large number of recyclables are disposed of incorrectly. On an average day, 24 autoclave bags are used, which amounts to over 5,000 autoclave bags per year[5] being tossed into the landfills. The ideal and simplest green solution is to separate the plastic face from the paper portion of the autoclave bag and recycle each half accordingly.

There is no practical alternative to wearing disposable gloves in the dental office as they are critical for infection control. Over 4,800 pairs of gloves per year burden the landfills from each operator alone.[5] In the United States, the dream of a glove recycling program has become a reality. The manufacturer, Kimberly-Clark Professional, strictly collects and recycles its brand of used nitrile gloves and then repurposes the waste into park benches and other plastic products.[6] According to the Occupational Safety and Health Administration, the majority of soiled items in dental offices are general medical waste without any biohazardous concerns.[7]

Finally, rethinking involves discussions with dental teams to identify ways to reduce, reuse, and recycle.[1] By implementing some small, affordable changes, dental offices can make an impact on the long-term sustainability of our environment.

Going digital

Many dental offices have already begun to transition to digital systems. According to a 2007 survey by the University of Waterloo, the average number of papers in a typical dental chart is 12.[5] In a 2000-chart dental office, approximately 12,600 pieces of paper could be saved by switching to digital record keeping.[5] If a traditional office is not ready to convert to digital charting yet, even the use of 151 lbs of 100% recycled paper has the potential to save 1 tree, 770 gallons of water, 158 lbs of net greenhouse emissions, 1,042 BTU of energy, and 82 lbs of landfill waste.[5]

Two significant environmental considerations associated with the use of traditional radiographs are silver and lead pollution. Lead is present in traditional film foils, shields, and aprons. The lead content within a foil ranges from 69% to 85%; these foils commonly end up in the landfill.[8] While most dental offices think this is only a small amount of lead, as much as 11.2 g of lead waste can be produced from a full-mouth survey on a client.[8]

Silver waste enters our water systems by improper disposal of dental radiographic fixer. Furthermore, this heavy metal presents as a toxic, untreated form of silver on unused films.[8] Takeback and recycling programs are available for radiographic fixer and developer, films, and all lead-containing products through most manufacturers. However, in 2014 manufacturing companies reported that only 5% of all products sold were returned,[8] which indicates either a lack of awareness of the program or negligence by dental professionals.

While recycling programs are available for silver and lead products in traditional films, the switch to digital radiography represents a true step in the "green" direction. Within 10.8 months, the initial investment in digital equipment is paid off due to savings in staff time and paper and chemical expenses.[4] Each subsequent year returns an annual savings of US$8,769.[4] Together the 2 systems of digital radiography and charting eliminate much of the need for paper, save staff time spent on filing, processing, and mounting, and reduce exposure to harmful chemicals and radiation.[4] A digital office is also a positive, modern marketing tool, as it makes sharing radiographs with other dental professionals much more convenient as long as the transmission is encrypted and secure.[4]

Vacuum systems

Fresh water is a limited resource as 97.5% of water on earth is salt water.[7] Of the fresh water on the planet, 70% is found in the ice caps of Antarctica and Greenland, leaving only 30% available for consumption,[9] of which 87% is allocated to agricultural purposes.[9] Therefore, only a small amount of the planet's water is available for human consumption. In 2007, 1 in 3 people were already facing water shortages.[9]

Every day, dental professionals are slowly contributing to the diminishment of one of the world's most important natural resources through the use of wet dental vacuum or suction systems. Vacuum systems are a critical piece of machinery in any dental office. However, these systems create suction power by using large amounts of clean, fresh drinking water. Approximately a half-gallon of water is used every minute per horsepower, which amounts to 57,000 to 200,000 gallons of water per year in a typical dental office.[10]

In contrast, dry vacuum systems create pressure by pumping air out of the vacuum chamber without the use of water. These dry vacuum systems have become far more technologically advanced and they are now smaller, produce less noise, and are safer for people and the environment.[10] Many brands also claim efficiency in energy consumption as a major selling point because the systems use less electricity and produce less heat.

Water recyclers are a green option for modifying wet vacuum systems. Water usage is reduced by 80% when water recyclers are used, because most of the liquid flows back through the pump, adding fresh water to it.[4] A typical one-horsepower water-ring pump for a small facility with a recycler uses approximately 15 gallons of water per hour as opposed to 120 gallons of water per hour without.[4]

Infection control

Going green in infection control must be considered in tandem with the provincial or territorial infection control guidelines. Cleaning and disinfection of some non-critical items may be challenging for multipart equipment such as high- and low-volume switches in which the benefits and drawbacks of wiping versus using a barrier must be weighed.

Thorough research of chemical contents in disinfectants is not always conducted. Items to look for on product labels include approval by the Environmental Protection Agency (EPA), which promotes the development of safer cleaning products for the consumer and the environment.[11] EcoLogo Environmental Choice Program approves and certifies environmentally friendly products, and searches for products that are enzyme-free, biodegradable, and contain no volatile organic compounds (VOCs).[12] Although disinfectant products with VOCs can be harmful to human health and the environment,[13] they should only be replaced with eco-friendly brands that have been proven to be microbiologically effective. To be effective as a disinfectant, eco-friendly products must be virucidal, bactericidal, fungicidal, and tuberculocidal.

CONCLUSION

Implementing changes to save our environment is imperative, as dental and medical waste management is a major ecological challenge of the modern world.[2] To decrease dentistry and dental hygiene's impact on the environment, dental professionals should focus on 4 sustainable approaches: 1) applying the 4 Rs of waste reduction; 2) converting to digital record keeping and radiographic systems; 3) implementing dry vacuum systems or water recyclers; and, 4) practising more eco-friendly infection control methods.

The future of the dental profession should be headed in the direction of making substantial changes and a conscientious effort to go "green." In 2012, Japan successfully synthesized biomaterials, such as calcium silicate cement, from dental waste, such as waste alginate material.[14,15] In 2014, the first large-scale nitrile glove and garment recycling program known as "Right Cycle" was created by Kimberly-Clark Professional and launched at the University of California Santa Cruz.[6] Thus far, Right Cycle is exclusive to the United States and they have yet to expand. No other major glove manufacturing companies have taken the initiative to create a feasible recycling program, likely because waste management costs continue to rise.[6] With Canada's reputation as a global leader in environmental action, it is only a matter of time before we achieve an innovative solution of our own. The answer is in collaboration and advocacy, not only within the dental community, but also with medical professionals who would benefit equally from a glove recycling program in Canada.

Adopting eco-friendly practices supports client health and is economically savvy as it has the potential to save dental offices thousands of dollars a year, in addition to preserving natural resources.[4] Ultimately, proper disposal of medical waste is good professional practice for all health care professionals, so keep "EnviroDental Practice" in mind, as the future is in your hands.

REFERENCES

1. Chopra A, Gupta N, Rao NC, Vashisth S. Eco-dentistry: The environment-friendly dentistry [Internet]. *Saudi J Health Sci.* 2014;3:61–65 [cited 2016 Mar 25]. Available from: www.saudijhealthsci.org/text.asp?2014/3/2/61/134837
2. Muhamedagic B, Muhamedagic L, Masic I. Dental office waste – Public health and ecological risk. *Mater Sociomed.* 2009;21(1):35–38 [cited 2016 Mar 24]. Available from: www.ncbi.nlm.nih.gov/pmc/articles/PMC3796776/
3. Avinash B, Avinash B, Shivalinga B, Jyothikiran S, Padmini M. Going green with eco-friendly dentistry. *J Contemp Dent Pract.* 2013;14(4):766–69.
4. Eco-Dentistry Association [Internet]. Berkeley, CA: Eco-Dentistry Association; 2014 [cited 2016 Mar 24]. Available from: www.ecodentistry.org/?aboutgreendentistry
5. Farahani A, Suchak M. Eco-friendly dentistry: *The environmentally-responsible dental practice*. Waterloo, ON: University of Waterloo; 2007. pp. 1–38.
6. University of California Santa Cruz, Sustainability Office. Kimberly-Clark nitrile glove recycling program [Internet]. Santa Cruz, CA: Regents of the University of California; 2016 [cited 2016 Mar 25]. Available from: http://sustainability.ucsc.edu/get-involved/student-projects/green-labs/Waste%20Reduction/Glove%20Recycling%20Program.html#how
7. OSAP the Safest Dental Visit. Frequently asked questions (FAQs) on dental infection control [Internet] [cited 2016 Mar 25]. Available from: www.osap.org/?FAQ_Waste1#whatistheproperbiohazard
8. Koneru J, Mahajan N, Mahalakshmi M. Management of dental radiographic waste: a review. *Int J Med Dentistry.* 2014;18(3): 206–209.
9. Climate Institute. Water [Internet]. Washington, DC: Climate Institute; 2007-2010 [cited 2016 Mar 24]. Available from: http://climate.org/archive/topics/water.html
10. Oral Health. A buyers' guide to dental vacuum systems [Internet]. *Oral Health*. July 2011 [cited 2016 Mar 24]. Available from: www.oralhealthgroup.com/features/a-buyers-guide-to-dental-vacuum-systems/
11. Atlas Resell Management. Wet and dry vacs: a comparison [Internet]. [cited 2016 Mar 24]. Available from: www.atlasresell.com/news/wet-and-dry-vacs-comparison
12. United States Environmental Protection Agency. Selected EPA-registered disinfectants [Internet]. [cited 2016 Mar 25]. Available from: www.epa.gov/pesticide-registration/selected-epa-registered-disinfectants
13. SciCan. *OPTIM cleaners, disinfectants, and sterilants…Quick, clean and green!* Toronto, ON: SciCan Ltd.; April 2013 [cited 2016 Mar 25]. Available from: www.scicancanada.ca/site/scican/assets/pdf/sd-207_ca_en_r6_optim.pdf
14. Govoni M. Become an environmentally friendly dental practice. *Dental Products Report.* April 16, 2012 [cited 2016 Mar 25]. Available from: www.dentalproductsreport.com/dental/article/become-environmentally-friendly-dental-practice
15. Washizawa N, Narusawa H, Tamaki Y, Miyazaki T. Production of a calcium silicate cement material from alginate impression material. *Dent Mater J.* 2012;31(4):629–34.

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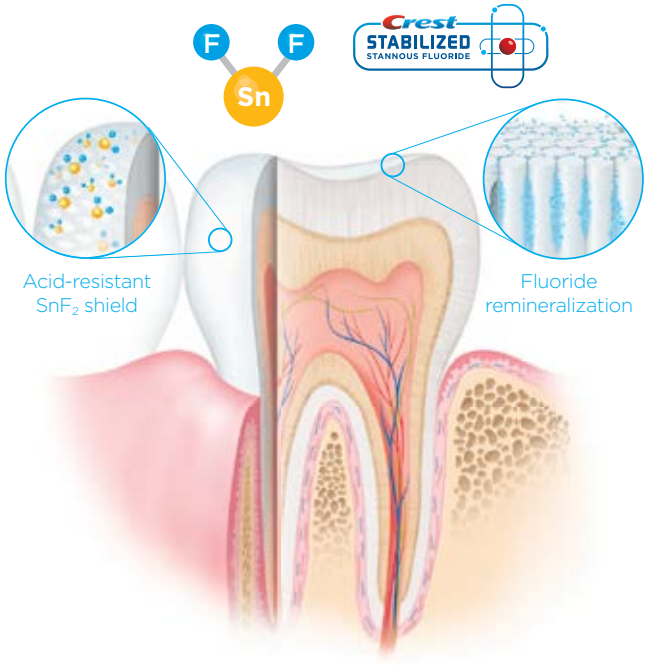

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References: 1. Carvalho TS *et al.* Consensus report of the European Federation of Conservative Dentistry: erosive tooth wear--diagnosis and management. *Clin Oral Investig* 2015:19(7);1557-61. Available at: doi: 10.1007/s00784-015-1511- **2.** Hasselkvista A *et al.* A 4 year prospective longitudinal study of progression of dental erosion associated to lifestyle in 13–14 year-old Swedish adolescents. *Journal of Dentistry* 2016;47: 55–62. **3.** Yan-Fang R. Dental Erosion: Etiology, Diagnosis and Prevention. *RHD Magazine* 2011(8):76-80. Available at: http://rdhmag.com/etc/medialib/new-lib/rdh/site-images/volume-31/issue- 8/1108RDH075-085.pdf **4.** Al-Dlaigan YH *et al.* Dental erosion in a group of British 14-year-old school children. Part II: Influence of dietary intake. *Br Dent J* 2001;190(5):258-61. **5.** Poonam Jain P *et al.* A comparison of sports and energy drinks - Physiochemical properties and enamel dissolution. *General Dentistry* 2012 (May/June):190-197. **6.** McGuire J *et al.* Erosive tooth wear among children in the United States: relationship to race/ethnicity and obesity. *Int J Paediatr Dent* 2009;19(2):91-8. Available at: doi: 10.1111/j.1365- 263X.2008.00952

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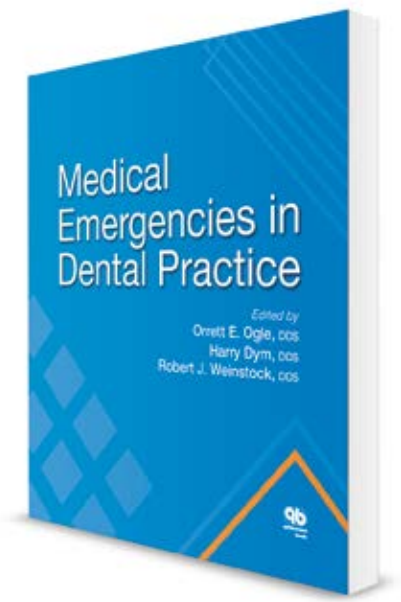
† Mouthwash, Gel and Spray.
‡ As measured in a 28-day clinical study.[6]

1. GSK data on file. Biotène dry mouth growth opportunity (with Canadian U&A data). July 16, 2014. **2.** Dawes C. How much saliva is enough for avoidance of xerostomia? *Caries Res.* 2004;38:236–240. **3.** Sreebny LM, Schwartz SS. A reference guide to drugs and dry mouth, 2nd edition. *Gerodontology.* 1997;14:33–47. **4.** Turner MD, Ship JA. Dry mouth and its effects on the oral health of elderly people. *J Am Dent Assoc.* 2007;138:15S–20S. **5.** Fox PC. *J Clin Dent.* 2006;17(Spec Iss):27–28. **6.** GSK data on file 2014, RH01986.

Medical emergencies in dental practice

Edited by Orrett E Ogle, Harry Dym, and Robert J Weinstock
Chicago: Quintessence Publishing Co, Inc.; 2016. 190 pp. with index
ISBN 978-0-86715-569-3; available from Quintessence Publishing (www.quintpub.com)

Sometimes, you can judge a book by its cover. Or, in this case, at least by its label. *Medical Emergencies in Dental Practice* is a title that is clear, concise, and to the point. Edited by Orrett E Ogle, DDS, Harry Dym, DDS, and Robert J Weinstock, DDS, and featuring contributions from several accomplished dental professionals, the book thoroughly explores a broad array of medical crises that might arise in a dental setting. The collective expertise is compiled in an easy-to-follow layout that covers all important facets of the topic under discussion. Each potential crisis is touched upon in depth.



The emergencies featured range from the most common, syncope, to rarer ones such as malignant hypothermia. All are grouped into distinct categories that are presented in a logical structure, beginning with a chapter on pretreatment evaluation of the dental client and ending on the topic of basic life support. In between, different physiologic systems and their associated ailments are examined in detail, including all variety of origins, symptoms, and treatments as especially related to their expression in a dental clinic. The book's early focus on pretreatment evaluation is an excellent reminder that each client is an individual with unique needs. Keeping this in mind while performing risk analysis can lower the potential for medical emergencies. It is particularly interesting to note the inclusion of dental fear as a precursor to syncope, since this is not always a consideration.

Prevention as a first thought, followed by treatment as necessary, is a recurring theme throughout the book, and one which reflects current trends in dental philosophy. Also in keeping with modern dentistry is an updated description of how to obtain medication information through online applications, rather than relying solely on a pocket compendium. References to technology in general are up to date, as with a discussion of soft tissue lasers used for cautery. The book's information is relevant and comprehensive, though it does perhaps fall short when it comes to illustrated examples for properly diagnosing an emergency situation. The section on strokes, for example, might be better off with more photographs of people suffering from such an affliction, since its symptoms are largely visual in their manifestation. Elsewhere, a figure on "questions surrounding the treatment of pregnant patients" lacks any actual answers. In contrast, the flow charts featured in each chapter are quite well utilized. Proper procedures to follow in a given emergency scenario are frequently outlined in a straightforward manner, enabling a practitioner to follow them easily should an actual medical emergency arise.

The emphasis of this book is on preparedness and, in this respect, it succeeds in providing the knowledge necessary to avoid a medical emergency and to deal effectively with one should it occur. The book stresses that, while many medical emergencies might happen infrequently in dental practice, when they do arise they can be life threatening. The material featured in these pages is therefore valuable, and often vital, even when its presentation is somewhat lacklustre. *Medical Emergencies in Dental Practice* would be of benefit to all dental professionals. As general study material and as a quick reference when needed, this is a resource worth keeping handy on a shelf in any clinic.

Brittany Rose Stumpf, BDSc, RDH, and Cory Stumpf, BJ, live in Kamloops, British Columbia. Brittany works in a private dental clinic and is also a community dental hygienist with Interior Health; Cory is an editor and freelance writer.

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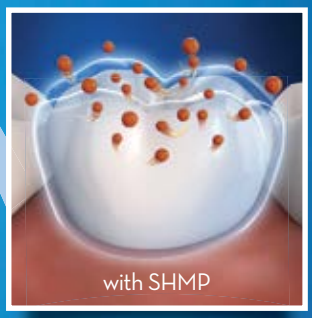

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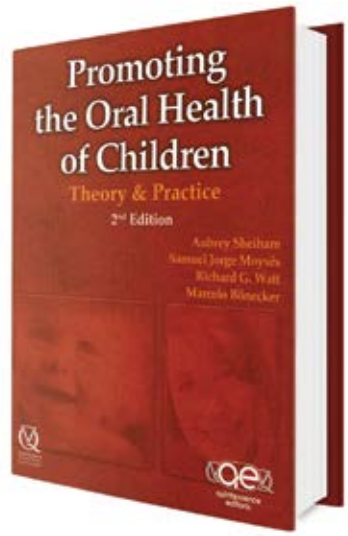
Promoting the oral health of children: Theory & practice, 2nd edition

By Aubrey Sheiham, Samuel Jorge Moysés, Richard G Watt, Marcelo Bönecker
São Paulo: Quintessence Editora Ltda; 2014. 450 pp.
ISBN 978-85-7889-037-7; available from Quintessence Publishing (www.quintpub.com)

This expanded second edition of *Promoting the Oral Health of Children: Theory & Practice* presents a refreshing and insightful perspective on the importance of adopting a new model for oral health care. The authors propose a model that moves away from the traditional or individualistic approach to oral health in favour of one that focusses on identifying the underlying social determinants of health in the population as a whole. The authors advocate an "upstream" approach whereby health care professionals work collectively to examine and address the broader causes of disease, emphasizing the impact that oral health has on the overall health of children.



The book is a collaborative effort of international academics in the field of population oral health. The main authors of the book, Aubrey Sheiham, Samuel Jorge Moysés, Richard Watt, and Marcelo Bönecker, are dental experts in epidemiology, public health, and pediatric dentistry. Sadly, Dr. Sheiham, a world-renowned dental epidemiologist at University College London and a pioneer in public health research, passed away in November 2015 after this revised edition was published. These authors have collaborated with other experts to provide a well-supported tool for every dental and medical professional. A short biography of all the contributing authors appears at the front of the book. More detailed information on the main authors of the book would be helpful to better inform the reader on their qualifications, recommendations, and experiences.

SUMMARY OF CONTENT

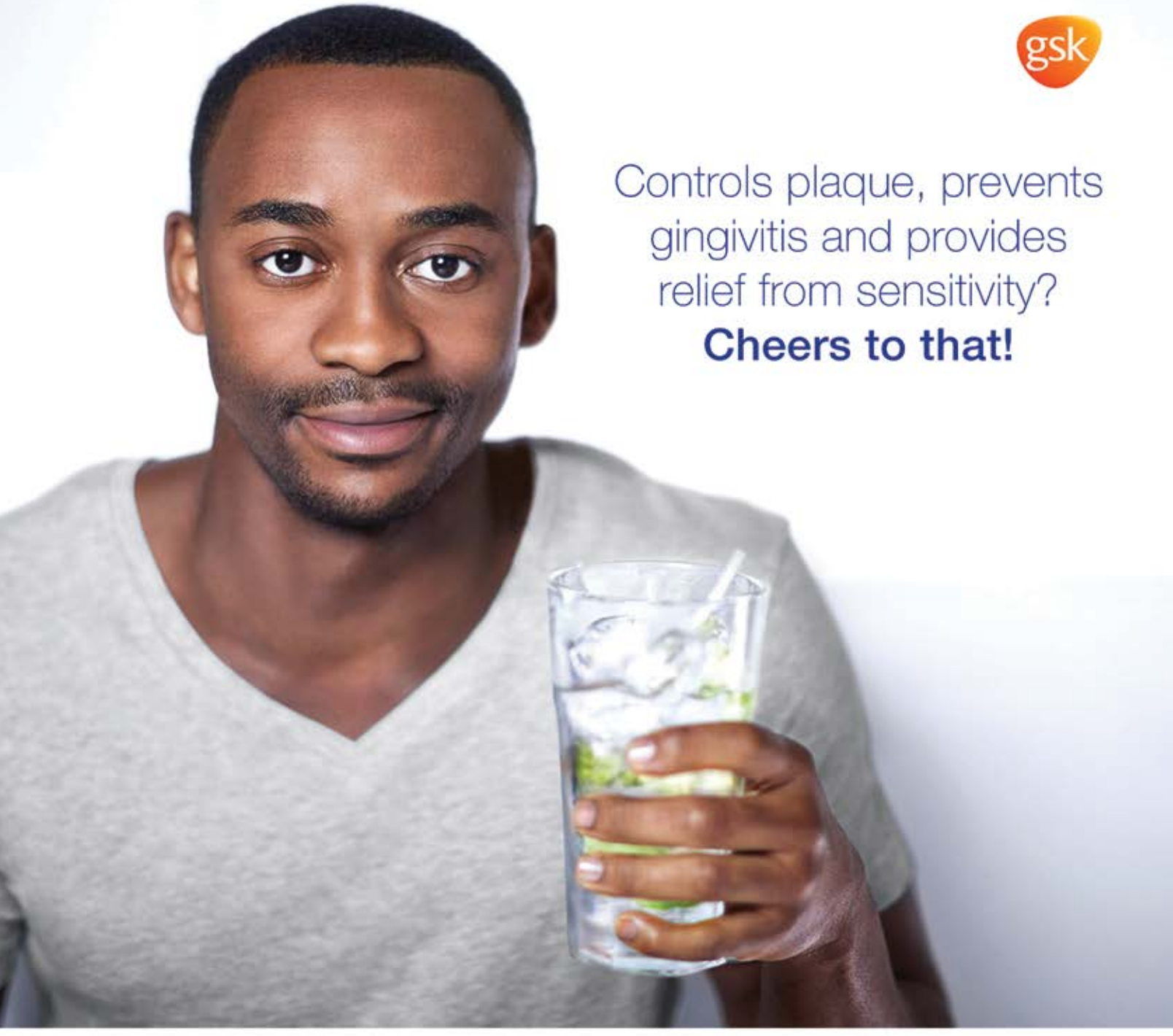
The purpose of this book is to raise awareness of the integral part that oral health plays in the overall health of children and the limitations of current approaches to dental health education. The authors advocate for a paradigm shift that fully integrates oral health promotion into broader health promotion initiatives. The chapters discuss the useful strategies for prevention of common dental problems among children, such as dental caries, periodontal disease, traumatic dental injury, and malocclusion. The book also explores public policy issues, the role of community health, and the ways that environmental and social factors, habit development, nutrition, and diet can affect pediatric oral health.

The book is well organized, highlighting key topics in an easy-to-read, visually appealing format. The detailed table of contents allows for easy navigation to the appropriate chapters. Helpful summaries and concluding statements are also provided, making it easy to focus on the salient features in each chapter. All 21 chapters of this 450-page book are thoroughly referenced, and information is delivered in a variety of formats: graphs, tables, infographics, and photos.

ANALYSIS AND EVALUATION

This book makes a strong case for improvements in pediatric oral health care: first, because oral diseases in children—especially dental caries—cause infection, discomfort, pain, and suffering that impact the family and remain the most common reason for children's hospitalization; and second, because poor oral health in the early years is the strongest predictor of oral disease in adulthood. The authors argue that, in order to improve the oral health of children and reduce inequalities, we need to work collectively, as health care professionals, using a public health community approach. The thought is that a number of theories and concepts from different health disciplines are helpful in building a better understanding of children's oral health. The book discusses the life-course approach and social determinants of health, as well as common risk factors, health promotion strategies, evidence-based practices, and the importance of integrated primary care.

The call for change comes primarily from academics in Brazil, which the book claims is the "emerging powerhouse of population oral health research." Researchers there have found a worldwide increase in the prevalence of non-communicable diseases, such as heart disease, cancer, diabetes, and dental disease, as well as common risk factors



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and possible associations between these diseases. These findings validate the need to change the way we approach the promotion of oral health. Yet the social determinants approach proposed by the authors raises questions about the practicality of implementation. How can clinicians make the changes needed to achieve meaningful results in children's oral health? This concern is of particular interest since the authors claim that traditional educational approaches alone are limited and could actually increase oral health inequalities among children.

Social models of oral health are based on prospective cohort studies. These studies require a high level of critical understanding and skill on behalf of the reader, which might be new to many in the dental profession. Typically, the clinician is more familiar with randomized clinical trials that study the effectiveness of interventions on individuals, rather than epidemiologic research that studies population groups over time in attempt to identify risk factors for disease. The authors advocate for partnerships among applicable agencies and sectors to focus on eliminating these risk factors and their social determinants. They argue that creating supportive environments, building healthy public policies, redirecting health services, and strengthening community action will ultimately lead to greater improvements in children's oral health.

The content of the book is comprehensive and valuable for those wanting to explore new ways to reduce inequalities among children in the field of public health. Health promotion that moves away from the individual treatment approach is compelling because it reaches a larger number of children. However, further studies would reinforce this need for a shift in thinking by using evaluation criteria based on a non-randomized, population-level approach. The activities and concepts proposed in Chapter 20 for modifying oral health promotion strategies need to be fully explored to determine what is practical and effective for the dental office to implement.

Strengths of the book

Each chapter addresses the overall theme of the book—the promotion of oral health for children—by exploring specific determinants of health. The reader is encouraged to reflect on the role of inequalities in life and how oral health and overall health relate to one another. The book highlights that the primary factors that shape one's health are life experiences as a child rather than one's later lifestyle choices or medical and dental treatments, which can be overly emphasized by clinicians. Throughout the book, we are reminded to consider the determinants of oral health in children rather than focus solely on the provision of dental services. The authors inspire all dental health care providers to lessen inequalities in health care by getting involved in our communities and collaborating with other health care sectors to create and encourage change. Overall, the book is effective in making us think beyond the dental chair, with consideration given to the population as a whole and the need to develop policies and strategies capable of benefitting a whole community of children.

Weaknesses of the book

One reoccurring theme in the book weakens its overall message. That theme is the practicality of implementing the information and activities presented to promote oral health and reduce health disparities in children. Typically, the clinician is focused on providing treatment to clients within a given time, making additional activity required within this time impractical. Additionally, it may be difficult for some clinicians to imagine how they could become involved at the public and political levels to effect change and reduce population health inequalities and disparities. Finally, population-based measurements need to be further developed and evaluated in order to build the evidence base to support "whole population public health policy" that would enable individuals and communities to increase control over the determinants of health and improve their health.

CONCLUSION

Overall, this book is of value not only to public health dental professionals but also to all dentists, dental hygienists, dental hygiene students, and dental and medical educators. The book provides some forward-thinking strategies that may be beneficial to policy makers and educators on the imbalance of resources allocated to oral health promotion and methods needed to reduce social inequalities.

This concept of taking a public health approach to children's oral health is new to those educated in the biological model of oral disease and individualized clinical interventions. This shift in thinking is a large step for the field of dentistry but the authors succeed in inspiring the reader to imagine the possibility through their clear and convincing presentation of information. By critically evaluating and applying what is articulated in this book, dental professionals can move towards a more universal model of care by reaching those with the greatest burden of oral disease. This will be accomplished through further public health research on the social determinants of health and the causal pathways linking the biological, psychosocial, behavioral, environmental, and political factors to health and disease outcomes. The findings of this research will inform the changes that need to be made to our oral health promotion strategies for children. This book inspires and encourages all health care workers to collaborate to create better health care policies that will improve the oral health and overall health of our children.

Karen Gallagher, BDSc, RDH, is pursuing a master's degree in education at Yorkville University, Fredericton, New Brunswick, Canada.

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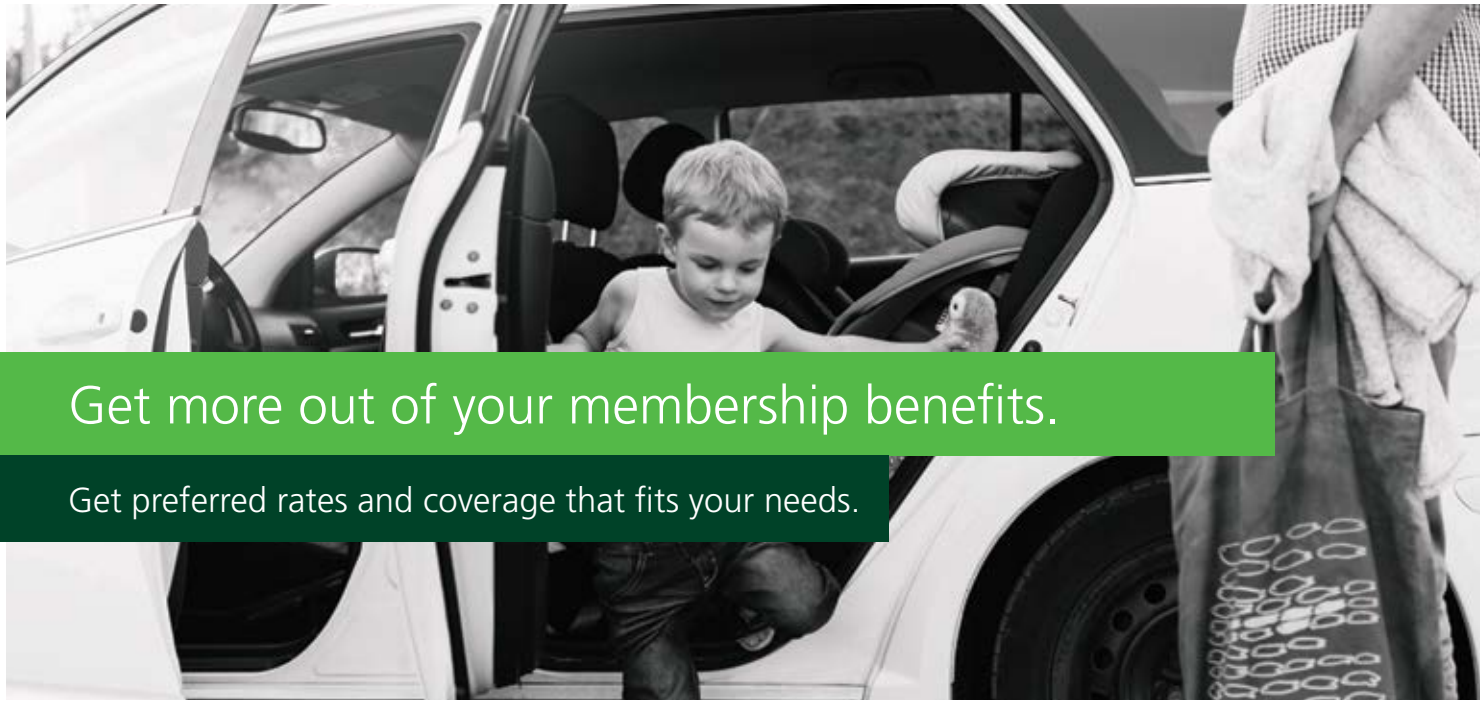

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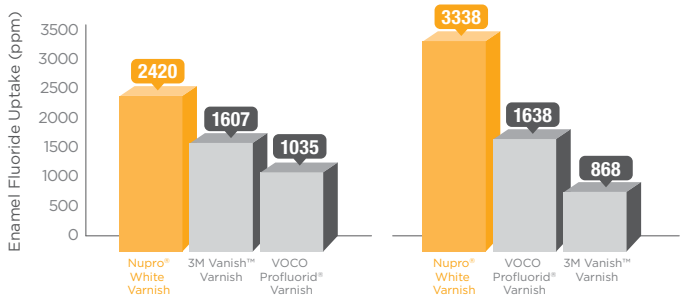

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