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Vaping crisis: A major public health concern

Salme E Lavigne*, PhD, RDH

Happy New Year to all our readers! I wish you a very happy, healthy, and prosperous 2020!

With the beginning of this new decade, it is time for us to look towards the future and what health behaviour changes we, as a profession, might be able to influence. As I reflected on what editorial topic might be of interest to all of you, I could not help but think about how often new products are introduced and placed on the market too quickly with insufficient evidence of their potential for harm over the long term. A perfect example that comes to mind is e-cigarettes. When e-cigarettes (ECs) were introduced approximately 14 years ago, they were thought to be a potentially healthy alternative to conventional cigarettes and, in particular, a means to assist individuals in smoking cessation. If we “fast forward” to the end of 2019, we have been apprised of an alarming number of deaths (52 to date), reported in the United States, that have been associated with e-cigarette use or vaping. In addition to these deaths, vaping-associated lung illnesses have also been reported in the United States, affecting approximately 2,409 people. Although no deaths have been reported in Canada yet, the Government of Canada is actively investigating the emergence of these vaping-associated lung illnesses also known as “severe pulmonary illness associated with vaping.”

As of January 7, 2020, 15 cases of vaping-associated lung illness have been reported to the Public Health Agency of Canada. Case profiles and products used by these individuals are available for all 15 cases. Of these individuals, 11 required hospitalization and all but one are now recovering at home. Four (4) of these individuals were reported to have respiratory symptoms such as shortness of breath and cough while the 11 others presented with a combination of respiratory, gastrointestinal and/or constitutional symptoms such as fever and weight loss.

The provinces where these cases were found are as follows:

- British Columbia (3)
- Alberta (1)
- Ontario (4)
- Quebec (5)
- New Brunswick (2)

In addition, these individuals ranged in age from 15 years to more than 50 years of age without any real age trends. Since little is known about the long-term effects of vaping, Health Canada has released an information update warning Canadians about the potential risk of pulmonary illness associated with vaping products and, in particular, warns youth, pregnant women, and those who do not currently vape not to vape. Health Canada has also partnered with the Public Health Agency of Canada and now has a webpage to keep the public informed about Canadian cases of severe pulmonary illness related to vaping. The latest number of confirmed or probable cases of severe vaping-related pulmonary illness in Canada will be posted and updated weekly on this website, as is done in the United States by the Centers for Disease Control and Prevention.

Dozens of chemicals that are not found in conventional cigarettes can potentially be found in vaping products in addition to nicotine. Some of these additives are flavours, metals, rubber, silicone, and ceramics. Significant amounts of metals (most likely from solder joints, wires, etc.) and silicate beads (most likely from the fiberglass wick) have been found in ECs. It is well known that occupational exposure to silicate dusts can cause extensive pulmonary damage. Similar to conventional cigarettes, e-cigarettes contain concentrations of lead and chromium, however the range of nickel has been reported to be 100 times higher than in conventional cigarettes. E-fluid has also been found to contain tin and to be cytotoxic. Interestingly, most of these metals appear on the US Food and Drug Administration’s list of Harmful and Potentially Harmful Constituents in Tobacco Products and Tobacco Smoke.

Despite these recent issues with vaping, Health Canada has been reported to be considering changing the rules that prevent vaping companies from making any health-benefit claims and may make an exception to allow e-cigarette manufacturers to use promotional statements suggesting that vaping products are safer than conventional cigarettes. This possibility has caused an uproar within the medical
community, with physicians, researchers, and health organizations such as the Canadian Cancer Society and the Heart and Stroke Foundation, all of whom believe that allowing companies to make such claims would be a “critical misstep.” Such statements could downplay the risks of e-cigarettes and could potentially encourage more young people to vape. A staff respirologist from Toronto’s Hospital for Sick Children told reporters at *The Globe and Mail* that there was “no credible evidence showing that vaping products are safer than traditional cigarettes and companies should not be allowed to promote such an idea.”

Health care professionals including dental hygienists should always ask clients as part of their medical history update if they use drugs from any source, legal or illegal, including e-cigarettes. If clients present with respiratory symptoms, particularly if the cause is unclear, dental hygienists should ask if they use vaping products and what devices and liquids they use. I believe as a preventive health profession whose major role is health promotion, we need to voice our objection to Health Canada regarding the potential advertising of e-cigarettes as less of a risk than traditional cigarettes. We are already experiencing the fallout of not having sufficient evidence of the safety and efficacy of these products; to allow such advertising seems to me to be going in the wrong direction.

_The danger to society is not merely that it should believe wrong things...but that it should lose the habit of testing things and inquiring into them..._  
—William Kingdon Clifford  
*The Scientific Basis of Morals (1884)*

### REFERENCES

ISSUE AT A GLANCE

We are pleased to feature 3 original research articles in this issue of the journal. Iris Feng, Mario Brondani, Christophe Bedos, and Leann Donnelly assess the perceptions of how a community-based, stigma free dental program influences access to care for people living with HIV/AIDS (pp. 7–15). Christine Fambely examines the challenges faced by mature female students when completing or furthering dental hygiene education (pp. 16–25). Serena Bianchi, Giulia Fantozzi, Sara Bernardi, and colleagues use scanning electron microscopy to analyse the residue left on titanium implant collar surfaces by commercial mouthwashes and gels (pp. 26–31).

In addition, this issue includes a position paper and statement from the Canadian Dental Hygienists Association on the state of the evidence of a causal relationship between periodontal disease and cardiovascular diseases (pp. 32–41). You will also find a short communication by Arnaldo Perez, Sharon Compton, Jacqueline Green, and Maryam Amin, who offer 3 clear recommendations for writing high-quality introductions to manuscripts and grant applications (pp. 42–44), as well as a review of Dentistry and the Pregnant Patient, by Rae McFarlane and Diane Cameron (pp. 47–48). Finally, we recognize and thank all those experts around the globe who reviewed manuscripts for the journal in 2019 (p. 51).

PLAIN LANGUAGE ABSTRACTS


Stigma and discrimination prevent many people living with HIV/AIDS from accessing oral care. To address this problem, the University of British Columbia Dental Hygiene Degree Program opened a community-based clinic offering affordable, preventive dental hygiene care at an HIV-specific organization in 2011. More recently, 10 clients of the clinic were interviewed and 12 staff participated in a focus group to share their perceptions of how this type of service delivery influences access to care. Clients and staff noted that the clinic’s stigma-free setting, accessible location, and trauma-informed approach to dental hygiene care encouraged participation. Clients also valued the opportunity to educate future dental professionals about issues affecting people with HIV/AIDS. However, the limited opening hours prevented the clinic from providing comprehensive oral health care to this population.


Mature female students completing or furthering dental hygiene education face many challenges when balancing family life with academic responsibilities. Twelve students at a community college in Quebec were surveyed and then interviewed about their student experience, family-life roles, and coping strategies. The students admitted that role conflicts at home were largely self-imposed and that a reallocation of household duties was required to deal with time constraints. They noted, however, that the educational system offered the least support for student success. Educators and institutions should develop policies and programs to improve student well-being and support specific groups of learners in their pursuit of higher education.


Dental implants are now widely considered a valid intervention for the replacement of missing teeth. Because these implants are exposed to biofilm in the same way as natural teeth, home oral hygiene care is essential for dental implant therapy success. Using scanning electron microscopy, this study examined the amount of residue left on titanium implant collars by 6 different commercial oral hygiene products. Three gel formulations, especially those containing fluoride, left more residues on the titanium smooth surfaces than 3 tested mouthwash products. The longer permanence of the gel products may lead to more effective plaque control, but future studies will have to determine if long-term bacterial control is possible without harming the implant surface.
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Access to oral health care for people living with HIV/AIDS attending a community-based program

Iris Feng*, BDSc, MSc; Mario Brondani*, DDS, MSc, MPH, PhD; Christophe Bedos§, DDS, PhD; Leeann Donnelly*, BDSc, MSc, PhD

ABSTRACT

Objective: People living with HIV/AIDS (PLWHA) have difficulty accessing oral health services primarily due to HIV-related stigma and discrimination. In 2011, the University of British Columbia (UBC) Dental Hygiene Degree Program implemented a preventive oral health services program at the Positive Living Society of British Columbia (PLSBC), a non-profit organization supporting PLWHA. This study aims to assess the perception of how this type of service delivery influenced access to oral health care for members of PLSBC. Methods: Personal interviews with 10 members and one focus group comprising 12 staff were conducted. Audiorecordings were transcribed verbatim and coded thematically. Emerging themes were identified using the interpretative phenomenology approach following Penchansky and Thomas' theory of access. Results: The program helped members maximize their dental coverage to receive other types of dental services. Members who were influenced by past traumatic experiences appreciated that services were delivered in a safe manner and in a stigma-free setting. Members valued the opportunity to educate future dental professionals to reduce HIV-related stigma. However, dental needs that could not be addressed by the program remained untreated for some members who continued to face barriers to care at referral clinics. Conclusion: This community-based preventive dental program provided affordable dental care, a stigma-free setting, care delivered in a safe manner, an educational opportunity, and accessible location, which all seemed to have a positive influence on access to oral health care for members of PLSBC. However, the limited availability of the program prevented many members from accessing comprehensive oral health care and is a factor that should be addressed.

Keywords: access, community-based preventive dental program, HIV/AIDS, oral health care, people living with HIV/AIDS, stigma

CDHA Research Agenda category: access to care and unmet needs

PRACTICAL IMPLICATIONS OF THIS RESEARCH

- Dental professionals need to recognize and address the influence of socioeconomic status, HIV-related stigma, and histories of trauma on the ability of people living with HIV/AIDS (PLWHA) to access oral health care.
- Dental curricula should provide comprehensive education on the history, background, and issues related to HIV and provide hands-on experience interacting with PLWHA with emphasis on a trauma-informed care approach.

*Royal College of Dental Surgeons of Canada

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INTRODUCTION
The Public Health Agency of Canada estimated that approximately 63,110 Canadians were living with HIV at the end of 2016.1 The rate of HIV diagnoses in British Columbia was 5.1 per 100,000 persons in 2016, consistent with the rate in 2015.2

Antiretroviral therapy (ART) offers the potential of lifelong viral suppression of HIV; people living with HIV/AIDS (PLWHA) who receive this therapy can expect to have a longer lifespan.3 The initiation of ART has caused a dramatic decline in the prevalence of HIV-associated oral lesions.1 Yet the prolonged use of ART and a recovered immune system put PLWHA at risk of developing oral mucosal hyperpigmentation, oral dryness, parotid gland enlargement, and human papilloma virus (HPV)-associated oral warts.4-6 Given the increased risk of oral complications, it is important that PLWHA receive routine oral assessments and care.7

However, dental services to specifically address the needs of PLWHA are sparse in British Columbia8,9 and elsewhere10,11 despite the prevalence of unmet dental treatment needs.8-11 This situation is in part due to HIV-related stigma that remains one of the major challenges for PLWHA when accessing needed care because of fears of disclosure, discriminating acts, and social exclusion.12,13 Moreover, PLWHA may include marginalized intersectional groups such as racial or ethnic minorities, substance users, the precariously housed, and those living with mental illness, who often experience oral health inequities.14 Additional barriers that PLWHA may face when accessing oral health care include disability, chronic illness, addiction, poverty, confidentiality-related issues, lack of access to support services, and limited oral health literacy.15,16

The Positive Living Society of British Columbia (PLSBC) is a non-profit organization that advocates the rights of their members living with HIV/AIDS.17 In September 2011, a weekly preventive dental clinic was launched in collaboration with the University of British Columbia (UBC) Dental Hygiene Degree Program (DHDP) at PLSBC. Through this community-engaged program, 4th-year dental hygiene students delivered preventive oral health services for 6 hours each week throughout the year, including assessments, periodontal therapy, fluoride applications, sealants, temporary restorations, education, and referrals for dental treatment.

Students also undertook various activities such as working in the onsite food bank, conducting lunch-and-learn sessions, and participating in fundraising activities with organization members to gain a deeper understanding of the sociocultural background and issues related to HIV. In preparation for working with this population and organization, students were required to complete a 6-hour online trauma-informed care course, a 2-hour violence and prevention course, and six 3-hour classroom sessions on the management of vulnerable populations. Students also completed a 3-hour online module about HIV and oral health supplemented by personal testimonials from PLWHA guest lecturers. This study aims to assess the perception of how the type of service delivery provided by the students influenced access to oral health care for members of PLSBC.

METHODS
Data collection
Upon ethics approval from the UBC Behavioural Research Ethics Board (BREB H17-02457), members of PLSBC who had availed of the program were recruited to participate in personal interviews to elicit insight into their experience accessing Canada’s oral health care system and this community-based program. Inclusion criteria required participants to be a past or current client of the program, an ability to communicate in English, and a commitment to a 1-hour, face-to-face interview. Recruitment posters outlining details of the study and interview were placed on bulletin boards and in visible areas at PLSBC, and a Can$25 honorarium was offered for participation. Ten individual interviews were conducted between January and May 2018 following a semistructured interview guide. Interview questions pertained to members’ past dental experiences outside the program, members’ experiences using the program, and members’ satisfaction and suggested improvements.

The focus group comprised 12 PLSBC staff and administrative personnel, who were recruited by 2 collaborators because of their perceived insight into how the program influenced access to oral health care for members. Participants in the focus group had a different perspective, serving as staff or administrative personnel at the organization, which added richness to the data and provided broader suggestions for improving the current program. Characteristics of members and the positions of staff who participated in the study are found in Tables 1 and 2.

Analysis and theoretical framework
Following each interview and after the focus group session, the audiorecording was transcribed verbatim. Each transcript was read multiple times and coded thematically using N-Vivo® 11 software. Rigour was reached by checking in order to reduce subjectivity and achieve the standards of ethics and quality in qualitative research. Coding and emerging thematic analysis were completed accordingly for each interview and the focus group using the interpretative phenomenology approach with Penchansky and Thomas’ concept of access as the framework.18 This framework defined access as 5 interlocking dimensions to the relationship between the client and health care system on individual terms (Table 3).19

An iterative and systematic approach was used to construct codes, categories, and themes. Three authors (IF,
MB, LD) each coded the same interview, and 2 authors (IF, LD) then coded 3 of the same interviews which were then compared and discussed until consensus was reached. The remaining 6 interviews and the focus group session were coded by the first author (IF). A total of 99 codes were assigned to statements that were relevant to the research question, then sorted into 18 categories that described an aspect of the phenomenon. Similar categories were grouped into 11 themes and structured into the 5 domains of access described ahead.

**RESULTS**

**Affordability**

Under- and unemployment were significant barriers to dental care for some members who were struggling financially. Some members described coping with the complex medical issues related to HIV and the difficulty of working full time and earning a stable income. Some members also identified competing needs, such as for food, shelter, and clothing, which take priority over their dental care. As member 3 shared, “I have $1,100 every month to pay for my rent, food, medications, and vitamins.”

While dental care was deemed important, members stated they sought dental care only when perceived as needed or under emergency circumstances. Members who were unable to afford dental care continually described how they often avoided dental care:

> The only concern I had with dental care is that I had to pay for it, because I have been fully employed, but then I wasn’t covered with the dental plan. So I had to pay for it, the things out of my own pocket, these dental services. (member 1)

It was clear that members had difficulty obtaining oral health care due to cost, which proved to be one of the main reasons for accessing and valuing the program. The program was an opportunity for many members who were underinsured to receive some preventive dental care with little impact on other life priorities.

**Limits of public benefits**

Members who were unable to afford dental care directly out-of-pocket often relied on publicly funded dental benefits. The Government of British Columbia’s Ministry of Social Development and Social Innovation (now the Ministry of Social Development and Poverty Reduction) offers public dental benefits up to a maximum of $1,000 over 2 calendar years for residents who are eligible for financial assistance. Unfortunately this amount of dental funding was often not enough to meet the dental care needs of members, as described by member 4:

> I’ve been on disability and we’re limited to about one thousand every 2 years paid for by the government. When you start putting 6 cleanings over 2 years, that takes up more than half of your [dental benefits], and I was always needing fillings or bridges or a root canal.

Given this limited dental coverage, “having [the program] augments whatever service [members] are going to get based on coverage” (staff K). Both members and staff discussed that, because the oral care was delivered free of charge, it allowed members to earmark their limited dental benefits for other dental services.
Throughout the interviews, a prominent theme was the influence of trauma in members’ lives, from issues related to HIV disclosure, perceived stigma and discrimination, to traumatic dental experiences. This theme highlighted the need for dental providers to be trained in trauma-informed care (TIC), as staff G suggested, to mitigate further trauma among members:

*Trauma-informed care teaches how some people have traumatic experiences in their lives that could easily be triggered by things we might take for granted...So things like trust, safety, communicating well with your patient, those kinds of things are really important for people who are carrying trauma around.*

Members described various traumatic experiences from their personal lives to being newly diagnosed as HIV positive. They recalled the complication in disclosing their HIV serostatus to their previous dental providers. As member 8, who struggled with his decision, explained:

*[I felt] mad, embarrassed...You just don’t want to tell anybody for the fear of not getting looked after. But it also puts everybody at risk if they don’t know...because if you tell [them] you don’t get the service, and if you don’t tell them you put them at risk. So I never went to the dentist.*

Some members also experience trauma through perceived stigma as described by member 5:

*It was just walking in and everybody was rosy...I fill out the form, and I checked off the HIV box. I don’t know if they’ve ever had that box checked off before in front of them...it was like they were triple gloved. And she went into shock. I could see it in her eyes...It was almost a frightening experience.*

The multiple forms of trauma described specifically influenced the acceptability of a dental provider. The onset of dental fear seemed to be related to individual vulnerability, traumatic dental experiences or perceived threat, as with the experience of member 2 who avoided dental visits for a long time after his extraction:

*“[The dentist] had me back in a chair, he had his knee on my chest, he had both hands on the puller, and whipped my head back and forth trying to get this tooth out.”*

Members had their own way to deal with their trauma; one coping mechanism was to seek care from dental providers who exhibited specific attributes in order to prevent further trauma when receiving future dental care.

### HIV knowledge and sensitivity

Members seemed to emphasize the need for dental providers to be knowledgeable in all aspects of HIV. While staff and members recognized the program provided access to preventive oral care and education, they also believed there to be a reciprocal opportunity to educate future dental providers. It was interesting that members 5, 8, and 9, in particular, identified the value of the opportunity to help students understand the impact of HIV. In fact, member 5 stated this was his primary reason for using the program:

*This younger generation is learning...Those are my biggest reasons for coming to this program. I feel all these dental hygienists should be exposed to HIV and what the protocol is, because obviously some people don’t. It’s one thing to*
Access to oral health care for people living with HIV/AIDS

The program was an educational opportunity for some, helping to remove the fear students may have had about PLWHA through interacting and learning cultural sensitivity early on in their practice. Both groups indicated that the more educated a dental provider was about HIV, the more likely members felt comfortable and safe, and would return to that same provider.

Non-discriminatory attitude
Comments about the way students treated members was another recurring theme, especially that students treated them “like any other normal human being” (member 8). Members believed the students and instructor displayed characteristics such as compassion, earnestness, and genuine care towards them as member 1 praised, “I was always impressed with the courtesy, the manners, the grace with all the students and coordinators.” The students’ education and volunteer activities may have helped them to overcome HIV-related fear, prejudice or misconceptions, thus developing empathy towards members that allowed them to have a non-discriminatory approach to care. Staff K noted:

the students would interact with the members in the lounge, which I thought was an amazing experience...Not only it educates the students, but the members. The young professionals are looking out for them...and are concerned about them.

Informative and attentive
Throughout the interviews, members also commented that the care students provided was “extremely informative, nice, and made [members] feel at ease” (member 7). For instance, students took the time to inform members of the assessments and procedures they were doing as member 2 noted:

[The student] was thorough, she was gentle, she talked me through it, “This is what I’m going to do, that’s what I’m going to do, this is why I’m going to do it.”

This approach and the personalized attention that members received appeared to build a positive relationship and trust while encouraging members to actively engage in managing their oral health.

Accessibility
Location and service convenience
The PLSBC facility was originally located in Vancouver’s central business district, known as Downtown Vancouver. From 2015 to 2017, the facility was under construction and moved to the Downtown Eastside of Vancouver (DTES), a community known to struggle with issues of drug use, crime, poverty, mental illness, homelessness, and unemployment. PLSBC returned to its location in Downtown Vancouver in September 2017.

Members commented on the convenience of traveling to the Downtown Vancouver location in particular because of the transit options. As member 7 said, “it’s just that [the DTES], it’s kind of out of the way, it’s off. [Downtown Vancouver] is pretty direct with your Sky Train then you take a bus. Whereas [the DTES], Sky Trains are not that close.” In addition, the Downtown Vancouver location allowed members to access a variety of health and social services conveniently because of their close proximity to each other. The Downtown Vancouver location “is more in a service corridor. Members can go to St. Paul’s Hospitals, mental health, a doctor’s appointment at Spectrum, and they’re on the bus line. Everything is close to here” (staff B). There is also a variety of services offered at PLSBC, which enhanced the convenience of services accessible within the organization. Finally, the travel distance was also emphasized as an important consideration, with the Downtown Vancouver location being more favourable. It was not surprising to hear that the more convenient and closer the location, the more likely members were to make efforts to seek oral health care.

Accommodation
Self-disclosure of HIV status
The clinic was able to reach out to the HIV community thanks to the integration of the program at PLSBC. The location of the dental program and the requirement that members of the organization be HIV positive meant that disclosure of HIV serostatus was eliminated, which was an important factor in utilization of services from the clinic as staff K stated, “of course the whole idea is that you don’t have to disclose here. It’s sort of given for our members, that everyone here is HIV positive. There isn’t that one last hurdle to get over.” Member 10 also indicated that “I would prefer to stay [at the program] because I know I’m not going to be discriminated and be looked at as a freak.” Consequently, the collaboration with PLSBC may have been one of the largest facilitators to access to the dental services provided by this program as it may have been perceived as more approachable and non-stigmatizing than other clinics.

Duration of appointment
Each appointment at the clinic can take up to 2 hours for students to complete, and it was anticipated that this 2-hour time period would be a detriment to the program. Yet, it seemed the extended appointment time permitted members to feel more at ease and relaxed as staff L commented, “A lot of our [members] like that the students
take longer because it gives them a couple of hours to lay down and relax and have someone focus on caring for them.” Members further elaborated that they believed the 2-hour appointment time allowed students to dedicate more time to personal attention, interaction, and education with them, characteristics which were favoured as member 7 expressed:

You’ve got 2 hours so [the students] do a lot... they’re checking your pulse...checking for bumps...She’s found something on the back of my ear that could potentially be a problem, or maybe not, but alerted me to another health issue that might be happening.

The positive feedback of a longer appointment indicated that this may be a more appropriate approach for community-based programs such as this one, considering this client pool may have experienced various life challenges and trauma, and appreciated the greater amount of time dedicated to their care and interaction.

Facility design
The program provided manual periodontal therapy on massage tables due to an inability to maintain infection control and the limited space provided at the facility. The majority of members described the experience as varying from comfortable to stiff to strange. As member 4 stated, “even now that we are in the new building, we are still on massage benches here with your head tipped over. That’s okay. I don’t mind that at all. In fact, it’s kind of restful.”

Members who did not find comfort with the massage chairs, however, came to moderate their view. As member 8 said, “it would be nice to have a couple of dental chairs instead of beds... but the space is fine and it is what it is.” Similar to various responses received about the massage chairs, some members noted the benefits to having power equipment available for better comfort and ease such as member 7 who indicated, “you don’t have the rinsing spit sink you know...I did have water, but I did need to spit it out into another cup. So that’s just one difference, but I don’t mind the little hand tools.”

It appeared this type of facility and equipment set-up created a non-intimidating, quiet environment that allowed members to feel more relaxed as compared to settings with high-tech equipment that produced a “functioning noise...and made [members] more alert” (member 7). Many members were in favour of this casual setting without dental equipment because “[members] have [their] own intimidation of a sterilized dental office with all those drill sounds and all the compressors going” (staff E). Furthermore, as this client pool is more likely to have experienced trauma, removing triggers and creating a quiet comfortable setting may have been beneficial in managing PLWHA in this type of setting.

Availability
Addressing immediate dental needs
As part of the students’ education, they were required to manage their community-based program. Some members found the appointment system a negative aspect of the program due to the lack of immediate contact and availability. A phone number was designated to contact the students, and members were required to leave messages on the answering machine when the program was not operating, as staff D described:

Some members have commented that they never get to speak directly to an individual whenever they call. So it’s usually a follow-up call. It’s very rare [members and the students] make first contact when dialing the dental clinic.

In addition, the program only operated from 10 in the morning until 4 in the afternoon on Wednesdays during the school year with several appointments arranged during the summer. Due to the program’s operational time and appointment system, immediate dental needs from members could often not be met. Members also had to adjust their schedule and book in advance to receive their services in a timely manner. Although Wednesday hours of operation worked well for members who were retired, unemployed or volunteered, the program was not available to those who worked on Wednesdays and needed the income.

However, the program’s flexibility and the ability to drop in for appointments or to inquire about resources prior to booking an appointment was perceived as a positive aspect of the clinic. As member 4 stated, “the program has an open door. So if I need to change something, I can always come down and knock on their door.” It was clear that this program was readily available to meet the dental needs of members who were active within PLSCB and willing to work with how the program was set up according to the students’ curriculum. This program did not seem to have the capacity to serve members who required urgent dental care and those who were unable to commit to program operation hours and dates.

Referrals
When the need for dental treatment was identified and/or the member was in pain, completed referrals were given to regular and reduced cost dental clinics in the Vancouver area so that radiographs could be taken and restorative care provided as indicated. Personal interviews revealed that some members already had a dental office they visited regularly, while other perceived regular dental care as unnecessary; most could not afford further dental care. Before the program was implemented, members 4 and 9 indicated that they did inquire into affordable dental care at PLSCB. Staff G, one of the peer navigators who helped members search for services such as housing, employment, and government funding, commented that before the
program, “many [members] came to [the organization] asking how [staff] can look after these things. Because dental is one of the hardest things to get covered. Even with people on those benefits, it’s incredibly limited.” With the referrals provided by the program, staff noted it had helped to increase dental resources for the organization and helped members navigate the dental system.

**Discussion**

The aim of this study was to assess the perceptions of how this community-based preventive dental program influenced access to dental care for members of PLSBC. Thematic analysis showed that affordable preventive dental care, stigma-free setting, care delivered in a safe manner, educational opportunity, and accessible location were positive influences while the limited availability of oral care appointment times may have caused members to become lost in comprehensive care.

The majority of the members interviewed were often under- or unemployed which caused them to struggle financially to address their dental needs under Canada’s oral health care system. Members stated that they would avoid dental visits if they had competing financial priorities, similar to Jessani et al. who found that more than half of the PLWHA participants faced challenges associated with access to food, housing, transportation, clothing, and dental coverage. This program addressed the members’ financial challenges by offering preventive services without out-of-pocket expenses or the need to draw on their limited dental benefits. The affordability of the services offered at the clinic was one of the main reasons members initially came to the clinic and continue to do so.

Many members described how their past traumatic dental experiences affected how they accessed dental care. This came as no surprise as perceived discrimination and HIV-related stigma are often associated with lower access and usage of health and social services. Due to the influence of individualized vulnerability and trauma, members required a trauma-informed care (TIC) approach to care in order to promote safety, trust, empowerment, respect, and resiliency. Clients are more likely to engage to care in order to promote safety, trust, empowerment, respect, and resiliency. Clients are more likely to engage in dental care.

The clinic setting also seemed to have complied with the standards of TIC to help members feel safe, and to have influenced the acceptability and accommodation dimensions of access. The onset of dental anxiety and trauma can be triggered through sensory experiences, such as the unpleasant sound of dental drills, sensation of high-frequency vibrations or sight of anaesthetic needles. Therefore, the reduction of dental stimuli, triggers, and noise, as well as the atypical setting and design of the clinic may have established a non-threatening, quiet, and casual environment.

The collaboration with PLSBC was essential in reaching PLWHA who were registered and familiar with the organization. As the clinic was only available to members, HIV disclosure was not required, which eliminated the perception of stigma and discrimination. The location of the clinic within PLSBC also enabled emotionally safe access to preventive dental services and accommodated the unique needs of PLWHA. Multidisciplinary clinics have been described as an innovative strategy for establishing a medical home with access to multiple health services for PLWHA. It seemed that PLSBC offered sufficient resources to meet the overall needs of members, non-medical and medical, to support their overall health which may have further encouraged members to utilize the clinic and enhanced the availability.

The program was described as convenient for the majority of members to travel to thanks to various transit options, the proximity to their home, and easy access to other services that were situated in the area. In contrast, transportation and services were limited at the DTES and may have reduced the accessibility of the clinic for members.

Some members took the opportunity to help reduce HIV stigma among future dental hygienists. The ability to educate students and faculty about their lived experience of HIV and dental care was described as empowering. This finding is in line with other academic curricula that provide HIV education and training for medical, dental or dental hygiene students in order to improve cultural competency with an increased compassion and empathy for providing client-centred care for PLWHA.

Lastly, previous studies have reported that roughly half of their participants who are living with HIV have unmet dental treatment needs. The program’s lack of available dental services, flexible operation times, and direct contact could not serve members who were either unable to attend on the program dates and times or required immediate dental care. Although the program provided referrals to help increase dental resources and assist members in navigating the dental system, members would be required to approach an unfamiliar dental clinic and dental professional, with the perceived possibility of experiencing discrimination. Members may have been lost during the referral care process due to lack of priority or the interrelated dimensions of access as previously discussed.

**Implications and recommendations**

Findings highlight some key implications for dental providers. Results indicate that there is a need to be mindful of the socioeconomic status of PLWHA and the limitations of their government funded dental benefits in order for dental providers to work effectively with their clients and their benefit providers. Additional advocacy efforts by policy makers, HIV-specific organizations, and dental
providers may encourage a more equitable reimbursement scheme for PLWHA to promote increased access to more affordable care. It is also important for dental providers to be aware of the types of trauma that PLWHA have encountered during their life, from their diagnosis to societal stigma and discrimination. The experience of trauma had a direct influence on how participants viewed oral health and their propensity to seek care. A Tic delivery approach is necessary for PLWHA to feel comfortable, safe, and respected in a dental setting. Finally, it is important that dental providers be knowledgeable about more than just the clinical manifestations of HIV. Education and training should be delivered to future dental professionals, with an emphasis on the history of HIV and HIV-related stigma. The acquired understanding appeared to have influenced the way services were delivered to the members and created desirable characteristics among the students.

It is recommended that there be increased collaboration, more active involvement, and communication with PLSBC staff to address the limited availability of the program. Peer navigators may be in a position to guide and provide resources for members when the clinic is not operating. The program needs to improve upon finding members an appropriate dental home that meets their personal needs in order to improve overall access to oral health care for members.

Limitations
The findings that describe the health and oral health status of the population at PLSBC cannot be generalized to all PLWHA living in Canada due to the small convenience sample of members who participated in the personal interviews. The experiences of PLWHA who are hard to reach, who live outside the Greater Vancouver area, are not registered with the organization, are a past user or discontinued the program were not captured. The feedback did not represent all members who utilized the clinic and may have produced biased responses from those who were satisfied and continued to use the program. While our findings may not be generalizable due to these limitations, the themes may be transferable to a similar population or organization and should be further investigated in a larger, more representative sample of PLWHA.

CONCLUSION
The ongoing free services and education delivered through this community-based preventive dental program appear to have multiple influences on access to oral health care for members of PLSBC. Embedding the program within a HIV-specific organization removed the fear of stigma and discrimination. Members felt empowered to break the societal stigma of HIV through the opportunity to interact and educate future dental professionals about issues that are important in their lives. Finally, the manner in which the services were delivered and the characteristics of the providers encouraged members to continue participating in the program. While many positive influences on access to oral health care were identified, access to comprehensive oral care appeared to need improvement.

ACKNOWLEDGEMENTS
The authors thank the collaborators, members, staff, and administrative personnel of PLSBC who organized or participated in the interviews and focus group. Many thanks also to the Canadian Foundation for Dental Hygiene Research and Education (CFDHRE) for the financial support provided to this project.

CONFLICT OF INTEREST
The authors have no conflict of interest to declare.

REFERENCES


Committed to yourself or have yourself committed: Balancing family life with student success

Christine A Fambely*, Cert Health Ed, BA, MEd, RDH

ABSTRACT

Background: Contemporary student demographics in institutions of higher learning include the mature female student. Preparing to enter an academic setting after an extended absence or for the first time can create personal role conflicts for this student cohort. The purpose of this study was to develop a more comprehensive understanding of the family-life roles, student experiences, and different coping mechanisms of mature female dental hygiene students in order to better enable and support individual student success. Methods: This study employed a mixed methods explanatory approach whereby quantitative data were obtained from mature female dental hygiene students (N = 12) via a 10-item questionnaire comprising both closed- and open-ended questions. Closed-ended questions were summarized using descriptive statistics. Open-ended questions were examined for common themes. Additional qualitative data were obtained through personal in-depth interviews examining supplementary common themes. Results: “Mothering” was identified as the primary family role both prior to and during school enrolment. All participants identified “time” as the greatest challenge and role conflict as being self-imposed. The prime benefit reported was increased self-confidence. The educational system offered the least amount of support according to respondents. Conclusions: The mature female student requires support when returning to higher education—from herself, family, and the academic setting. Institutions of higher education should be cognizant of specific characteristics, barriers, and challenges any student encounters to help facilitate student success.

INTRODUCTION

“Student success” in higher education involves a challenging curriculum, quality teaching strategies, and reasonable accommodation.1-3 The number of adults entering postsecondary educational settings for the first time, returning to higher education or pursuing a career change is increasing. Between 1976 and the mid-2000s, adult learners in general accounted for 11% to 16% of Canadian postsecondary students.4 Shifts in the demographics of institutions of higher learning include the mature female student as a now-familiar part of the student milieu.5 Preparing to enter an academic setting after an extended absence or for the first time can create role conflicts for these students.6,7

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PRACTICAL IMPLICATIONS OF THIS RESEARCH

• Educators and institutions need to be mindful of the challenges and barriers faced by an increasingly diverse dental hygiene student population.

• The experiences of mature female students completing or furthering dental hygiene education are shared by their peers. They must realize this and learn how to initiate self-reliance as well as solicit support from family and the academic community.

• An open dialogue among students, staff, and institutions can enhance student success.

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The concept of role can be viewed as an umbrella consisting of many interwoven sections, determined and influenced by social patterns and demands. Everyone in life assumes a certain role and tries to fit into a particular identity mold. Halls attributes this search for identity to the individual’s perception of how well she or he can meet the external social expectations. One’s identity can change as personal changes and experiences alter perceptions throughout life. Role definition addresses the challenges faced by an individual as she or he works through redefining the conventional roles and responsibilities to which they have conformed. Problems for females arise when conflicts occur among multiple roles or identities. The intensity of the conflict between a commitment to learning and personal obligations varies depending on the level of demands placed on the individual. These adult learners need academic support not only from their learning environment in order to excel in their studies and achieve student success, but also from their families, who can assist them with role conflicts they face while continuing their education.

According to Laing, Chao, and Robinson, a traditional student is defined as one who “entered higher education at the age of 18 straight from high school to further education, [and] studied continuously and full time for either three or four years.” Traditional postsecondary education students are those who proceed to college or university after graduating high school and fall between the ages of 18 and 22, while other literature identifies mature students as those who are at least 25 years of age. The returning adult female student is not a new trend in institutions of higher learning. From the previous generation to the present, the challenges have remained consistent. Besides being students, these women often have multiple roles such as parent, spouse, and possibly employee. Mature females can experience role conflicts such as competing pressures of child care, household responsibilities, financial obligations, and school commitments. These additional challenges can influence their academic success. Despite many studies investigating the issues of female adult learners, the majority of the findings focus on psychological issues such as anxiety, stress or depression. However, the psychological issues are often caused by challenges that may come from family, self, and school. With the expanding population of adult students in postsecondary settings comes the need for change and adaptation. Higher educational institutions must consider the services required to meet the needs of this population. Adult students often have different motivations and goals, and may encounter barriers not experienced by most traditional students. For the mature female student, in particular, returning to school requires more planning and lifestyle reassessment than what is required of conventional students.

Although there is a vast amount of literature on health care professionals that examines student success and role conflicts of mature female students returning to postsecondary education, there is a lack of such literature pertaining to the specific discipline of dental hygiene. As such, the purpose of this study was to develop a more comprehensive understanding of the family-life roles, student experiences, and the different mechanisms used for coping with role conflicts of mature female dental hygiene students in order to better enable and support individual student success.

For the purpose of this research, concepts were defined as follows: “Mature female student” refers to a woman, returning to postsecondary education, at least 23 years of age, married or cohabitating at the same address as her husband or partner, and with at least one child. “Family” refers to the husband or partner, wife or partner, and dependents. “Role conflicts” include overlapping role demands as wife or partner, mother, homemaker, career person, and student. “Role definition” addresses the challenges faced by mature female students as they work through redefining the conventional roles and responsibilities to which they have conformed and prepare themselves to embrace a new reality in order to succeed academically. Finally “student success” was defined as the achievement of the student’s own educational goals, being mindful of the complexity of challenges to achieving these goals.

METHODS
This study was approved by the John Abbott College Research Ethics Board (JACREB201805).

Inclusion and exclusion criteria
Mature female dental hygiene students in one community college in Quebec, who were returning to postsecondary education, who were at least 23 years of age, married or cohabitating at the same address as her partner, and who had at least one child, were included in the study. All other students who did not meet the inclusion criteria were excluded from the study.

Participant selection and description
In order to minimize participant coercion the researcher elicited the assistance of a colleague in the dental hygiene department to initially approach each student who met the inclusion criteria and ask if she was interested in participating. For those who expressed interest in being part of the study, individual informational meetings were scheduled with this colleague where a preapproved “Informed Consent” form was signed by the students to establish their voluntary participation. Consent was obtained from 12 mature female students representing 14% of the total student population of a 3-year dental hygiene program at an English community college (CEGEP) in Quebec. The youngest study participant was 35 years of age while the oldest was 49 years; mean average
age was 39 years. All students had 2 children or fewer, with 25% having one. The ages of the 21 children varied from 6 months to 18 years. Nine preschool children ranged in age from 6 months to 4 years (mean average age was 2.4 years), while the 12 school-aged children ranged in age from 5 years to 18 years (average age of 11.5 years). All participants were immigrants; 75% have resided in Canada for 8 years or less. English was not their mother tongue; in fact English was the third language for 25% of these women. For three-quarters of the participants, their formal education was completed in their mother tongue and English. Furthermore it had been more than 14 years since entering a classroom for 67% of this cohort. Role conflicts included overlapping role demands as daughter or caregiver, spouse or partner, homemaker, mother, career person, and student. A demographic summary of this cohort is provided in Table 1.

### Procedures
Data were obtained during the winter 2018 academic semester, with the students in their second through sixth semester offering an accurate representation of the dental hygiene program in its entirety. As English was not the first language of these learners, the same colleague who assisted with participant recruitment was available while the female students completed the questionnaire (Appendix) at the college to ensure each fully understood the instructions and the meaning of terms. Anonymous completed questionnaires were placed in a manila envelope and remained in a secure environment until the end of the academic semester. Only then did the author have access to this confidential information.

Subsequently, 30-minute semi-structured interviews with open-ended questions (Table 2) were conducted by the author at a place of each participant’s choosing. Through personal, in-depth interviews each participant had the opportunity to further explain feelings and offer additional information and insights into the unique experience of a mature female student in a postsecondary setting. All interviews were digitally recorded and transcribed by the author. Participants were invited

<table>
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<tr>
<th>Table 1. Demographics of participants</th>
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<td>Age</td>
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<th>Table 2. Qualitative interview questions</th>
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<td>Open-ended qualitative interview questions</td>
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<tr>
<td>When you think of your own life what roles seem most important/predominant to you?</td>
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<tr>
<td>What factors have contributed to identifying these roles to be important/predominant to you?</td>
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<tr>
<td>What conflicts have you experienced between your various roles since entering John Abbott College?</td>
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<td>How do you deal with these conflicts... a) within the family? b) when considering your student life?</td>
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<td>Have you used any services at John Abbott College to help deal with role conflicts?</td>
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<tr>
<td>What would you say to an incoming mature female dental hygiene student to encourage student success?</td>
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to read their personal transcribed dialogue in order to assure accuracy of themes and concepts. Their voices and authentic familiarity allowed for perspective along with the good, bad, and ugly of being a mature female student returning to postsecondary education.

**Instrument**

Guided by previous evidence-based literature2-7,10-13 a 10-item questionnaire comprising closed- and open-ended questions was developed and distributed to participants (Appendix). Changes were made to the questionnaire after consultation with mature female students from other professional programs at John Abbott College. Instructions were reworded and descriptors were changed to facilitate ease of understanding. This study employed a mixed methods explanatory approach (Figure 1) that includes both quantitative and qualitative data. One advantage of this research method is the ease of implementation, allowing the focus of the research to be maintained as the qualitative data build on the quantitative data.17

Almalki states: “Explanatory designs are described as a two stage design which sees quantitative data being used as the basis on which to build and explain qualitative data. The quantitative data informs the qualitative data selection process, which [...] is a great strength in that it enables researchers to specifically pinpoint data that is relevant to [a] specific research project.”18 p293

**Data analysis**

Closed-ended questions from the questionnaire were summarized using descriptive statistics, while open-ended questions were examined for common themes using content analysis. Qualitative data obtained through in-person interviews were analysed employing Braun and Clarke’s 6 phases of thematic analysis, which included familiarising oneself with the raw data, generating initial codes, searching for, reviewing, and naming themes then producing the findings.19 These qualitative data were examined for supplementary common themes in order to produce a rich description of the students’ life experiences through the voices of the women themselves. Participants had the opportunity to provide feedback to the researcher after thematic content analysis to check the validity of the data interpretation. Thematic analysis was then used to identify recurring patterns within the interview data. Both descriptive statistics and thematic analysis were carried out exclusively by the author.

**RESULTS**

**Role identity**

Mothering was identified as the primary and most important role (Table 3) for these respondents prior to entering into the academic setting. The roles of wife and homemaker were a close second and third, respectively, during this time in their lives. Upon entering the educational environment these adult learners assumed a slightly different set of priorities. Interestingly, mothering was still the most important and predominant role characterized by 92% of the respondents. They rated their role as a student next followed by that of being a wife. For these mature students, their role as a student was significant. However, as stated during the interview, “You never stop being a mother.”

**Sources of conflict**

Once in this new environment, the primary source of conflict (Table 4) identified by 100% of participants was the element of time. In order of importance, time conflicts were ranked as follows: time allotted to be a parent (92%), time to complete academic work (83%) or even time to complete household responsibilities (58%). Identified as a major source of conflict was the weight of conforming to the traditional role of parenting. Another cause of conflict identified in the questionnaire was the reality of being responsible for many of the household tasks.

Together these sources of conflict were identified by 100% of respondents, yet these challenges did not deter them. As respondents stated:

*Household responsibilities and the children’s needs fell onto my shoulders.*

*I was trying to do so much on my own, and it was driving me mental.*

All participants agreed the role conflict they were experiencing was self-imposed. These mature female students felt it was their duty to be all things to all people. Only after...
completing all tasks could they feel their roles were being accomplished to their high standards. “...I'm the role model for my sons and if I failed for them...it would be a shock. That’s why I was always stressed from that.”

Processing role experiences
While attending school, the respondents experienced a number of negative effects from the constant role conflicts (Table 5). Most common was fatigue. As respondents stated:

...it’s just this little nagging fatigue I’ve carried around with me.

I felt disappointed and exhausted because of the pressure from my role as a mom of dependent children. I carried a lot of responsibility alone, so I needed to change something to help myself.

Respondents cited being short tempered with family members, especially husbands and children, as one example of the negative impact. The students reported that they usually did not recognize this harmful behaviour until after the damage had been done. Depression or disappointment were identified as additional negative effects these women attributed to the stress of being a full-time student. Even though depression or disappointment were not experienced by all, 67% found these feelings to be an unforeseen consequence of role conflicts. Interestingly study participants (83%) felt the academic environment offered the least amount of support for these issues and in promoting student success. “JAC [John Abbott College] makes no special provisions for mature students with families who are in career programs. There are no differences—expectations are the same for everyone.”

However, on a positive note, all respondents reported having experienced a significant increase in self-confidence while attending school and dealing with role conflicts. “It’s not only for the income or to support the family, but also for self-esteem and self-fulfillment.” As summed up by one of the participants, her spouse:

...respects my determination and success where previously he didn’t think I could do it and almost made me believe that also. The achievement is not so important as the experiences that I have acquired since returning to school. Rebuilt self-confidence and improved communication skills are far more important to me than the dental education. This has made me a better mother, wife and friend.

When dealing with role conflicts, all mature female students found the greatest strength came from within themselves (Table 5). They found an internal fortitude to deal with the self-imposed conflicts. During an interview,
one respondent remarked: “I think it is important also to recognize the way in which stress and tensions are handled.” Her family, primarily her spouse/partner, was found to be a source of support. “My husband and I discussed a lot about the family responsibilities, and agreements were made about how to share. That’s why I have full support from him while attending school. I think for a mature female student, husband is the most important support for her.” In addition, her children offered support to the mother–student role.

Coping strategies and outcomes

All participants (Table 6) reported that they had delegated traditional responsibilities to their husband or partner. These tasks included housework, cooking, shopping, and laundry. Delegating certain family responsibilities to the children was found to be an effective coping strategy employed by 83% of the participants. The responsibilities included doing their own laundry, taking care of their bedrooms, making their own lunch or setting and clearing the dinner table. As stated, “The table was never set properly or well but it was very much appreciated.” Along with all these coping techniques, the participants reported that they found it necessary to eliminate personal activities they had enjoyed, such as volunteer work and art lessons, and limit participation in their children’s activities; in general, less socializing. These events were described as “personal relaxation time.” However, due to role conflicts, school commitments, and struggling to find coping techniques the students found themselves too exhausted to pursue these pleasures.

While dealing with the conflicts within the family, study participants found the most effective coping strategy was to establish a new set of priorities. This could be viewed as role redefinition, as 100% of the participants confirmed this concept during the interviews. “Yeah...I couldn’t be everywhere doing everything, so I learned to live with dust.” These new priorities included new personal expectations; what the participants saw as attainable while “maintaining a sense of balance between the home environment, student success and self-preservation.”

Once the participants realized they could not continue with the present situation, new coping strategies offered positive outcomes (Table 6). The predominant result experienced was a sense of less stress or fatigue as mentioned by 100% of the cohort. “I was too tired to do it all—I just through my arms up and thought...that’s it. After that within a few days, things just seemed easier. I was actually brighter, the kids seemed happier and I felt lighter.” Personal contentment with newfound, redefined priorities and personal expectations helped to optimize this balance. “I can’t be a top student, super mom and be happy. I’m passing and learning, not just memorizing for tests. I know I will not be the top student anymore...and that’s OK by me.” Furthermore, 83% of participants were happier and commented on improved family dynamics.

Student success

One hundred percent of participants acknowledged empathetic verbal support offered by staff and faculty to promote student success. “Acknowledgement of the difficulties or words of support can go a long way.” Nonetheless as noted in Table 5, 83% of the respondents felt it was the academic environment, specifically an inflexible academic schedule, which hindered individual student success.

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Table 6. Coping strategies and outcomes

<table>
<thead>
<tr>
<th>Role experiences</th>
<th>Outcomes</th>
<th>Percentage of participants (%)</th>
</tr>
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<tbody>
<tr>
<td>What strategies helped you cope while dealing with role conflicts?</td>
<td>Delegating tasks to husband or partner</td>
<td></td>
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<tr>
<td></td>
<td>a) household responsibilities (e.g., cleaning, laundry, cooking)</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>b) child care responsibilities (e.g., babysitting, homework, transportation, participation in child’s activities)</td>
<td></td>
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<tr>
<td></td>
<td>Delegating tasks to children</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) household responsibilities (e.g., cleaning, laundry, cooking)</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>b) child care responsibilities (e.g., homework, transportation, participation in child’s activities)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eliminating activities or roles (e.g., movies with friends or family, not accompanying family on outings)</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Reassessing priorities (e.g., home, school, self)</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Redefining personal expectations (e.g., home, school, self)</td>
<td>100</td>
</tr>
<tr>
<td>What has been the outcome since applying these coping strategies?</td>
<td>Less stress and fatigue</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Personal contentment</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>Improved family (husband/children) relations and communications</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>Improved academic standing</td>
<td>75</td>
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My feeling is that I should be in the same level as other students but sometimes I feel I cannot because there are a lot of things I should do besides my studying like being a mom.

I thought when I started the program that really I’m killing myself...I can’t believe I’m done with one tough chapter of my life.

The three years spent in the program were the most difficult in my life.

DISCUSSION AND IMPLICATIONS
The data gathered affirm that, prior to entering the academic setting, the women identified their roles as including more traditional commitments. This perception invites speculation as to whether women acquire the intense identity of mothering from personal experiences, nature or society. One must stay mindful of personal values, traditions, and responsibilities. Do mothers feel obliged to fulfill this role should conflicts arise even when pursing personal interests such as academic studies? All being immigrants, this cohort offers unique results, as their cultural background may affect the relevance of the findings. The participants’ responses may have been influenced by cultural factors with respect to role responsibilities as support provided to women within a household is often socially determined. In addition, child-rearing in the form of babysitting was a useful coping strategy used by many respondents. However, the term babysitting denotes that the primary responsibility is still entrusted to the woman. Harris et al. reported that female partners are reluctant to relinquish primary responsibilities within the more traditional roles. One way these adult learners might internalize this new set of priorities is to allow husbands to help in the child-rearing. The women, however, viewed this as a supportive function; they retained the primary role of mothering.

The immediate or extended family rarely applied any degree of pressure that would compel these individuals to push themselves to the extent reported. Hence, a new philosophy for the mature female student could be “committed to yourself or have yourself committed.” One can only in the short term be all things to all people. Returning to school is important to these female adult learners who will need to learn how to establish new realistic standards. The individuals’ perceptions of and attitudes towards the conflicts are in a period of change and transformation. Possibly this could include redefining certain roles, establishing new priorities or relinquishing certain roles all together. The mature female student needs to commit time, energy, and resources to her studies or risk suffering emotional collapse. The student role does not take the place of the other roles but is superimposed, rendering the student at risk of suffering both chronic fatigue and poor health. Students describe a rebuilt self-confidence and a renewed desire to achieve. These 2 positive outcomes complement each other and are congruent with findings from Roehl & Okun who suggest these are potent internal motivators for life-long learning. Improvement in the lines of communication within the family (especially with the spouse), coupled with the female student’s need to achieve, were found to be equally attributable to a successful re-entry into academic life. Since these mature female learners felt most of the conflicts stemmed from their perceptions of a situation, internalization or reflection to develop a more realistic approach would seem to be a logical progression. Along with this new perception of their responsibilities within the family, students also found that delegating certain responsibilities to family members was a useful coping strategy.

Analysing the sources of conflict offered some interesting results, highlighted by the simultaneous occurrence of juggling multiple roles, time management challenges, and the pursuit of academic excellence. The academic workload in a dental hygiene program is frequently heavy. Lecture and lab time can vary from 24 hours to 30 hours per week for students taking a full course load. Academic work, including lengthy in-depth assignments as well as long laboratory and practical sessions, demanding in both time and energy, adds to the conflicts felt by the students. As a result, the idea of academic accommodation should be explored by institutional administrators. Traditionally academic accommodations are provided when a student experiences a disability-related barrier that would prohibit demonstrating knowledge or skill. Accommodations are provided to level the playing field so the student can have a better chance at being successful. However, with the mature female student, there are no learning disabilities and no visible or overt barriers hindering academic success. Furthermore, students or staff and faculty may not be aware of the various accommodation options available to support these students. Communicating college policies to students, staff, and faculty is essential for student success. This needs to be addressed during student orientation, at the beginning of each semester or when counselling services are warranted. The institution supporting student success needs to have mechanisms in place to share policies, criteria for student workloads, and support for this segment of the student population.

How can the educational system help the mature female student achieve a balance between family life and the pursuit of student success? Clarification of attitudes towards and perceptions of women with families and/or careers as they transition through their new roles as students is key. Individual perceptions of institutional attitudes towards academic accommodations for the mature female student need to be defined and applied. One constant in higher education is diversity, not...
uniformity; classroom diversity that includes valuing the mature female student is a great strength. There must be an integration of these concepts to reflect the reality of today’s student population. Anticipating the positive and offering reasonable accommodations are just 2 ways an educator can assist the mature female learner cope more satisfactorily when re-entering the education environment. Educators can respond effectively by offering guidance, understanding, and encouragement for this particular population. Full-time student status, course workload, and course sequencing as defined by the educational institution need to be re-examined to better support student success when dealing with mature students, as multiple roles, stressors or depression are a reality for this population. Courses can be offered online, which will allow for flexibility of scheduling. Further research needs to be conducted to enhance these findings.

Limitations and future research
Within the limits of the study, the data confirm the results in the literature with regard to the experiences of mature female students returning to postsecondary education, the competing roles that must be assumed, and the difficulties in coping with role conflicts while completing an education program. However, while this study has offered further insights into role conflicts and gives the participants a voice through the reporting of qualitative data, some caution is required. Considering this particular study cohort, all participants were adult women who were immigrants from other countries and who may endure diverse difficulties when considering pursuing postsecondary education. In addition, these learners have lived in Canada for only a short period of time, thus they may confront specific issues that Canadian-born female students do not. Thus, the results of this study are limited to this very specific population group and cannot be generalized to include all mature students. As a consequence, it would be meaningful to conduct research on barriers and challenges among different ethnic female adult student populations.

Another limitation may be the small sample size. The challenge for the researcher in this mixed methods study design is the selection of participants who meet the relevant criteria. While it may be argued the findings are consistent with the literature, generalizability of the findings and conclusions drawn here to other situations and contexts must be considered with caution. Future research should also be conducted to consider mature male students returning to postsecondary education to investigate whether they exhibit characteristics similar to their female counterparts.

In a utopian academic setting, strategies for student success would mirror the client-centred approach to dental hygiene care. Ideally these mature female students would complete “agreed upon” assignments and evaluations to convey to faculty and the institution their learning objectives within course material. Self-directed learning or previous experience would lend themselves to this task.

CONCLUSION
This study offered the mature female student a chance to voice their family-life roles and student experiences. These particular dental hygiene students can balance highly demanding roles, learn specific coping strategies, and maintain resilience in order to complete their education. Academic support is required to improve student well-being while pursuing postsecondary education. Too many of today’s educational policies or discussions about higher education with student success are insufficiently connected to a clear understanding of what academic accommodations could be for specific groups of learners. Work is required in order to provide institutions and policy makers with further direction to create evidence-based policies and programs to support the female adult learner. Recommendations have been made based on the input of these adult students. Becoming mindful of any particular student population with specific needs, goals, and obstacles is a positive step forward, starting and continuing the open dialogue for student success.

ACKNOWLEDGEMENTS
Thank you to the Dental Hygiene Department staff, past and present, at John Abbott College whose support and encouragement allowed me to focus on this meaningful study. I also owe a great debt of gratitude to the students who participated in this research, sharing a valuable commodity—their time. Their input and commentary have made me appreciate even further the time and energy these students must expend in order to fulfill both their family and academic lives.

CONFLICT OF INTEREST
The author has declared no conflicts of interest.
## APPENDIX: QUESTIONNAIRE

**Role Identity:** Daughter/Caregiver, Spouse/Partner, Homemaker, Mother, Student, Career, Volunteer work, Other: Specify ________________, Other: Specify ________________

From the Role Identities listed above reflect and identify the **3 MOST important** role(s) you perceive.

Number 1: indicates to be the **MOST important** ROLE  
Number 2: indicates to be the **SECOND** most important ROLE  
Number 3: indicates to be the **THIRD** most important ROLE

PRIOR to entering school: 1) _______________ 2) ______________ 3) ______________  
WHILE attending school: 1) _______________ 2) ______________ 3) ______________

For the REMAINING questions/statements please reflect, identify to yourself and then rank:

1. The **PREDOMINANT** (greatest) source(s) of CONFLICT WHILE attending school...
   - Being a good spouse/partner ____, Parenting ____, Caregiver to parent ____, Time ____, Completing household responsibilities ____, Completing academic work ____, Completing career responsibilities ____, Other (specify) ________________, Other (specify) ________________

2. I believe to have EXPERIENCED ROLE CONFLICT due to...
   - Self-imposed ____, Husband/partner ____, Children ____, Other family member (specify) ________________, Society ____, Other (specify) ________________, Other (specify) ________________

3. Negative role conflict attributes WHILE ATTENDING school...
   - Fatigue ____, Depression ____, Anger ____, Emotional collapse ____, Little support from family (specifically with) ________________, Shortness of temper with family (specifically with) ________________, Inflexible academic schedule ____, Other (specify) ________________, Other (specify) ________________

4. Positive role outcomes identified WHILE ATTENDING school...
   - Improved self-confidence ____, Closer family relations (specifically with) ________________, New time management skills ____, Improved lines of communication (specifically with) ________________, Respect ____, Need for achievement ____, Support from family (specifically with) ________________

5. Support to deal with role conflict WHILE ATTENDING school...
   - Husband/partner ____, Children ____, Self ____, Academic environment ____, Community ____, Peer (Fellow student) ____, Other family member (specify) ________________, Other (specify) ________________

6. What strategies helped you cope while dealing with role conflicts?

7. What has been the outcome since applying these coping strategies?

Please comment further. Do you have any comments, feelings or thoughts you would like to share with the investigator at this time. Remember—there will be an opportunity to elaborate/clarify/ explain concepts or ideas further during the interview process.
REFERENCES


Conclusions: The use of medicated mouthwashes and gels in the home care maintenance of dental implants is controversial due to the possibility of residue deposition on the implant collar. The aim of this in vitro study was to analyse, by means of scanning electron microscopy (SEM), the amount of residues on dental implant collars treated with various commercial home dental care products. Methods: Gel and mouthwash products were tested on 10 implants. The gels included sodium fluoride, amine fluoride, and sodium hyaluronate products. The mouthwash tested contained triclosan, nimesulide, stannous fluoride, amine fluoride, and hexetidine-chlorobutanol. The SEM observations were performed at different magnifications in double modality SE (secondary electrons) and BSE (backscattered electrons) to qualitatively assess any residual products. The image quantitative analysis was performed by Image J® software to assess areas occupied by residuals. All results were analysed by the same researcher with experience in electron microscopy. Results: The fluoride-based gel products left wider areas occupied by residuals than the mouthwash products. In particular the fluoride-based and hyaluronate products left the highest amount of residues. Among mouthwashes, fluoride–based and triclosan products showed the highest amount of residuals deposition. Discussion: Oral hygiene procedures and related professional products are fundamental to the prevention, treatment, and control of microorganisms. In the case of implants, mechanical and chemical plaque control strategies are even more important since the potentially harmful biofilm covers abiotic titanium surfaces. In situ fixture maintenance is crucial for dental implant therapy success. Correct recommendation of home care products for bacterial control is fundamental to the health of implants and their surrounding tissues. Conclusions: Data from this experimental study showed that home care commercial products in gel formulation, especially those containing fluoride, leave more residuals on titanium smooth surfaces than mouthwash products. The longer permanence of the products may lead to a more effective plaque control than other products.

PRACTICAL IMPLICATIONS OF THIS RESEARCH

- Dental implants are now widely considered a valid intervention for the replacement of missing teeth.
- Harmful biofilm can quickly cover the abiotic titanium surfaces and surrounding tissues, making mechanical and chemical home care plaque control strategies for clients critical.
- Commercial oral care products in gel formulation, especially those containing fluoride, leave more residuals on titanium smooth surfaces than mouthwash products, potentially leading to more effective plaque control.

COMMERCIAL ORAL HYGIENE PRODUCTS AND IMPLANT COLLAR SURFACES: SCANNING ELECTRON MICROSCOPY OBSERVATIONS

Serena Bianchi*, MD, PhD; Giulia Fantozzi†, DH; Sara Bernardi*, PhD, DDS; Sebastiáni Antonouli‡, MSc; Maria Adelaide Continenza*, MD; Guido Macchiarelli*, MD

ABSTRACT

Background: The use of medicated mouthwashes and gels in the home care maintenance of dental implants is controversial due to the possibility of residue deposition on the implant collar. The aim of this in vitro study was to analyse, by means of scanning electron microscopy (SEM), the amount of residues on dental implant collars treated with various commercial home dental care products. Methods: Gel and mouthwash products were tested on 10 implants. The gels included sodium fluoride, amine fluoride, and sodium hyaluronate products. The mouthwash tested contained triclosan, nimesulide, stannous fluoride, amine fluoride, and hexetidine-chlorobutanol. The SEM observations were performed at different magnifications in double modality SE (secondary electrons) and BSE (backscattered electrons) to qualitatively assess any residual products. The image quantitative analysis was performed by Image J® software to assess areas occupied by residuals. All results were analysed by the same researcher with experience in electron microscopy. Results: The fluoride-based gel products left wider areas occupied by residuals than the mouthwash products. In particular the fluoride-based and hyaluronate products left the highest amount of residues. Among mouthwashes, fluoride–based and triclosan products showed the highest amount of residuals deposition. Discussion: Oral hygiene procedures and related professional products are fundamental to the prevention, treatment, and control of microorganisms. In the case of implants, mechanical and chemical plaque control strategies are even more important since the potentially harmful biofilm covers abiotic titanium surfaces. In situ fixture maintenance is crucial for dental implant therapy success. Correct recommendation of home care products for bacterial control is fundamental to the health of implants and their surrounding tissues. Conclusions: Data from this experimental study showed that home care commercial products in gel formulation, especially those containing fluoride, leave more residuals on titanium smooth surfaces than mouthwash products. The longer permanence of the products may lead to a more effective plaque control than other products.

RÉSUMÉ

Contexte : L'utilisation de bains de bouche et de gels médicamentés lors des soins d'entretien à domicile des implants dentaires porte à controverse en raison de la possibilité de dépôts de résidus sur le collet de l'implant. La présente étude in vitro visait à analyser par microscopie électronique à balayage (MÉB) la quantité de résidus sur les collets d'implants dentaires traités in vitro avec divers produits commerciaux de soins dentaires à domicile. Méthodologie : Les produits de gels et de bains de bouche ont été testés sur 10 implants. Les gels comprenaient les produits de fluorure de sodium, de fluorure d'amine et de hyaluronate de sodium. Les bains de bouche évalués contenaient du triclosan, de la nimesulide, du fluocarbamide et du hexétidine-chlorobutanol. Les observations par MÉB ont été effectuées à diverses amplifications en modalité double SE (électrons secondaires) et BSE (électrons rétrodiffusés) pour évaluer de manière qualitative tout produit résiduel. L'analyse quantitative de l'image a été effectuée à l'aide du logiciel Image J® pour évaluer les zones ayant des résidus. Tous les résultats ont été analysés par le même chercheur expérimenté dans le domaine de la microscopie électronique. Résultats : Les produits de gels à base de fluorure ont laissé des résidus sur de plus vastes zones que les produits de bains de bouche. En particulier, les produits à base de fluorure et le hyaluronate ont laissé la plus grande quantité de résidus. Parmi les bains de bouche, les produits à base de fluorure et de triclosan ont révélé la plus grande quantité de dépôts de résidus. Discussion : Les procédures d'hygiène buccodentaire et les produits professionnels qui y sont liés sont essentiels à la prévention, au traitement et au contrôle des microorganismes. En matière d'implants, les stratégies de contrôle mécanique et chimique de la plaque sont encore plus importantes puisque le biofilm potentiellement nocif couvre les surfaces abiotiques du titane. L'entretien in situ du montage est primordial au succès de la thérapie de l'implant dentaire. La bonne recommandation de produits de soins à domicile pour le contrôle des bactéries est essentielle à la santé des implants et des tissus environnants. Conclusions : Les données de cette étude expérimentale ont montré que les produits commerciaux de soins à domicile en formule de gels, surtout ceux contenant du fluorure, laissent une plus grande quantité de résidus sur les surfaces lisses du titane que les produits de bains de bouche. La permanence plus longue des produits peut mener à un contrôle plus efficace de la plaque que d'autres produits.

Keywords: chemical agents, dental devices home care, dental implants, mouthwashes, oral health, oral hygiene

CDHA Research Agenda category: risk assessment and management

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INTRODUCTION

Oral hygiene products and mechanical plaque control are fundamental to maintaining the health of the oral cavity and, in particular, the dental and periodontal tissues. Toothpastes containing fluorides have decreased tooth decay on the natural dentition for decades. In their meta-analysis, Walsh et al. confirmed the preventive action on the implant collar. 17 has been proposed that salts or other residuals can remain and topical gel applications is still controversial since it use on dental implants. The use of medicated mouthwashes products—particularly mouthwashes and gels—are safe to use on natural teeth as they are for individuals with natural teeth. However, scant evidence exists about which home care products—particularly mouthwashes and gels—are safe to use on dental implants. The use of medicated mouthwashes and topical gel applications is still controversial since it has been proposed that salts or other residuals can remain on the implant collar. 17

The aim of this in vitro study was to determine, by means of visual examination using scanning electron microscopy (SEM), whether some commercial products designed for oral health maintenance leave residues on the neck portion of implants.

MATERIALS AND METHODS

This study was conducted on 10 implants provided by Sweden and Martina® S.P.A. Five of the implants were Sweden and Martina® “Khono” implants, with the fixture covered in titanium-plasma-spray (TPS); 5 other implants were Sweden and Martina® “Premium,” with the surface made in nano-Pore. In addition to the different type of fixture surfaces, the considered portion for the production adhesion was the collar, which is overlapping, in order to make the area comparable.

Commercial oral hygiene products

Overall, 4 fluoride-based gel products were tested and 4 mouthwash products were tested. Fluorine® Gel and Mentadent® Gel were sodium fluoride-based, Elmex® Gel was amine fluoride-based, and Aminogam® Gel contained sodium hyaluronate. The 4 mouthwashes tested contained triclosan (DentoOral® mouthwash), hexetidine and chlorobutanol (Buccagel® mouthwash), nimesulide (Erefflog® mouthwash), and amine fluoride plus stannous fluoride (Meridol®).

Three gel products were tested on the “Khono” implants; a mouthwash was used as positive control and saline solution was used as negative control. The mouthwash products were tested on the “Premium” implants; a gel product was used as positive control and saline solution was used as negative control.

Study protocol

The study steps were as follows:

1. Implant handling always by sterile pliers (to fasten it on an appropriate support)
2. Implant labelling and product assignment
3. Product application for 30 minutes, in order to simulate the manufacturer indications
4. Water rinsing
5. Final SEM observation of the pre-established surface

One single product was tested on one single fixture.

SEM observations

The SEM (Philips XL30CP, The Netherlands) observations were performed as previously described and at different magnifications in double modality SE and BSE to qualitatively assess the presence or absence of residual products. The observations were performed at 20.0 kV, at a working distance ranging from 14.5 mm to 17.5 mm, capturing images at 15x magnification. In order to homogenize the observations, all the implants were observed at the same reference points.

Image analysis

The image analysis was performed by the Image J® software, using the thresholding process to assess the occupied area of the residuals. In particular, the area was measured and the grey tones associated with the residuals were isolated. Then the occupied area was assessed by the software and the percentage area was calculated. Given the small sample size, only a descriptive comparison of the residuals could be performed.

RESULTS

The SEM observations were easily identified as all of the products left some residue on the smooth implant surfaces, including the negative control constituted by the saline.
solutions (Figures 1 and 2).

In particular, the areas occupied by the sodium fluoride-based gels (Fluorine® Gel and Mentadent® Gel) were smaller than those of the amine fluoride gel (Elmex® Gel) and the gel with an amino acid and hyaluronic acid composition (Aminogam® Gel). In addition, the SEM observation revealed the presence of tiny particles presenting a very peculiar shape (Figure 1D) in the sample exposed to the amine fluoride gel, while the sample exposed to the hyaluronic acid gel was covered completely (Aminogam® Gel) (Figure 2E).

Among the mouthwash products, the highest assessed values were found with the DentoOral® product, followed by the mouthwash containing fluoride (Meridol®). In the sample exposed to the triclosan, the residuals observed by SEM were distributed more widely along the smooth surface (Figure 2B).

In addition, the image analysis showed that some of the gel products left more residues, occupying a larger area than those left by the mouthwash formulations (Table 1). It is worth noting, moreover, that the products containing amine fluoride, both gel and mouthwash, left high percentages of residues, and the hyaluronated gel remained on the entire surface.

**DISCUSSION**

Microbial biofilm, in general, represents a complex bacterial community living under peculiar conditions protected from UV light, dehydration, host immune cells, and killing molecules. In particular, when an infection is biofilm mediated, the adhesive bacteria are extremely dangerous and difficult for the immune system to eliminate. In the oral cavity, in the presence of saliva and direct contact with the external environment, biofilm formation is physiological. The initial biofilm formation on cleaned teeth is estimated to occur in 6 hours, while the biofilm formation on the implant takes more time, but with similar stages.

When an imbalance or dysbiosis of the microbial population within the biofilm covering the biotic and abiotic surfaces of the oral cavity occurs, it leads to the development of oral pathologies, such as caries, periodontitis, and peri-implantitis. Oral hygiene procedures and related professional home care products are fundamental to the control of this dysbiosis of oral biofilm in order to prevent such infective oral pathologies.

In the case of dental implants, mechanical and chemical plaque control strategies are even more important since the potentially harmful biofilm covers the abiotic titanium surfaces. Our morphological data have demonstrated how commercial home care products in 3 different gel formulations, especially those containing fluoride, leave residues on titanium smooth surfaces, while 3 tested mouthwash formulations left fewer residuals on titanium smooth surfaces.

Numerous inconsistencies in the literature regarding this topic have been identified. Huang and Lee in 2005 reported that the use of fluoride ions on titanium alloy surfaces was harmful. Indeed, in their study, the use of fluoride ions in artificial saliva with an acid pH caused the loss of the superficial oxide titanium film. Conversely, a 2009 study by Muguruma and colleagues observed that mouthwashes containing fluoride left residuals on titanium surfaces, but they concluded that these residuals did not adversely alter the mechanical properties of the titanium alloy. Quaranta et al. also highly recommended the use of amine fluoride mouthwash as a home care product for routine oral hygiene.

One commonality among all cited authors was their recognition of the potential damage derived from the combination of high levels of fluoride ion concentrations and low levels of salivary pH, such as 3.5. Interestingly, Joska et al. in a 2010 study demonstrated the high resistance of TiN alloy, which is used for the fabrication of endodontic instruments and orthodontic wires, in a simulated environment with high concentrations of fluoride ions in a strong acid pH. In 2013, Licausi et al., building on their study results, demonstrated how the contact between fluoride ions and titanium alloys in artificial saliva leads to the formation of a salt incorporated into the examined surfaces. They assumed that the salt formation made the superficial layer of the titanium porous. However, more investigations using the profilometer are required to support these assumptions.

Within the limits of this current study, including the small sample size, the decision not to test each product against a control on each type of implant surface, and the lack of numerical analysis for comparison of results of the morphological evaluation of the examined titanium surfaces, the observations showed the presence of residuals of different molecules in all tested formulations, but no significant superficial damages were observed. In particular, the highest percentage of occupied residual area resulted from gel formulations of amine fluoride. This result could be due to the particular formulation of the gel and the nature of the amine fluoride. Specifically, gels and mouthwashes belong to colloidal systems, using water as the main solvent. Gels are lipophilic systems that are highly concentrated. The cohesion between the elementary particles within gels is higher in comparison to those of mouthwashes, allowing the formation of a 3-dimensional reticulic structure that incorporates the solvent (gel).

Even if both formulations (gels and mouthwashes) have a high capillarity, which enables them to fill into very small spaces or fissures, they have a difference in viscosity.

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**Table 1. Numerical data of the quantitative image analysis**

<table>
<thead>
<tr>
<th>Type of product</th>
<th>Area occupied in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium-fluoride gel</td>
<td>4.48</td>
</tr>
<tr>
<td>Sodium-fluoride gel</td>
<td>1.21</td>
</tr>
<tr>
<td>Amine fluoride gel</td>
<td>36.59</td>
</tr>
<tr>
<td>Stannous and amine fluoride mouthwash</td>
<td>24.28</td>
</tr>
<tr>
<td>Triclosan-based mouthwash</td>
<td>34.12</td>
</tr>
<tr>
<td>Hexetidine and chlorobutanol mouthwash</td>
<td>14.29</td>
</tr>
<tr>
<td>Nimesulide mouthwashes</td>
<td>28.92</td>
</tr>
<tr>
<td>Hyaluronated gel</td>
<td>100</td>
</tr>
<tr>
<td>Saline solution</td>
<td>0.05</td>
</tr>
</tbody>
</table>

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Figure 1. SEM observations of the “Khono” implant surface, before and after product applications.
A: “Khono” implant surface with no application of product. B: SEM observation after the application of fluoride gel. The observation presented in backscattered secondary electron shows punctiform residuals of the product along the considered smooth surface. C: SEM observation after the application of Mentadent® Gel. D: SEM observation after the application of Elmex® Gel. The observation presented in secondary electrons shows how the residual of the product occupies a very large area. E: Magnification of the salt of the product on the surface. No particular damage is detectable. F: SEM observation of the positive control after the application of the fluoride-based mouthwashes, which leaves a quite important area of residuals. G: SEM observation of the negative control (saline solution); the black arrows point to the small residuals.
The mouthwashes are liquids in state; the gels have a more complex structure that promotes the internal friction between cross-linked molecules, opposing the outflow of the formulation.\textsuperscript{35}

In situ fixture maintenance is crucial for the success of dental implants. Given the complexity of the microbial environment of the oral cavity, recommendations for the safe use of home care oral hygiene products targeted for bacterial control are fundamental to the health of implants and their surrounding tissues.

**CONCLUSIONS**

The investigated dental home care products left residues on the smooth collar part of the implants. Future studies should investigate if amine fluoride product residue on the titanium surfaces of dental implants can demonstrate a positive bacteriostatic action for long-term fixture maintenance without harming the implant surface.
REFERENCES

5. Rølla G, Saxegaard E. Critical evaluation of the composition and potential conflicts of interest. The authors are not aware of any existing or potential conflicts of interest.

CONFLICTS OF INTEREST
The authors are not aware of any existing or potential conflicts of interest.
An umbrella review of systematic reviews of the evidence of a causal relationship between periodontal disease and cardiovascular diseases: Position paper from the Canadian Dental Hygienists Association

Salme E Lavigne*, PhD, RDH; Jane L Forrest§, EdD, RDH

ABSTRACT
Previous position papers have confirmed associations between periodontal disease and cardiovascular disease. Causal associations have not been confirmed and have been the source of much confusion for oral health professionals and the public. **Aim:** To investigate whether sufficient evidence exists for a causal relationship between periodontal disease and cardiovascular disease. **Methods:** The PICO question was "For adults in good general health who are diagnosed with periodontal disease, will receiving non-surgical periodontal therapy (NSPT), as compared to not receiving NSPT, lower their risk for cardiovascular diseases?" Only systematic reviews (SRs) with or without meta-analyses (MAs) of randomized controlled trials published in the English language between 2007 and 2019 were included. Databases searched included PubMed, MEDLINE, EbscoHost, CINAHL, Scopus, Cochrane Registry of Systematic Reviews, and Clinical Trials Registry. Quality assessments were conducted by both authors using the PRISMA checklist. The Bradford Hill criteria were used to determine evidence for causality. **Results:** Of 53 cardiovascular disease studies retrieved, 7 met the inclusion criteria, of which 6 contained MAs. Results were mixed for various periodontal interventions lowering the risk for cardiovascular outcomes. Only one SR used cardiovascular events as a direct outcome; the other 6 used various surrogate measures. **Conclusions:** Bradford Hill criteria analysis failed to support a causal relationship between periodontal disease and cardiovascular disease.

RÉSUMÉ
Les énoncés de position précédents ont confirmé des liens entre la maladie parodontale et les maladies cardiovasculaires. Des associations causales n'ont pas été confirmées et ont été la source de beaucoup de confusion pour les professionnels de la santé buccodentaire et la population. **But :** Étudier s'il y a suffisamment de preuves qu'un lien de causalité existe entre la maladie parodontale et les maladies cardiovasculaires. **Méthodologie :** La question PICO était : « Les adultes en bonne santé générale, qui ont reçu un diagnostic de parodontite, auront-ils une réduction de leur risque de maladies cardiovasculaires s'ils reçoivent une thérapie parodontale non chirurgicale (TPNC), en comparaison à ne pas recevoir de thérapie parodontale non chirurgicale? » Seules les revues systématiques (RS) avec ou sans méta-analyse (MA) d'essais comparatifs randomisés publiés en anglais entre 2007 et 2019 ont été incluses. Les recherches de bases de données ont été effectuées, entre autres, dans PubMed, MEDLINE, EbscoHost, CINAHL, Scopus, le registre de revues systématiques Cochrane et le registre d'essais cliniques. Des évaluations de la qualité ont été menées par les 2 auteurs à l'aide de la liste de vérification PRISMA. Les critères de Bradford Hill ont été utilisés pour déterminer la preuve de causalité. **Résultats :** Dans les 53 études repérées sur la maladie cardiovasculaire, 7 correspondaient aux critères d'inclusion, et parmi celles-ci, 6 comprenaient des MA. Les résultats en matière de diminution du risque d'effets cardiovasculaires étaient mixtes selon les différentes interventions parodontales effectuées. Une seule RS a utilisé les effets cardiovasculaires comme résultat direct, les 6 autres ont employé diverses mesures de remplacement. **Conclusions :** L'analyse de critère de Bradford Hill n'a pas réussi à appuyer un lien de causalité entre la maladie parodontale et les maladies cardiovasculaires.

Keywords: cardiovascular diseases, meta-analysis, oral health, periodontal disease, periodontal treatment, periodontitis, stroke, systematic reviews

CDHA Research Agenda categories: risk assessment and management; capacity building of the profession

CANADIAN DENTAL HYGIENISTS ASSOCIATION POSITION STATEMENT
The Canadian Dental Hygienists Association acknowledges that, although associations between periodontal disease and cardiovascular disease have been well established, there is insufficient evidence that periodontal disease causes cardiovascular disease.

INTRODUCTION
Relationships between periodontal disease and a number of systemic diseases have been proposed since the late 1800s when physicians speculated that bacteria from the mouth caused everything from brain abscesses to arthritis. With the onset of “periodontal medicine” in the early 1990s, studies investigating the relationships between numerous oral and systemic conditions have increased, with inflammation now recognized as a common factor.

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Despite the amount of research published over the last 30 years, questions remain about the exact nature of these relationships. While relationships may be in the form of associations or correlations, they should not be assumed as causal.

Unfortunately, the differences between assumptions and causality are not well understood and the terms are often used interchangeably. A relationship merely describes how 2 variables might somehow be related or connected to each other. For instance, lung cancer rates are higher for people without a postsecondary education (who tend to smoke more), but that does not mean that someone can reduce his or her cancer risk just by getting a college or university education. An “association” refers to “a relationship between an exposure (or a characteristic) and a disease that is statistically dependent; that is, the presence of one alters the probability of observing the presence of the other. An association is a necessary condition of a causal relationship, but not all associations are causal. If there is no association, the variables are said to be independent. A correlation is a relationship in which there is a “Linear association between two continuous or ordinal variables. The measure of the correlation is the correlation coefficient, which ranges from 1 (perfect positive association, e.g., as one variable increases, the second one also increases at the same rate) through 0 (no association) to a −1 (perfect negative association, e.g., as one variable increases, the second one decreases at the same rate).”

In order for a relationship to be coined as “causal,” actual “cause and effect” must be determined through a very rigorous set of criteria. One must be able to state with certainty that “A” causes “B” (a specific exposure has been shown to cause a specific outcome). Randomized clinical trials (RCTs) provide the strongest evidence of cause and effect, rather than the outcome happening by chance. These experimental studies are the most methodologically challenging and ones in which the researcher controls or manipulates the variables (i.e., the intervention, its timing and dose) under investigation, such as in testing the effectiveness of a treatment, as compared to another treatment or a placebo.

Often, when clinicians read a research article that is reporting a correlation or an association between an oral disease and a particular outcome of interest, they automatically, and incorrectly, jump to the conclusion that the relationship is causal. Prime examples of such misinterpretations are the assumption that periodontitis is one cause of heart disease or of adverse pregnancy outcomes, or that stress causes periodontitis. It is important for clinicians to understand that correlations and associations do not imply or equal causality. In fact, incorrect assumptions of causality are a major public

Table 1. The Bradford Hill criteria for causality

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength of association</td>
<td>A strong association is more likely to have a causal component than is a modest association. Strength of the association is determined by the types of existing studies. The highest-level studies from the evidence pyramid would represent the strongest associations (i.e., RCTs and systematic reviews with meta-analyses). Results from these studies must demonstrate an odds ratio or relative risk of at least 2.0 or above in order to be meaningful. Anything between 1 and 2 is weak while &gt;2 is moderate and &gt;4 is considered strong.</td>
</tr>
<tr>
<td>Consistency</td>
<td>A relationship is repeatedly observed in all available studies.</td>
</tr>
<tr>
<td>Specificity</td>
<td>A factor influences specifically a particular outcome or population. The more specific an association between a factor and an effect, the greater the probability that it is causal.</td>
</tr>
<tr>
<td>Temporality</td>
<td>The cause must precede the outcome it is assumed to affect (e.g., smoking before the appearance of lung cancer). Outcome measured over time (longitudinal study).</td>
</tr>
<tr>
<td>Biological gradient (dose-response)</td>
<td>The outcome increases monotonically with increasing dose of exposure or according to a function predicted by a substantive theory (e.g., the more cigarettes one smokes, the greater the chance of the cancer occurring).</td>
</tr>
<tr>
<td>Plausibility</td>
<td>The observed association can be plausibly explained by substantive matter (i.e., biologically possible).</td>
</tr>
<tr>
<td>Coherence</td>
<td>A causal conclusion should not fundamentally contradict present substantive knowledge. (Studies must not contradict each other).</td>
</tr>
<tr>
<td>Experiment</td>
<td>Causation is more likely if evidence is based on randomized experiments or a systematic review of randomized experiments. However, these RCTs may not be ethically possible and thus prospective rather than experimental studies, such as cohort studies, may be the highest level of evidence available.</td>
</tr>
<tr>
<td>Analogy</td>
<td>For analogous exposures it outcomes an effect has already been shown (e.g., Effects first demonstrated on animals or an effect previously occurring on humans such as the effects of thalidomide on a fetus during pregnancy).</td>
</tr>
</tbody>
</table>

health concern. From a public health perspective, no evidence should be considered causal unless it has gone through very rigorous scrutiny using standard public health guidelines such as the Bradford Hill criteria for causality\(^6\) (Table 1).

In 2004, Lux and Lavigne\(^7,8\) published a position paper for the Canadian Dental Hygienists Association (CDHA) in 2 parts, outlining the nature of the proposed linkages between periodontal disease and 4 systemic conditions: cardiovascular diseases, preterm low birth weight babies, respiratory diseases, and diabetes. Updates to those first position papers were published in the Canadian Journal of Dental Hygiene in November/December 2006\(^9\) and January/February 2007,\(^10\) in which the author reported associations between periodontal disease and cardiovascular diseases, diabetes, adverse pregnancy outcomes, and respiratory diseases (in particular, pneumonia in health-compromised seniors).

A recent systematic mapping of registers of clinical research trials conducted on periodontal medicine revealed 57 conditions that are currently hypothesized to be linked with periodontal diseases.\(^11\) While it is beyond the scope of this current position paper to explore all of these proposed linkages, the status of 10 of these hypotheses will be evaluated in a series of position papers written by the same authors and released in the coming months by CDHA. These forthcoming position papers will assess the nature of the relationships between periodontal disease and diabetes, obesity, respiratory diseases, rheumatoid arthritis, Alzheimer disease, end-stage renal disease, inflammatory cancers and influenza.

The purpose of these updated position papers is to review the research undertaken since the publication of the last CDHA position papers in 2006 and early 2007 on these proposed relationships. Unlike the methodology used for the previous position papers and updates, this investigation is more specific in looking at whether the state of the evidence has evolved from one of associations to one of actual causality. Determining a causal relationship requires studies that have examined an intervention, thus only the highest levels of evidence will be sought for this update. This specific position paper investigates whether a causal relationship exists between periodontal disease and cardiovascular diseases.

### METHODOLOGY

The overarching PICO question developed for the first 5 oral–systemic connections to be explored in this series of position papers was customized in this paper for cardiovascular diseases. “For adults in good general health who are diagnosed with periodontal disease (Population), will receiving non-surgical periodontal therapy (NSPT) (Intervention), as compared to not receiving NSPT (Comparison group), lower their risk for cardiovascular diseases? (Outcome)”

#### Eligibility criteria

Both authors independently searched the literature, limiting the search to systematic reviews (SRs) with or without meta-analyses (MAs) of intervention studies using the inclusion and exclusion criteria presented in Table 2. SRs and MAs of observational studies were excluded.

#### Search strategy

a. Databases searched included PubMed, MEDLINE, EbscoHost, CINAHL, Scopus, Cochrane Registry of Systematic Reviews, and Clinical Trials Registry (clinicaltrials.gov). Additionally, bibliographies of retrieved articles were searched for further relevant systematic reviews and meta-analyses and added when appropriate.

b. Keywords used for each search were as follows: cardiovascular diseases; stroke; periodontal disease; periodontitis; periodontal treatment; oral health; AND systematic reviews; meta-analysis

c. Search strategies (limited to publications after 2007 and in the English language):

- cardiovascular disease and periodontal disease and systematic reviews
- stroke and periodontal disease and periodontal treatment and systematic reviews
- cardiovascular disease and oral health and systematic reviews
- stroke and oral health and systematic reviews

### Table 2. Inclusion and exclusion criteria

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Published between 2007 and 2019</td>
<td>Published before 2007</td>
</tr>
<tr>
<td>English language</td>
<td>Languages other than English</td>
</tr>
<tr>
<td>Systematic reviews with or without meta-analyses (MAs) of RCTs (or cohort studies if no SRs of RCTs were available)</td>
<td>Abstracts, posters, conference proceedings, editorials or commentaries, duplicate studies, narrative reviews, RCTs, observational studies/both cohort and case–control and systematic reviews of observational studies and/or case–control studies.</td>
</tr>
<tr>
<td>Studies involving humans</td>
<td>Animal studies (in vivo, ex vivo) and in vitro studies</td>
</tr>
</tbody>
</table>
Evidence of a causal relationship between periodontal disease and cardiovascular diseases

Study selection
Both authors independently screened the titles and abstracts of all articles retrieved by the search using the inclusion criteria and then discussed their choices to reach consensus regarding their suitability for full-text reading. Both authors independently reviewed the selected full-text articles and reached consensus on their inclusion or exclusion.

Quality assessment
The methodological quality of the selected systematic reviews and meta-analyses was assessed blindly by both authors using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist tool.\(^\text{12}\) Scores were then compared and discussed where inconsistencies occurred to reach consensus.

Data extracted
The following information was extracted from each selected SR or MA and compiled in table format: year published, number of RCTs included, country of origin, methods used for assessing risk of bias, heterogeneity, outcomes measured, and conclusions of the findings.

RESULTS
A total of 53 reviews were retrieved from database searches and articles identified within these reviews. After eliminating duplicates and articles that did not meet the inclusion criteria, the authors retained 7 studies\(^\text{13-19}\) that were eligible for review. A flow diagram (Figure 1) illustrates the details of the selection process; Table 3 reports the reasons for elimination of full-text articles that did not meet the inclusion criteria. One exception was the inclusion of a 2006 SR/MA\(^\text{19}\) because it contained studies that were not included in the previous 2006 CDHA position paper.

<table>
<thead>
<tr>
<th>Records Retrieved from Search</th>
<th>53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstracts Screened</td>
<td>29</td>
</tr>
<tr>
<td>Full-Text Articles Screened</td>
<td>27</td>
</tr>
<tr>
<td>Studies Included in Review</td>
<td>7</td>
</tr>
</tbody>
</table>

DISCUSSION
A misunderstanding has existed for several years regarding the relationship between periodontal disease and cardiovascular disease. In 2012, this misunderstanding came to the attention of the public through a press release by the American Academy of Periodontology (AAP) stating “Periodontal Disease Linked to Cardiovascular Disease.”\(^\text{21}\) This statement was based on the results of a 2012 systematic review published in the American Heart Association’s journal *Circulation.*\(^\text{22}\) Its findings were twofold: 1) “observational studies support an association between periodontal disease and atherosclerotic heart disease independent of known confounders” and 2) “they do not, however, support a causative relationship.”\(^\text{22}\) Unfortunately, this initial press release failed to include the second finding, but other news outlets quickly noted this discrepancy and released another contradictory statement “No Proof that Gum Disease Causes Heart Disease.”\(^\text{23}\) Although the American Heart Association attempted to clarify the controversy, it created confusion both within the oral health professions and among the public.

The purpose of this umbrella review was to examine the second part of this controversy, specifically to determine if sufficient evidence exists demonstrating that NSPT lowers the risk for cardiovascular events, thus bringing us closer to determining a causal relationship. Given the multifactorial nature of cardiovascular disease, and by not using direct cardiovascular (CV) outcomes following periodontal therapy, there is insufficient evidence to satisfy the Bradford Hill criteria of temporality and experiment. When surrogate measures are used, one can only make assumptions that NSPT may assist in lowering the risk of a cardiovascular event. RCTs examining direct CV outcomes showed mixed results for a variety of periodontal treatments lowering the risk for cardiovascular outcomes. Only one study\(^\text{20}\) included within one SR\(^\text{13}\) directly used cardiovascular events as outcomes; the remainder used various surrogate measures including endothelial function, arterial stiffness, hsCRP, TNF-α, Fibrinogen, IL-6, total cholesterol, and HDL-Cholesterol. Three (3) studies\(^\text{13,14,19}\) showed no relationship between periodontal treatment and cardiovascular risk while two (2) studies\(^\text{15,16}\) reported positive outcomes for improving endothelial function\(^\text{16}\) and several biomarkers of CVD.\(^\text{16}\) Two studies (2)\(^\text{17,18}\) reported mixed results. These results are illustrated in Table 5.

Results of the quality appraisal of the 7 included systematic reviews and meta-analyses are shown in Table 4. Based on the 27 PRISMA checklist items, scores ranged from 15 to 25. Agreement between the 2 independent evaluators was close to 100%, with scores being off by only 1 to 2 points. The quality of the studies was generally moderate to high, however 3 studies did not report risk of bias\(^\text{17-19}\) and one study did not include a quality assessment tool.\(^\text{17}\)
as an endpoint are difficult to conduct and, in most instances, considered unethical.

The sole SR that used a direct CV outcome was conducted as a Cochrane review by Li and colleagues.\textsuperscript{13} Their inclusion criteria sought out RCTs and/or quasi-RCTs that included patients diagnosed with periodontal disease who had either previous cardiovascular disease (secondary prevention study) or no cardiovascular disease (primary prevention study) and in which patients in the intervention group received active periodontal therapy compared to maintenance therapy, no periodontal treatment or another kind of periodontal treatment in the control group. No primary prevention studies focused on the prevention of cardiovascular disease were identified, and only one secondary prevention study was located.\textsuperscript{20} This study compared the effects of NSPT with community care on patients previously identified as having either \( \geq 50\% \) blockage of one coronary artery or a coronary event within 3 years of the study, with a follow-up period of 6 months to 25 months. Although the study measured adverse CV events, the authors did not report any data on deaths. No statistically significant differences between the 2 groups were found. Authors of the SR found the included study to be at high risk of bias due to protocol deviation and lack of follow-up. The study was classified as being of very low quality, providing insufficient evidence to either support or refute whether NSPT could prevent the recurrence of CV events.\textsuperscript{13}

The remaining 6 SRs investigated the effects of NSPT on several surrogate measures with mixed results. One SR by Schmitt et al.\textsuperscript{14} studied the effects of NSPT on arterial stiffness, considered a marker of atherosclerosis and a risk factor for cardiovascular disease. Of the 10 studies included in their review, 2 were intervention studies and only 1 of the 2 was an RCT. Given the difference in study design, no meta-analysis was conducted comparing these 2 studies,

<table>
<thead>
<tr>
<th>Included</th>
<th>Deleted</th>
<th>Reason for deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Li et al.\textsuperscript{13} 2017 (Cochrane) (1 RCT)</td>
<td>Lockhart et al.\textsuperscript{22} 2012 (US)</td>
<td>N/A to PICO</td>
</tr>
<tr>
<td>2. Schmitt et al.\textsuperscript{14} 2015 (France) (8 observational &amp; 2 intervention studies)</td>
<td>Martin-Cabezas et al.\textsuperscript{23} 2016 (France)</td>
<td>No intervention studies &amp; only 2 cohort studies out of 20 studies</td>
</tr>
<tr>
<td>3. Orlandi et al.\textsuperscript{15} 2014 (UK) (25 cohort &amp; 1 intervention study)</td>
<td>Dai et al.\textsuperscript{29} 2015 (China)</td>
<td>Not relevant to PICO</td>
</tr>
<tr>
<td>4. Teeuw et al.\textsuperscript{16} 2014 (Netherlands) (25 intervention studies)</td>
<td>Xian-Tao Zeng et al.\textsuperscript{28} 2016 (China)</td>
<td>No intervention studies included</td>
</tr>
<tr>
<td>5. Teixeira de Freitas et al.\textsuperscript{17} 2012 (Brazil) (4 RCTs &amp; 7 non-RCT intervention trials)</td>
<td>Lopez N.\textsuperscript{31} 2014 (Chile)</td>
<td>Critical summary of Teeuw et al.</td>
</tr>
<tr>
<td>6. Paraskevas et al.\textsuperscript{18} 2008 (Netherlands) (4 intervention studies)</td>
<td>Levac et al.\textsuperscript{32} 2010 (Canada)</td>
<td>N/A to PICO (scoping review)</td>
</tr>
<tr>
<td>7. Ioannidou et al.\textsuperscript{19} 2006 (US) (7 cohort and 3 RCTs)</td>
<td>Cheng et al.\textsuperscript{33} 2018 (China)</td>
<td>No intervention studies</td>
</tr>
<tr>
<td>8.</td>
<td>Leira et al.\textsuperscript{34} 2017 (Spain)</td>
<td>No intervention studies</td>
</tr>
<tr>
<td>9.</td>
<td>Sfyroeras et al.\textsuperscript{35} 2012 (Greece)</td>
<td>No intervention studies</td>
</tr>
<tr>
<td>10.</td>
<td>Kelly et al.\textsuperscript{36} 2013 (US)</td>
<td>N/A to PICO</td>
</tr>
<tr>
<td>11.</td>
<td>Mustapha et al.\textsuperscript{37} 2007 (US)</td>
<td>N/A to PICO</td>
</tr>
<tr>
<td>12.</td>
<td>Shi et al.\textsuperscript{38} 2016 (China)</td>
<td>No intervention studies</td>
</tr>
<tr>
<td>13.</td>
<td>Lam et al.\textsuperscript{39} 2011 (UK)</td>
<td>N/A to PICO</td>
</tr>
<tr>
<td>14.</td>
<td>Matthews D.\textsuperscript{40} 2011 (Canada)</td>
<td>Critical summary of Lam et al.</td>
</tr>
<tr>
<td>15.</td>
<td>Dietrich et al.\textsuperscript{41} 2013 (UK)</td>
<td>N/A to PICO</td>
</tr>
<tr>
<td>16.</td>
<td>Xu et al.\textsuperscript{42} 2017 (China)</td>
<td>N/A to PICO</td>
</tr>
<tr>
<td>17.</td>
<td>Leng et al.\textsuperscript{43} 2015 (China)</td>
<td>N/A to PICO</td>
</tr>
<tr>
<td>18.</td>
<td>Merchant A.\textsuperscript{44} 2012 (US)</td>
<td>Critical summary of Lockhart et al.</td>
</tr>
<tr>
<td>19.</td>
<td>Lafon et al.\textsuperscript{45} 2014 (France)</td>
<td>N/A to PICO</td>
</tr>
<tr>
<td>20.</td>
<td>Helfand et al.\textsuperscript{46} 2009 (US)</td>
<td>N/A to PICO</td>
</tr>
</tbody>
</table>
Table 4. Quality appraisal and summary of the systematic reviews/meta-analyses (n = 7)

<table>
<thead>
<tr>
<th>Author (Country)</th>
<th>PRISMA score</th>
<th>Heterogeneity</th>
<th>Risk of bias</th>
<th>Quality assessment instrument</th>
<th>Comments</th>
<th>Included meta-analysis of the SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li et al.13 2017</td>
<td>25/27</td>
<td>N/A (only one study)</td>
<td>High (Due to protocol deviation and lack of follow-up)</td>
<td>Cochrane Handbook for Systematic Reviews of Interventions</td>
<td>1 RCT (303 participants) Results: RR 0.72 Measured effects of Periodontal treatment directly on prevention of CV events</td>
<td>N/A Not possible as only 1 study included</td>
</tr>
<tr>
<td>Schmitt et al.14 2015</td>
<td>20/27</td>
<td>Moderate to high</td>
<td>Only 1 RCT included in quantitative analysis and it had a low risk of bias</td>
<td>Cochrane Handbook for Systematic Reviews of Interventions used for RCTs Newcastle-Ottawa Scale used for non-RCTs</td>
<td>10 studies included Only 2 intervention studies showed contradictory results on PF reducing arterial stiffness Measured effectiveness of periodontal treatment on reducing arterial stiffness</td>
<td>Yes Studies included in meta-analysis: 7 observational and 1 RCT but no MA performed with just the 2 intervention studies</td>
</tr>
<tr>
<td>Orlandi et al.15 2014 (UK)</td>
<td>23/27</td>
<td>High</td>
<td>Possible selection bias noted</td>
<td>Newcastle-Ottawa Scale for non-RCTs</td>
<td>Measured effects of periodontal treatment on endothelial function 35 studies included in qualitative analysis 22 studies included in quantitative synthesis (3 of 6 RCTs used in MA) MA resulted in statistically significant improvement in endothelial function following periodontal therapy</td>
<td>Yes (included 22 studies) Three were RCTs and used separately to assess the effects of periodontal treatment on endothelial function through flow-mediated dilatation.</td>
</tr>
<tr>
<td>Teeuw et al.16 2014 (Netherlands)</td>
<td>22/27</td>
<td>High</td>
<td>Publication or other bias noted in MA.</td>
<td>Van der Weijden et al (2009)</td>
<td>7 trials included periodontitis patients in good systemic health; 18 trials included periodontitis patients with comorbidities A variety of surrogate outcomes measured. (hsCRP; IL-6; TNF-a; Fibrinogen; triglycerides; total cholesterol; HDL; and LDL; HbA1c and blood pressure). Concluded that periodontal therapy improves surrogate markers for CVD but more so in those with existing comorbidities</td>
<td>Yes (included all 25 trials)</td>
</tr>
<tr>
<td>Teixeira de Freitas et al.17 2012 (Brazil)</td>
<td>20/27</td>
<td>Low</td>
<td>Not reported</td>
<td>None used</td>
<td>4 RCTs Concluded that all 4 studies reduced CRP post NSPT, but only 2 were statistically significant. Measured effectiveness of periodontal treatment on reduction of CRP</td>
<td>Yes 4 RCTs used</td>
</tr>
<tr>
<td>Paraskevas et al.18 2008 (Netherlands)</td>
<td>18/27</td>
<td>Low</td>
<td>Indicated it was explored but none reported or discussed.</td>
<td>Cochrane Handbook of Systematic Reviews</td>
<td>4 Tx studies (Total treated 152; total controls 134) Although hsCRP reduced in intensive treatment groups. No statistically significant differences between standard &amp; intensive treatment were found Measured effects of periodontal therapy on hsCRP reduction</td>
<td>Yes 3 RCTs included in MA</td>
</tr>
<tr>
<td>Ioannidou et al.19 2006 (US)</td>
<td>15/27</td>
<td>High</td>
<td>Bias not reported</td>
<td>Consort</td>
<td>7 single cohort studies and 3 RCTs but only 2 used in MA Although results favored periodontal treatment, no statistically significant differences found in CRP</td>
<td>Yes (only 2 RCTs)</td>
</tr>
</tbody>
</table>
however the RCT did not find a statistically significant difference between the intervention and control groups whereas the cohort study results significantly favoured the treatment group. This is consistent with other findings where the lower levels of evidence reported greater effects than the higher levels. With these contradictory results, the authors concluded there was insufficient evidence that NSPT had a positive effect on reducing arterial stiffness and subsequently lowering the risk of CV events.

Orlandi and colleagues included studies in their SR/MA that investigated the effects of NSPT on endothelial function, a surrogate measure for cardiovascular disease measured by flow-mediated dilation. The results of the meta-analysis that included 3 of 6 RCTs (Table 4) demonstrated statistically significant differences between the treatment and control groups following NSPT. They concluded that periodontal disease and endothelial dysfunction are causally related. Teeuw et al. also reported similar findings for endothelial function as well as several other biomarkers of atherosclerosis. However, one must keep in mind that these results cannot preclude a causal relationship between periodontal disease and cardiovascular disease as endothelial dysfunction is a surrogate measure of cardiovascular disease not a direct outcome measure.

Four SR/MA investigated the effects of NSPT on C-reactive protein (CRP), a non-specific marker of systemic inflammation that has been shown to be elevated in the presence of periodontal disease in numerous studies. Both the Centers for Disease Control and Prevention and the American Heart Association have classified serum levels of CRP through high-sensitivity analysis to be indicators of coronary heart disease risk. Thus it is hypothesized that, since periodontal disease has been shown to increase serum CRP, reducing periodontal inflammation through NSPT may reduce systemic levels of CRP and subsequently lower the risk for CV events. Results of these CRP studies were mixed. Texeira de Freitas et al. reported positive results, concluding that CRP values were reduced following NSPT. However, although all 4 studies used in the meta-analysis demonstrated reductions in CRP, only 2 of the 4 studies had statistically significant outcomes. Interestingly, one of the studies that was included in the Texeira de Freitas MA (Tonetti et al.) was excluded in the Paraskevas MA due to lack of reporting of end-of-trial means. This begs the question as to how Texeira de Freitas et al. arrived at their results?

One of the key findings in the Teeuw et al. SR/MA was that NSPT reduced hsCRP only in periodontitis patients with comorbidities but not in healthy participants. This finding is in direct contrast to those of Paraskevas et al. who found reductions in hsCRP in healthy patients, although they categorized the level of evidence to be modest. Additionally, Ioannidou et al.’s findings did not support the hypothesis that periodontal therapy reduced serum CRP.

These very inconsistent findings are not surprising given that CRP is a non-specific marker of the acute-phase inflammatory response. Elevated levels of CRP associated with periodontal inflammation are modest at best and often do not exceed the clinical normal. There are many conditions that are known to raise CRP values such as obesity, smoking, and trauma; other unknown inflammatory conditions may also contribute to elevations in CRP. These confounders are often not mentioned in clinical trials as they are difficult to control. In addition,

### Table 5. Primary outcomes of retained studies

<table>
<thead>
<tr>
<th>Cardiovascular diseases</th>
<th>Outcome 1</th>
<th>Outcome 2</th>
<th>Outcome 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No relationship</td>
<td>Possible relationship (mixed results)</td>
<td>Positive relationship</td>
</tr>
<tr>
<td>Schmitt et al. 2015 (arterial stiffness)</td>
<td>Texeira de Freitas et al. 2012 (hsCRP)</td>
<td>Orlandi et al. 2014 (for endothelial function)</td>
<td></td>
</tr>
<tr>
<td>Li et al. 2017 (CV event)</td>
<td>Paraskevas et al. 2008 (hsCRP)</td>
<td>Teeuw et al. 2014 (numerous surrogates: hsCRP in those with comorbidities; and improved endothelial function)</td>
<td></td>
</tr>
<tr>
<td>Ioannidou et al. 2006 (CRP)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 6. Summary of issues identified by authors of systematic reviews of RCTs

1. Inconsistency in defining periodontal disease and periodontal disease severity
2. Inconsistency in the type of periodontal treatment provided, i.e., timing, frequency, clinician, use of antibiotics, etc.
3. Quality of studies (methodological shortcomings)
4. Variation in outcomes measured and measurement technique used
5. No uniform methods for adjustment of confounders (i.e., smoking, obesity, comorbidities)
6. Publication bias: studies showing no (negative) effect may not have been published
7. Only 1 study identified that used a cardiovascular event as the endpoint
8. All other studies used surrogate measures for cardiovascular disease risk
Evidence of a causal relationship between periodontal disease and cardiovascular diseases

There are numerous laboratory techniques for measuring high sensitivity CRP (hsCRP) and studies have not been consistent in their use of these various methods, which could contribute to inconsistencies in results.

Authors of the 7 SR/MAs identified similar shortcomings in the individual studies included in their SR/MAs. Table 6 lists common issues identified by these authors.

Using the Bradford Hill criteria for causation to determine whether a causal relationship exists between periodontal disease and cardiovascular disease, several criteria have not yet been satisfied. In examining the “strength of association,” modest evidence was reported by only 2 studies for 2 different surrogate measures (endothelial function and hsCRP). The second criterion of “consistency” has not been met as numerous inconsistencies in findings have been reported. This also poses a question as to publication bias; how many studies were turned away that did not have positive results? Similarly, the criterion of “specificity” has not been met; the studies failed to demonstrate that in every instance, the outcome will be the same. In fact, of all the studies included in this review, only one examined the effect of periodontal therapy directly on cardiovascular outcomes. All the other studies used surrogate measures. The criterion of “temporality,” where periodontal disease is required to precede cardiovascular disease, has not been established, which definitely weakens the cause and effect hypothesis. Although experiments (RCTs) have been conducted, surrogate measures rather than cardiovascular events as direct outcomes following periodontal treatment have been investigated with the exception of one study. Studies investigated in this review also have not demonstrated a “dose-response” outcome comparing results with various magnitudes of periodontitis, demonstrating those with more severe periodontal disease would have a greater prevalence of cardiovascular disease. The criterion of “biological plausibility,” however, clearly has been met, as elevated levels of inflammatory cytokines are present during both periodontitis, and cardiovascular disease and several plausible mechanisms have been demonstrated in previous studies. The criterion of “coherence” also has been previously met as numerous biological, animal, and human studies have well established that a relationship exists between periodontal disease and cardiovascular disease. “Experiment” has failed to demonstrate consistent results through RCTs and SRs/MAs of these studies, particularly since the only positive experimental results have used surrogate measures rather than direct cardiovascular events as outcomes. Finally, the last criterion of “analogy,” although the weakest, was not explored in this review. Thus, of the 9 criteria, only 2 (biological plausibility and coherence) can be said to have been fulfilled. Table 7 summarizes these results.

Therefore, based on this analysis, it is concluded that there is not sufficient evidence to support a causal relationship between periodontal disease and cardiovascular disease.

**Table 7. Bradford Hill criteria results**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Met</th>
<th>Not met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength of association</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Consistency</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Specificity</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Temporality</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Dose-response</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Biological plausibility</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Coherence</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Experiment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analogy</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**CONCLUSION**

Based on findings from the 7 SRs/MAs investigated in this current review, one can state with confidence that the answer to the PICO question, “For adults in good general health who are diagnosed with periodontal disease, will receiving non-surgical periodontal therapy (NSPT), as compared to not receiving NSPT, lower their risk for cardiovascular diseases?” is “No.” Current evidence does not support NSPT for reducing the rate of cardiovascular events. Numerous issues exist with published studies that may have influenced these results. Future studies will need to focus on correcting these inconsistencies, particularly by identifying 1) a standard case definition of periodontal disease, 2) the type and frequency of the intervention, 3) the target population, and 4) measuring the effectiveness of the intervention.

While it has been well established in 2 previously published CDHA position papers that an association exists between periodontal disease and cardiovascular diseases, neither of those papers investigated the nature of that association. This position paper explored the possibility that periodontal disease is causally related to cardiovascular...
disease by investigating whether sufficient evidence exists that NSPT lowers the risk of a cardiovascular event. The results of this paper provide clear evidence that, although an association exists, the nature of that link remains unknown. There is insufficient evidence at this time for that association to be causal. Nonetheless, clients should continue to be provided with appropriate dental hygiene care and educated on the benefits of good oral hygiene. The results of this study will enable the dental hygiene practitioner to clarify the nature of this relationship with their clients based on the most current research.

ACKNOWLEDGEMENTS:
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CONFLICTS OF INTEREST
The authors have declared no conflicts of interest.

REFERENCES


Recommendations for approaching the introduction section of manuscripts and grant applications

Arnaldo J Perez*, PhD; Sharon M Compton§, PhD, RDH; Jacqueline L Green*, BA(Hon), MSc; Maryam AminΔ, DMD, MSc, PhD

ABSTRACT
Research on dental and dental hygiene education is key to improving learning, teaching, and oral health care in academic dental institutions. Faculty should be able to write research proposals and reports properly to secure funding for research and share the findings of studies with stakeholders. Specifically, they should demonstrate why the study matters in the introduction section of their text. Our experience in mentoring dental and dental hygiene faculty shows that some have difficulty justifying the importance of their studies due to the way they approach the introduction section. This short communication provides 3 recommendations to help faculty approach and write this section adequately, which can be useful for writing other sections of manuscripts and grant applications.

RÉSUMÉ
La recherche sur l’éducation en matière d’art dentaire et d’hygiène dentaire joue un rôle clé dans l’amélioration de l’apprentissage, de l’enseignement et des soins de santé buccodentaire dans les établissements universitaires dentaires. Le corps professoral devrait pouvoir rédiger des offres de service et des rapports de recherche de façon adéquate en vue d’obtenir du financement pour la recherche et de partager les résultats des études avec les parties intéressées. Plus précisément, il devrait démontrer l’importance de l’étude dans l’introduction de ses textes. Notre expérience en matière de mentorat du corps professoral de l’art dentaire et de l’hygiène dentaire montre que beaucoup de personnes ont de la difficulté à justifier l’importance de leurs études en raison de la façon dont ils abordent la section d’introduction. Ce bref article fournit 3 recommandations qui aideront au corps professoral à aborder cette section et à la rédiger de manière adéquate, ce qui peut être utile lors de la rédaction d’autres sections de manuscrits et de demandes de subventions.

Keywords: academic writing, introduction section, research report

CDHA Research Agenda category: capacity building of the profession

INTRODUCTION
The Educational Research & Scholarship Unit (ERSU) in the School of Dentistry at the University of Alberta supports faculty members and graduate students from the Doctor of Dental Surgery and Dental Hygiene programs in designing, conducting, and reporting educational research. A common issue found when reviewing drafts of manuscripts and grant applications is that very often the introduction section is not properly developed. This section defines the scope, context, and relevance of the study. Similar to what has been previously reported, ERSU staff have found that introductions may not 1) follow conventional structures, 2) summarize what is currently known and unknown about the study topic, 3) highlight limitations of previous studies, 4) elaborate on the importance of addressing the identified research gap(s), 5) define key concepts, and 6) clearly state the study purpose or research question. This may come as a surprise as many resources, including journal guidelines for authors and reporting checklists, have been developed to help researchers write academic articles.

It can be argued that some researchers may not be aware of these resources or may not act accordingly when writing research papers. However, the experience of ERSU staff suggests that a common reason for not writing introductions properly relates to how this section is frequently approached. For example, senior researchers may ask graduate students to write the introduction

PRACTICAL IMPLICATIONS OF THIS RESEARCH
• Writing the introduction section of manuscripts and research proposals properly is essential to securing funding for research and sharing the findings of projects with stakeholders (e.g., students, clients, decision makers, and other researchers).
• The authors offer 3 concrete recommendations on how to approach the introduction section and the specific elements (e.g., practical problem, gap, and importance of addressing the research gap) that must be developed.
section because they believe it is the easiest section to write. This view is in contrast with the opinion of experts in academic writing who consider the introduction of research manuscripts to be one of the most difficult sections to develop. Additionally, staff have noticed that introductions are often hastily written and occasionally tailored to study results to overrate the contributions of the studies. Indeed, common pitfalls in writing introductions include providing poor definitions of study objectives and questions and exaggerating the study contribution.

**HOW TO APPROACH INTRODUCTIONS PROPERLY**

Providing researchers, especially novice researchers, with resources to write manuscripts properly is key to enhancing their academic productivity. However, current resources commonly discuss what needs to be included in this section (e.g., problem, research gap, importance of addressing the identified research gap, and study objective) and not necessarily other important aspects of the craft of writing good introductions, including how to approach this section. Here are 3 recommendations to improve the introduction section of research manuscripts and grant applications in order to demonstrate the actual relevance of the study in the context of what is currently known.

**Recommendation 1: Be aware of the complexity of the introduction**

Introductions briefly summarize what is known about the study topic, clearly state the knowledge gap that the study aims to address, formulate the aim(s) of the study, and highlight the importance of addressing the identified research gap. None of these aspects is easy to define, especially if researchers are unfamiliar with the existing literature. It is unlikely that a novice researcher can get a sense of what is known and the importance of addressing some unknowns by reading a few papers on the study topic. This task becomes even harder if they are not informed by senior researchers and reference librarians about the relevant literature, including key journals, leading authors, and seminal publications. Additionally, determining what has been empirically documented may not be sufficient since being aware of theoretical and methodological gaps is also important for grasping the state of the art in a research area. The decision of whether the study will primarily tackle an empirical, methodological, and/or theoretical gap is not trivial and requires a high level of expertise. For example, addressing an empirical knowledge gap may imply producing new knowledge or producing sufficient knowledge on the same issue to understand factors that may remain important across samples and situations. The assessment of how much “replication” is needed to achieve an acceptable level of knowledge in a study area is subtle and complex.

When writing introductions, it is important to keep in mind that research is not a personal, but rather a collective enterprise. A proper research gap is not what one does not know, but what the community of researchers investigating the study topic does not know. Research is a social activity in 2 important senses. First, it directly or indirectly involves others; second, it is primarily committed to advancing collective knowledge.

**Recommendation 2: Write applied introductions**

For the most part, dental and dental hygiene education research are applied areas of research, so they are primarily concerned with the practical application of scientific knowledge. Introductions to applied science projects should be written accordingly. The practical problem researchers want to address and how the study will help address that problem should be clearly defined. ERSU experience suggests that faculty may struggle to properly define one or the other and sometimes both. For example, they may justify the use of problem-based learning by alluding to the limitations of traditional teaching methods and the benefits of active learning strategies to facilitate understanding of key concepts in a given content area. However, the relevance of the study may not be fully demonstrated unless they also indicate the importance of learning these concepts (why they matter) and the difficulties that students often encounter when trying to understand them (the practical problem). Implementing new methods of teaching for the sake of their “inherent” benefit may be irrelevant if either the content to be learned is not important or there is no indication that students are having difficulties grasping the content in question. Evidence, as opposed to anecdotal experiences, should be provided to support the position that the problem under consideration exists, is relevant, and has not been sufficiently understood.

Structuring introductions around broad problems as opposed to the practical problem that the study aims to address is another common mistake. Introductions are not extensive reviews of the literature, so unnecessary background information should be removed to make manuscripts clear and concise.

**Recommendation 3: Seek and consult available resources**

Given the complexity of writing introductions, novice researchers should be proactive in consulting resources (e.g., books, articles) on academic writing, participating in workshops on this topic, and seeking the mentorship of senior academics. A good idea before engaging in writing is to read articles, especially introductions, of high-quality papers published in high-impact journals or in the target journal. These readings help the writer understand how proper introductions are structured and how authors nicely walk readers from the description of a practical problem to the study objective. Additionally, developing and discussing the outline of the introduction with members of the research team is critical. Besides improving the quality of introductions, these discussions are opportunities for novice researchers to become aware of general (e.g.,
background, research gap, and objective) and specific (e.g., problem, traditional approach and its limitations, new approach and its advantages, research gap, and objective) structures of introductions. The experience of ERSU staff suggests that junior faculty appreciate these discussions, learn a great deal from them, and feel more confident in subsequently developing first drafts.

Manuscripts should be written with a journal and an audience in mind. The final goal of publishing is to contribute to an ongoing conversation on the study topic. Consequently, it is important to read and follow the instructions for authors of the target journal carefully. Additionally, consulting quality assessment checklists (e.g., Newcastle–Ottawa Scale for non-randomized studies) and reporting checklists (e.g., Consolidated criteria for reporting qualitative research) is also recommended. The former allow researchers to assess the quality of their work, while the latter allow them to assess the quality of their report.

CONCLUSION

To write proper introductions, it is important to know what should be included in this section and how to approach it. As discussed throughout this article, researchers should be aware of the complexity of the introduction, structure it around the practical problem the study aims to address, and make use of available resources to improve academic writing. These recommendations also apply to the writing of other sections of manuscripts and grant applications. In a context where publishing is becoming increasingly difficult, the quality of the report is as important as the quality of the study.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

REFERENCES

2. UK EQUATOR Centre. Enhancing the Quality and Transparency of Health Research [EQUATOR] [Internet] [cited 2018 Sept 20]. Available from: http://www.equator-network.org/library/
6. Katz MJ. *From research to manuscript.* New York, USA: Springer; 2009.
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Dentistry and the pregnant patient

By Daniel Ninan, DDS
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INTRODUCTION
You may be drawn to this book from the bookstore shelf or from a website due to its appealing physical features. The book sports a soft, purple cover featuring a pregnant woman’s silhouette and a clearly stated title. Upon opening it, you will view a concise table of contents consisting of 7 chapters, appendices, and an index. Each chapter contains key points, subtitles, charts, and tables along with a robust list of references. All the chapters are designed for easy reading and quick searches. Important information is found in highlighted boxes, tables, and figures, all of which are presented in a colourful manner with titles and subtitles.

The author, Daniel Ninan, DDS, is also a coauthor of a neonatal study published in the Journal of Obstetrics, Gynecology, and Neonatal Nursing. At the time of book publication, he was an assistant professor of dental education services at Loma Linda University School of Dentistry. Dr. Ninan maintains a dental practice in San Bernardino, California, and is active in organized dentistry, serving on the Tri-County Dental Society’s New Dentist Committee and Communication Committee, as well as on committees and councils within the SAC Health System, which offers affordable health care services particularly to uninsured individuals and their families.

The book’s intent is to be a quick reference guide on how to maximize the safety of the pregnant woman and her unborn child while performing dental procedures. The author shares his observations about dental professionals who are reluctant to treat pregnant clients for fear of causing harm to either the unborn baby or the expectant mother. The book can be used by oral health professionals such as dentists and dental hygienists. Further, the author feels that other health professionals such as nurses would find the book useful for consultations with their pregnant clients and possible dental referrals.

CHAPTER OUTLINES
In chapter 1, “Perceptions about dental treatment during pregnancy,” the author describes the perceptions of the dental or prenatal care provider as well as the pregnant woman’s perceptions of and attitudes towards dental office visits. He highlights an absence of dental referrals and a common perception of dental treatment as unsafe during pregnancy.

Under subheadings in chapter 2, “Considerations for treating pregnant patients,” the author lists circumstances and treatment options where consultation with the woman’s prenatal care provider is needed for dental treatment and indicates which trimester is best suited for routine dental treatment.

Chapter 3, “Complications and the impact of dental care,” categorizes the physiological changes during pregnancy and how dental treatment may need to be modified to account for them.

Chapter 4, “Procedures and treatment guidelines,” describes safety concerns pertaining to dental restorative and preventive treatments. Radiographs, filling materials, scaling and root planing safety form the first half of the chapter whereas prevention of oral diseases through nutritional counselling and self-care for the pregnant client forms the last half.

The final 3 chapters delve into the details of possible medications pregnant women can and cannot use whether in the care of their perinatal health care provider or the dental professional.
ANALYSIS

Our immediate question when opening the book was why the title and the table of contents are focused on pregnancy and do not include pre- and post-natal stages. The term commonly used is “perinatal,” meaning the time before, of, and after birth. After perusing the book, we found short mentions of pre- and post-pregnancy information embedded in the chapters. Nonetheless, as clinicians with experience in perinatal programs, we felt the book should have been titled Dentistry and the perinatal patient and included all stages of pregnancy in its content.

Even though the purpose of the book is to alleviate the fears of dental professionals who are hesitant to treat perinatal women, it unfortunately has the opposite effect. The risks associated with treating pregnant women are presented in a tone of fear, and there are numerous recommendations for pregnant clients to contact their health care provider before or during dental treatment. The chapters thunder on about what could go wrong, with the resulting message that pregnancy is something about which to be concerned. In chapter 2, there is an unsettling background tone of worry generated by titles and subtitles such as “Emergency…,” “Urgent…,” “Necessary…,” “Effective…,” “Safety Considerations,” “Consequences…,” etc. Chapter 3 continues in the same alarming tone, discussing the physiological changes during pregnancy and emphasizing the complications a dental or health professional may observe rather than the normality of pregnancy. This approach makes one ponder if dental professionals would actually want to see and treat a pregnant client.

In chapter 6, medications not to be used during breastfeeding are discussed, which prompted us to ask why the post-pregnant woman would consult a dentist about this medication and not her physician or health specialist in the first place.

The book applies a clinical treatment focus to pregnancy. Very little of the book is devoted to preventive dental care and to special considerations women may have during their pregnancies. For example, chapter 4 has a disappointingly short few paragraphs devoted to preventive education for infant oral care. In contrast, there is plenty of information about guidelines for children’s caries treatment. We discussed this aspect of the book and both concluded that having children is a natural stage in a woman’s life and should be treated as such rather than as a potential risk factor for disease.

On the positive side, the book includes information that may be new to some dental practitioners or a knowledge refresher for others. Tables summarize categories of treatment and medications. However, one of the limitations of using textbooks as a source of evidence is the currency of the information. The author provides a comprehensive list of references to a variety of good sources: systematic reviews, primary research papers, peer-reviewed literature reviews, professional and government white papers, as well as expert edited textbooks. Yet the most recent reference publication date was 2012, even though the book was published in 2018. Further, most of the information found in this book could be accessed via free online peer-reviewed journals or professional websites that offer expert, evidence-informed guidelines. A good example of the latter is found in the appendices. Both the Sample Consult Forms and the Caries Risk Assessment Form from the American Academy of Pediatric Dentistry and American Dental Association are updated frequently. The forms included in this textbook are already outdated. The appendices also contain a list of recommended websites. We randomly chose a few and found many inactive links.

CONCLUSION

This book tends to treat pregnancy as an exclusively clinical condition rather than as part of the normal life cycle of most women. Furthermore, the dearth of information about prevention before, during, and after pregnancy limits its value to dental hygienists. For dental or other health care providers to keep abreast of the oral care needs of their perinatal clients, we recommend saving your money and not buying the book. Instead, review recent, updated primary sources in journals and on reputable professional websites. If there are safety concerns about a specific therapy, consult with the client’s perinatal health care providers before proceeding.

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