CANADIAN JOURNAL OF DENTAL HYGIENE · JOURNAL CANADIEN DE L'HYGIÈNE DENTAIRE
THE OFFICIAL JOURNAL OF THE CANADIAN DENTAL HYGIENISTS ASSOCIATION

CJDH JCHD

QUARTERLY ISSUE · AUGUST 2013 VOL. 47, NO. 3

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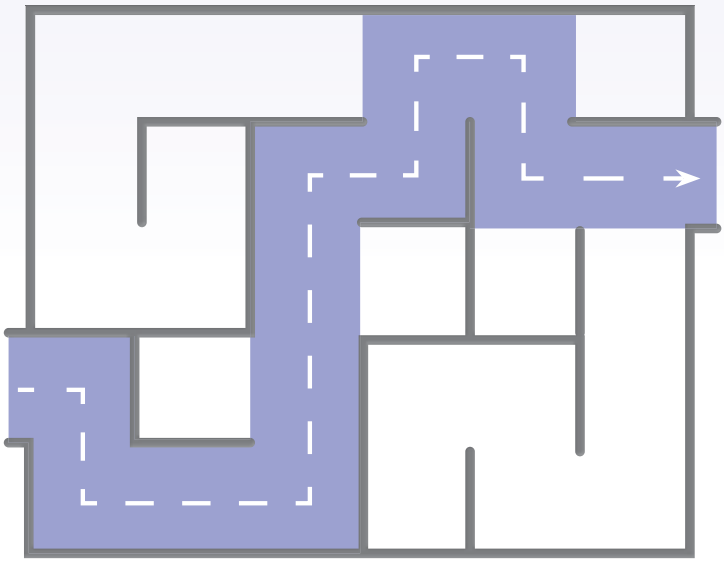

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Published four times per year: February, May, August, and November.
Current volume 47, issues 1–4
Canada Post Publications Mail #40063062.

CANADIAN POSTMASTER
Notice of change of address and undeliverables to:
Canadian Dental Hygienists Association
96 Centrepointe Drive, Ottawa, ON K2G 6B1

SUBSCRIPTIONS
Annual subscriptions are $90 plus HST for libraries and educational institutions in Canada; $135 plus HST otherwise in Canada; C$140 US only; C$145 elsewhere. One dollar per issue is allocated from membership fees for journal production.

ADVERTISING
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CDHA 2013
6176 CN ISSN 1712-171X *(Print)*
ISSN 1712-1728 *(Online)*
GST Registration No. R106845233

Canadian Journal of Dental Hygiene is indexed in the databases of: CINAHL; EBSCOhost; ProQuest; Thomson Gale

The *Canadian Journal of Dental Hygiene (CJDH)* is the official peer reviewed publication of the Canadian Dental Hygienists Association. The CDHA invites submissions of original research, discussion papers and statements of opinion of interest to the dental hygiene profession. All manuscripts are refereed anonymously. Bilingual *Guidelines for Authors* are available at www.cdha.ca/AM/Template.cfm?Section=Publications

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Conferences are vital to professional practice

Katherine Zmetana, DipDH, DipDT, EdD

Scientific Editor, CJDH

CDHA's 50th anniversary conference, fast approaching, provides an opportune moment to reflect on the contribution of professional conferences to our working lives. The question of whether to attend may be pressing on your mind. Can you really afford to go? Can you really afford not to? The answer is evident: Attending a conference is something that you owe to yourself and to others in your profession.

First and foremost, the CDHA national conference showcases the dental hygiene profession to the Canadian public. Your attendance demonstrates your moral commitment to both the profession and the association. In addition, you experience the many aspects of professional practice outside the confines of the office walls, meeting face-to-face with distant colleagues, scientific and academic experts, faculty and students, public health and government administrators, office staff, and product suppliers. Attending a conference can be unquestionably the most enjoyable way of earning continuing education credits, but there is much more to it than that.

One of the prime reasons for attending any conference is to listen to the presentations, of which there are two major types: 1) scientific papers and poster sessions, which have been chosen by an evaluation team according to impact and relevance to dental hygiene; and 2) invited speakers who present on hot topics of current interest to dental professionals. In addition, pre-conference workshops allow participants to maintain and develop new skills, to interact with experts and colleagues, and to initiate conversations that can continue throughout the conference or later at home through social media.

However, presentations are not the only learning opportunity available to participants. You learn a great deal simply from speaking to others—attendees, presenters, exhibitors, staff—who occupy the same professional role as you or work in a related field. You can discover other professional development opportunities as well as career paths of which you may not have been aware. Look into ways to diversify, intensify, and accelerate your career. Consider where you want to be in 5, 10 or 20 years, then look to people you admire and find out how they got to where they are.

If you are well versed in dental hygiene, feel current in knowledge and practice, and have been to several conferences, then make a commitment to be one of those "others" who "pay it forward," sharing your knowledge with those who haven't had your experiences. Obligate yourself to meet new people, participate actively in discussions, and ask thought-provoking questions. You will contribute as much to the conference as you will receive if you make the commitment to do so and clarify your goals.

Another excellent venue for learning at a conference is in the exhibit hall. If you don't discover any new products or services, you still have the opportunity to investigate what the vendors are saying and how they are marketing their products. You may discover key concerns of vendors or clients about a specific product, while also getting tips on communicating with clients or speaking to the general public. Evidently, an additional benefit is in the free samples of commercial products that are offered for you. Use them to do some preliminary research yourself, testing the products to see if they deliver what they promise. Give vendors feedback about your successes and your concerns, special procedures, and techniques as they relate to professional practice needs. Get the references and resources to back up the claims, include your personal insights, and pass that information on once back at the office.

The *Canadian Journal of Dental Hygiene* will also be represented at the conference. You will have the opportunity to find out more about scientific research, writing, and how to get published in a scholarly journal. Meeting and speaking informally with published authors who have gone through the rigours of submission and peer review can provide you with even more insight than speaking to acknowledged experts. You'll discover that publishing your research or clinical findings in *CJDH* is one of the best ways to share your knowledge and expertise with your colleagues across the country.

Remember also that you are allowed to have fun. The formal structure of conferences doesn't mean that you have to take everything seriously. In fact, the more you relax and enjoy, the more you will get out of the experience. Become familiar with the city; take some time to do some sightseeing and shopping. If Toronto is your home town, see the city through a tourist's eyes and share your best secrets. Rediscover what is new and fun in your own backyard.

At the conference, challenge yourself to find out one thing you didn't know before, try out a product you've

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never heard of, meet one new person, talk to one specialist you'd like to get to know, share at least one idea or opinion, and go to one place you've never been. Write down one positive thing about being at the conference, and buy one special memento that will remind you of your trip.

Finally, once the event is over, make a contribution. If you enjoyed a presentation or a paper, e-mail the presenters later and tell them so. Write a Letter to the Editor or submit a paper to the *CJDH* for consideration. Successful or not, you will have had the opportunity to express yourself and your work and get feedback from experts. It will improve your communication skills and will also have a positive impact on your practice at home.

Above all, allow yourself to enjoy being a dental hygienist. Think about it: Where else can you mix with so many people who, like you, are just as interested in making a difference in the world, one smile at a time?

In this issue, we offer a foretaste of the content featured at CDHA's 50th anniversary conference. You will find the abstracts of the scientific presentations by up-and-coming as well as accomplished researchers on pages 139–45. **Dr David Clark** (p. 135), invited speaker, provides this issue's short communication on the role of HPV in oropharyngeal squamous cell carcinoma. We also present research on the differences between bachelor's degree and diploma education in dental hygiene by **Dr Susanne Sunell**, **Rae McFarlane**, and **Heather Biggar** (p. 109), recipients of the 2013 *CJDH* Research Award. **Ariel Tsui** (p. 123) evaluates the readiness of recent dental hygiene graduates for web-based continuing education. **Sandy Lawlor's** editorial (p. 105) underlines the importance of advocacy in shaping the future of the profession.

In addition, in this anniversary year for CDHA and for dental hygiene worldwide, **Dr Sunell** (p. 149), former scientific editor of *CJDH*, comments on the evolution of dental hygiene research in Canada over the past 50 years. **Marilyn Goulding** (p. 147) and **Stephanie Nagle** (p. 146), also past editors, offer their insights into the evolution of the journal from its early days. I have had the opportunity as scientific editor to carry on the excellent work begun by the editors before me and to see even more changes brought about by open access, online publishing, and our commitment to mentoring new authors and supporting both quantitative and qualitative research. I am honoured to build on the strong foundation of research and sharing that was started almost 50 years ago in support of the very rewarding profession of dental hygiene.©CDHA

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The dental hygiene profession: Predicting the future by creating it

Sandy Lawlor, RDH, BA(Psych), BSW

CDHA President

When I was in a friend's office recently, a sign on the wall caught my eye. It read, "The best way to predict the future is to create it" (no author cited). In 2013, as we celebrate one hundred years of dental hygiene and fifty years of the Canadian Dental Hygienists Association (CDHA), I find myself drawn back to that message time and time again. Reflecting on the profession's past achievements, it is clear that we have witnessed so many advances. Dental hygiene has developed into a primary health care profession with an expanded scope of practice. For example, dental hygiene-specific research is now being carried out. Furthermore, dental hygienists are now working collaboratively within interdisciplinary health care teams. As we trace the history of dental hygiene, it is evident that dental hygienists have predicted the future of their profession by creating it—and at the heart of that creative spirit and determination is advocacy.

Professions are defined by many elements including the establishment of local and national associations, a comprehensive education program, licensure or self-regulation, and the development of a code of ethics.[1] Over the past fifty years, the quest for professional recognition has been paramount in the evolution of the dental hygiene field in Canada, as illustrated by several important milestones.

In 1963, several alumnae from the School of Dental Hygiene at the University of Toronto had a vision and were determined to organize dental hygiene graduates in Canada on a national basis.[2] Their efforts resulted in the establishment of the CDHA, whose mission is to assist members in providing quality preventive and therapeutic oral health care while promoting good overall health for the Canadian public.[3]

Later, many insightful Canadian dental hygienists wanted to develop a certification process for the profession. As a result, in 1982, the CDHA began to explore a process of national certification that would make it easier for dental hygienists to move from one jurisdiction in Canada to another without having to become licensed or registered again with each move.[4] Through hard work and determination, the National Dental Hygiene Certification Board (NDHCB) was created in 1994 to develop and administer the national certification examination. This process has been enhanced and strengthened by the development of entry-to-practice competencies and standards for Canadian dental hygienists.[5]

Dental hygiene associations across the country have also lobbied for and many have achieved

THIS IS A PEER-REVIEWED ARTICLE.
Correspondence to: Sandy Lawlor, CDHA President; president@cdha.ca

La profession d'hygiène dentaire : Prédire l'avenir en le créant

Sandy Lawlor, HDA, BA(Psych), BSW

Me trouvant récemment dans le bureau d'un ami, un écriteau sur le mur a retenu mon attention : « La meilleure façon de prédire l'avenir, c'est de la créer » (auteur non mentionné). En 2013, nous célébrons le centenaire de l'hygiène dentaire et le cinquantenaire de l'Association canadienne des hygiénistes dentaires (ACHD). Cette citation me revient constamment à l'esprit. En réfléchissant sur les réalisations passées de la profession, il est clair que nous avons été témoins de très nombreux progrès. L'hygiène dentaire, qui s'est développée comme profession de soins de santé primaires, a maintenant un large champ d'exercice. Par exemple, la recherche spécifique en hygiène dentaire est devenue courante. Qui plus est, les hygiénistes dentaires travaillent maintenant en collaboration dans des équipes interdisciplinaires de soins de santé. En retraçant l'histoire de l'hygiène dentaire, il nous est évident que les hygiénistes dentaires ont prédit l'avenir de leur profession en la créant — et, au cœur de cet esprit créatif et de cette détermination se situe la promotion.

Beaucoup de facteurs définissent les professions, y compris l'établissement d'associations, locales et nationale, un programme complet de formation, un permis d'exercer ou l'autoréglementation et l'élaboration d'un code de déontologie.[1] Au cours des cinquante dernières années, la quête d'une reconnaissance professionnelle s'est avérée primordiale dans l'évolution du domaine de l'hygiène dentaire au Canada, comme l'illustrent plusieurs étapes.

D'abord, en 1963, plusieurs anciennes étudiantes de l'École d'hygiène dentaire de l'Université de Toronto, qui avaient eu une vision, décidèrent de réunir les diplômées en hygiène dentaire du Canada dans une organisation nationale.[2] Leurs efforts ont abouti à la création de l'ACHD, qui a pour mission d'aider les membres à dispenser des soins de santé buccale préventifs et thérapeutiques de qualité tout en promouvant la bonne santé générale dans la population canadienne.[3]

Ensuite, plusieurs hygiénistes dentaires canadiennes

CET ARTICLE A ÉTÉ ÉVALUÉ PAR LES PAIRS.
***Correspondance à :** Sandy Lawlor, présidente de l'ACHD; president@cdha.ca*

self-regulation. On June 1, 2013, dental hygienists in Newfoundland and Labrador became the latest province to achieve self-regulation under the *Health Professions Act 2010*,[6] bringing the total number of Canadian provinces that are now self-regulated to eight.

Finally, recognizing the need for its members to provide ethical health care services, the CDHA developed a Code of Ethics for the profession. Over the years this Code has been revised to meet the evolving nature of dental hygiene practices while also addressing ethical expectations that come with changing technological, social, and health care environments.[7] The most recent release of the CDHA Code of Ethics in June 2012 balances the association's Code with the requirements of the provincial and territorial regulatory authorities which have their own codes.

At the heart of these historic achievements of the dental hygiene profession lay the ability to advocate not only for the individuals within the profession but for the communities that they served. As dental hygiene enters its second century, advocacy will undoubtedly move in new directions. The costs of health care are escalating as are the costs of oral health care.[8,9] In 1998, the direct cost of oral health care ranked second only to cardiovascular disorders,[9] which has huge implications for disadvantaged Canadians who most often do not have the means to access oral health care.

Research is illustrating that good oral health and access to oral health services contribute to good overall health, especially where chronic conditions such as diabetes, respiratory ailments, and cardiovascular diseases are involved.[10] If the overall health of Canadians is improved because of good oral health, then health care costs may become more manageable.

As health care goes through increasingly difficult and evolving times, it will be important for dental hygienists to continue speaking up for ourselves and those we serve. Advocacy is hard work, which involves producing thorough analyses of issues, working collaboratively with many and varied stakeholders, and using the media strategically.[11] Dental hygiene has done some of these things remarkably well in the past, as evidenced by the opportunities that independent dental hygiene practices have had in providing care to the homebound and those in long-term care. While the profession is clearly able to go beyond traditional service delivery methods, we will most likely face challenges in the future.

Change is always challenging but it presents opportunities. Our past has illustrated that. As a new century beckons, I encourage all dental hygienists and dental hygiene professionals to envision a future where all Canadians will have access to affordable oral health care, as prevention is the key to a healthy life. Through various forms of advocacy we can play an active role in shaping our future rather than simply watching it unfold before our eyes. Given our proud past, it is clear that our profession predicted its future by creating it. With that knowledge and spirit, let's continue to build on this solid foundation.

perspicaces souhaitèrent élaborer une procédure de délivrance de certificats pour la profession. Il en est résulté qu'en 1982, l'ACHD entreprit d'explorer une procédure de certificat national devant faciliter aux hygiéniste dentaires le passage, au Canada, d'une juridiction à une autre sans avoir à obtenir un autre permis ni se réinscrire à chaque déplacement.[4] Grâce à un travail intense et à une vive détermination, le Bureau national de la certification en hygiène dentaire (BNCHD) était créé en 1994 pour élaborer et administrer l'examen du certificat national. Cette procédure a été améliorée et renforcée par la mise au point des compétences et des normes d'entrée en exercice pour les hygiénistes dentaires canadiennes.[5]

Les associations d'hygiène dentaire du pays ont aussi exercé des pressions et plusieurs ont obtenu le statut d'autoréglementation. Le 1er juin 2013, les hygiénistes dentaires de la province de Terre-Neuve et Labrador furent les plus récentes à obtenir l'autoréglementation sous la Loi sur la réglementation des professions de la santé, 2010,*[6] portant à huit le nombre de provinces canadiennes maintenant autoréglementées.*

Finalement, consciente du besoin pour ses membres de fournir des services de soins de santé éthiques, l'ACHD a élaboré un Code de déontologie pour la profession. Ce code a été révisé au fil des ans pour suivre l'évolution naturelle de l'exercice en hygiène dentaire, compte tenu des attentes déontologiques qui accompagnent l'évolution des environnements technologiques et sociaux et des soins de santé.[7] La diffusion la plus récente du Code de déontologie de l'ACHD, en juin 2012, de rajuster celui de l'association aux exigences des autorités régulatrices provinciales et territoriales qui ont leurs propres codes.

Au cœur de cette réalisation historique de la profession d'hygiène dentaire se trouve la capacité d'intervenir non seulement pour les membres individuels de la profession mais aussi pour les communautés que celles-ci servent. Comme l'hygiène dentaire aborde son deuxième siècle, l'intervention prendra certes de nouvelles orientations. Les coûts des soins de santé augmentent de même que ceux des soins de santé buccale.[8] En 1998, le coût direct des soins de santé buccale s'est classé second après celui des troubles cardiovasculaires[9] qui ont d'énormes conséquences chez les Canadiens désavantagés, ceux-ci n'ayant le plus souvent pas les moyens d'accéder à des soins de santé buccale.

La recherche illustre le fait qu'une bonne santé buccale et l'accès aux services de santé buccale contribuent à une bonne santé générale, lorsque des problèmes chroniques, tels le diabète, les affections respiratoires et les maladies cardiovasculaires sont impliquées.[10] Si la santé générale des Canadiens s'améliore à cause d'une bonne santé buccale, alors les coûts des soins de santé pourraient devenir plus raisonnables.

Comme les soins de santé traversent des temps d'évolution de plus en plus difficiles, il sera important pour les hygiénistes dentaires de continuer de parler franchement pour nous et les gens que nous servons. L'intervention est difficile. Elle implique l'analyse minutieuse des problèmes, le travail en collaboration avec plusieurs intervenants et l'utilisation stratégique des médias.[11] L'hygiène dentaire a remarquablement posé de tels gestes dans le passé, comme l'ont démontré les opportunités d'exercice indépendant de l'hygiène dentaire pour dispenser des soins à des patients retenus à la maison et à des cas de traitement à long terme. Alors que la profession est nettement capable d'aller au-delà des méthodes traditionnelles de prestation des services, nous devrons vraisemblablement affronter d'éventuels défis.

REFERENCES

1. Mieg HA. Professionalism and professional identities of environmental experts: the case of Switzerland. *Environmental Sciences*. March 2008;5(1):41–43.
2. Canadian Dental Hygienists Association. *Our history* [website]. Ottawa: CDHA; 2013 [cited 2013 Jul 22]. Available from http://www.cdha.ca/AM/Template.cfm?Section=History.
3. Canadian Dental Hygienists Association. *About CDHA* [website]. Ottawa: CDHA; 2013 [cited 2013 Jul 22]. Available from http://www.cdha.ca/AM/Template.cfm?Section=About_CDHA&Template=/CM/HTMLDisplay.cfm&ContentID=5146.
4. National Dental Hygiene Certification Board. *About the NDHCB* [website]. Ottawa: NDHCB; 2013 [cited 2013 Jul 22]. Available from http://www.ndhcb.ca/en/about.php.
5. Canadian Dental Hygienists Association. *Entry-to-practice competencies and standards for Canadian dental hygienists*. Ottawa: CDHA; January 2010.
6. *An Act Respecting the Regulation of Certain Health Professions*, SNL 2010 H-1.02.
7. Canadian Dental Hygienists Association. *Code of Ethics: Final Report*. Ottawa: CDHA; 2012. Available from http://www.cdha.ca/pdfs/Profession/Resources/Code_of_Ethics_EN_web.pdf.
8. Canadian Institute for Health Information. *Health care cost drivers: The facts*. Ottawa: CIHI; 2011.
9. Health Canada. *Report on the findings of the oral health component of the Canadian Health Measures Survey, 2007–2009*. Ottawa: Minister of Health; 2010.
10. Pickett FA. Discussion of strength of science related to oral-systemic links. *Can J Dent Hygiene*. 2012;46(2):89–90.
11. Johnson SA. Public health advocacy. Edmonton: Healthy Public Policy—Alberta Health Services; 2009. p. 2.

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S'il comporte toujours des défis, le changement présente aussi des opportunités. Notre passé le démontre. À l'aube d'un nouveau siècle, j'encourage toutes les hygiénistes dentaires et les professionnelles de l'hygiène dentaire à entrevoir un avenir où toute la population canadienne aura accès à des soins de santé buccale abordables, la prévention étant la clé d'une vie en bonne santé. Par diverses formes d'intervention, nous pouvons façonner notre avenir plutôt que regarder simplement ce qui se déroule sous nos yeux. Compte tenu de notre fier passé, il est clair que notre profession peut prévoir son avenir en le créant. Avec nos connaissances et notre esprit, continuons de construire sur notre assise solide.

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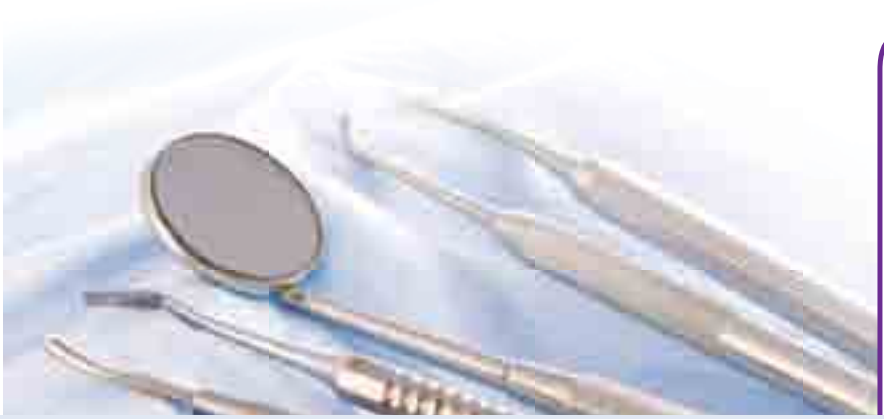

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Differences between diploma and baccalaureate dental hygiene education: A quantitative perspective

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ABSTRACT

Introduction: In March 2012, British Columbia's Ministry of Health approved a new registration category for dental hygienists. The associated College of Dental Hygienists of British Columbia bylaw included 4 competencies that registrants were required to meet at the 4th-year baccalaureate degree level. **Purpose:** To identify the differences, if any, between diploma and baccalaureate degree education with regard to the 4 legislated abilities. **Methods:** An online survey including closed- and open-ended questions was conducted with registrants who had entered practice with a diploma and then earned a baccalaureate degree. This article focuses on the quantitative data arising from the survey. **Results:** A conservative analysis of available data suggests the study had a 51% response rate (n=123). Fifty per cent or more of the respondents indicated that their abilities in each of the 4 required competencies had improved as a direct result of their baccalaureate education. The *improved* ratings ranged from 50% to 89% with the abilities in critical thinking, problem solving, and research use being rated as the highest areas of change. Two statistically significant differences were found with regard to years of practice (p=0.02, p=0.04); three were found related to years since graduation from university (p value ranging from 0.01 to 0.04). These results are not believed to be of practice significance. No differences were found in the ratings between 2-year and 3-year diploma graduates. **Discussion and Conclusion:** The differences between diploma and baccalaureate education within the context of the 4 required competencies were largely expressed through cognitive abilities including critical thinking, problem solving, and research use. Both the knowledge base and the practice judgements of respondents were expressed as being improved with degree education. The outcomes of this study highlight the importance of baccalaureate education in supporting evidence-based decision making by dental hygienists.

RÉSUMÉ

Contexte : En mars 2012, le Ministère de la santé de la Colombie-Britannique approuvait une nouvelle catégorie d'inscription pour les hygiénistes dentaires. La réglementation associée du Collège des hygiénistes dentaires de la Colombie-Britannique comprenait 4 compétences que les personnes inscrites devaient avoir acquises au niveau de la licence de 4e année. **Objet :** Identifier les différences de formation, le cas échéant, entre le diplôme et la licence concernant 4 capacités législatives. **Méthodes :** Un sondage en ligne, comprenant des questions fermées et ouvertes, a été effectué auprès des personnes inscrites qui avaient entrepris la pratique avec un diplôme et celles qui avaient obtenu une licence par la suite. Cet article se concentre sur les données quantitatives résultant du sondage. **Résultat :** Une analyse conservatrice des données disponibles suggère que l'étude avait eu un taux de réponses de 51% (n=123). Cinquante pour cent ou plus des répondantes ont indiqué que, dans chacune des compétences requises, leurs capacités s'étaient améliorées, comme résultat direct de leur formation de premier cycle. Les taux d'*amélioration* variaient entre 50% et 89% selon les capacités de pensée critique, de résolution des problèmes et d'utilisation de la recherche jugée comme étant le secteur du changement le plus élevé. Deux différences statistiquement significatives ont été constatées concernant les années de pratique (p=0,02, p=0,04); trois semblaient reliées aux années écoulées après le diplôme universitaire (la valeur p variant entre 0,01 et 0,04). L'on ne croit pas que ces résultats soient significatifs de la pratique. L'on n'a pas trouvé de différence entre les résultats chez les diplômées de 2 et 3 ans. **Discussion et Conclusion :** La différence de formation entre les degrés du diplôme et de la licence dans le contexte des 4 compétences requises s'exprimait grandement par les capacités cognitives, incluant la pensée critique, la résolution des problèmes et l'utilisation de la recherche. L'amélioration de la base de la connaissance et des jugements de la pratique des répondantes s'exprimait selon le niveau de formation. Les résultats de cette étude soulignent l'importance de la formation du premier cycle pour soutenir la prise de décision fondée sur l'évidence par l'hygiéniste dentaire.

Key words: outcomes assessment, competencies, dental hygienists, dental hygiene education, baccalaureate degree, dental hygiene degree

INTRODUCTION

In March 2012, British Columbia's Ministry of Health approved a new "Full Registration (365 Day Rule Exempt)" registration category for dental hygienists, which enables specifically qualified dental hygienists to provide oral care for clients in a variety of settings without requiring a dental exam by a dentist (http://www.cdhbc.com/News--Events.aspx). The bylaw identified 4 competencies that registrants in this new category had to demonstrate to a 4th-year baccalaureate degree level. The required abilities included a focus on:

THIS IS A PEER-REVIEWED ARTICLE AND WINNER OF THE 2013 *CJDH* RESEARCH AWARD. Submitted 31 May 2013; revised 26 June 2013; accepted 15 July 2013.

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Table 1. Competencies from CDHBC Bylaw, Section 40(1)(c)iii*

Legislated competencies
A. ability to safely and effectively perform a needs assessment, develop a dental hygiene diagnosis and plan, implement and evaluate dental hygiene care, for clients with complex needs or disabling conditions;
B. ability to work effectively as a member of an interprofessional health care team;
C. ability to apply the standards of infection control and safe practice in alternative practice settings; and
D. ability to make appropriate and timely referrals through the identification of abnormalities, conditions and circumstances which are outside the scope of dental hygiene practice or limit the registrant's ability to provide safe dental hygiene care.

*http://www.cdhbc.com

- implementing the process of care for clients with complex needs or disabling conditions;
- working in interprofessional teams;
- applying standards of safe practice in diverse settings; and
- making effective referrals (see Table 1).

The bylaw also identified other criteria that needed to be met, including but not limited to 3500 practice hours and cardiopulmonary resuscitation certification at the health care provider level.

The College of Dental Hygienists of British Columbia (CDHBC) is responsible for regulating the profession of dental hygiene in the province. Its mission is to protect the public by developing, advocating, and regulating safe and ethical dental hygiene practice. The bylaw's focus on abilities related to the 4th-year of undergraduate education suggests that the CDHBC needed to identify the differences, if any, between diploma and baccalaureate degree education in relation to the 4 required competencies. To address this question, an online survey was conducted in June 2012 to obtain the views of registrants who had earned a baccalaureate degree after entering practice with a diploma education. This article presents the quantitative data gained from the survey; the analysis of the qualitative data will be discussed in a separate article. While the focus of this study is on the 4 required competencies, the results provide important insights into diploma and baccalaureate education in Canada.

The new "365 Day Rule Exempt" registration category triggered discussion among the registrants in British Columbia, revealing divergent views on the bylaw's wording. Some expressed the opinion that there were no differences between diploma and baccalaureate dental hygiene education in the 4 required areas; others believed that differences existed. However, there was little evidence to guide regulatory decisions. In a recent study[1] of dental hygienists in Texas (n=175; 35% response rate), 46% of respondents indicated that they were *not prepared* to provide care for bedridden patients and 34% were *not prepared* to provide care for institutionalized patients. When the new bylaw was passed, there were 102 registrants in British Columbia with the ability to practice as primary care providers without the requirement of a dentist's examination within 365 days (http://www.cdhbc.com). The reported lack of registered complaints involving dental hygienists could not be taken as solid evidence that all registrants had demonstrated the required abilities in primary practice settings at a baccalaureate level.

A review of the CDHBC's 4 required competencies identified a strong focus on abilities commonly associated with client safety and better health outcomes. Client safety issues have been prominent in health care discussions and policies for over a decade. Observations related to the Severe Acute Respiratory Syndrome (SARS) incident in 2003 and other factors resulted in the creation of the Public Health Agency of Canada (PHAC) as a separate entity under the federal health portfolio in 2004.[2] One of the first initiatives of PHAC was to develop core public health competencies with a focus on client safety and better health outcomes.[2] It supported the development of discipline-specific core competencies, which led to the establishment of the discipline competencies for dental public health in Canada.[2]

The work of both PHAC[2,3] and the Canadian Association of Public Health Dentistry (CAPHD)[4] reflects the literature in the area of client safety. The concept of client safety is now being explored through the lens of the social determinants of health in recognition of our broader understanding of the influences affecting health outcomes.[5,6] Prior to this shift, discussions about safety largely focused on procedural and technical aspects of care, particularly those related to acute care.[7] The discussions now focus on critical thinking, research use, communication, collaboration, coordination, and health promotion.[7–14] The resources being expended for the development of interprofessional education (IPE) are an example of this shift. It was discovered that clients were at risk because health care providers were working in isolation, in their "silos."[15–19] Clients were adversely affected because of the failure of professionals to communicate and coordinate their care. This focus on client safety is an international one; the World Health Organization is also active in articulating the abilities required of health professions in the 21st century.[20]

The focus on IPE to support client safety and better health outcomes initiated discussions on shared curriculum among health professionals.[18–22] In their initial work, Verma et al.[22] identified common curriculum in the health professions through their "harmonizing"' model which directed attention to the following abilities:

- communication
- cooperation
- collaborative practice
- consultation
- coordination

The abilities in this model also align with the literature on the generic outcomes of postsecondary education from a national[23–25] and international perspective.[26–34] This literature highlights the following abilities:

- communication;
- critical thinking and problem solving;
- interpersonal abilities (working with others);

- managing self (accepting responsibility, being flexible and adaptable); and
- learning independently (accessing information, using technology, numeracy, reading for comprehension and writing).

These abilities, often described as integral to all postsecondary education ranging from diploma to graduate programs, were also evident in the draft outcomes generated in 2000 through the work of the Canadian Dental Hygienists Association (CDHA) Task Force on Dental Hygiene Education.[35] This work was further explored in the study conducted by Dental Hygiene Educators Canada (DHEC).[36] The DHEC results suggested that the differences between diploma and baccalaureate dental hygiene education pertained to increased abilities in the following areas:

- thinking critically
- communicating and negotiating
- supporting research initiatives
- working in interprofessional teams
- facilitating change
- providing services in diverse practice contexts

The themes in the literature on generic postsecondary and health professional abilities have merged and blended with those associated with client safety and better health outcomes.

In 2007, the National Dental Hygiene Competencies for Entry-to-Practice[37] were developed under the direction of a steering committee of national organizations. It was deemed important to focus on foundational competencies for the dental hygiene profession given that an erosion of dental hygiene education was being observed.[38] The decision to focus on entry-to-practice abilities directed attention to curriculum at the foundational level and limited discussions about baccalaureate and graduate dental hygiene curricula. Discussions about program length and credentials were avoided altogether in order to emphasize the foundational abilities for entry into the profession. The faculties of dental hygiene programs are working with these competencies but no studies have been published on their interpretation, implementation or evaluation within current entry-to-practice programs.

There is a scarcity of literature exploring the outcomes of dental hygiene baccalaureate education. The studies that exist largely concentrate on the outcomes of completing such a degree from the perspective of employment options and educational pathways.[39–42] A more recent qualitative study by Kanji et al.[43] (n=16) described major themes reflective of the outcomes of baccalaureate education. They included:

- greater depth of knowledge
- increased abilities
- change in self-perception
- changed values

The change in self-perception reflected discussions about increased self-confidence and perceived credibility. The respondents also talked about their expanded knowledge base of the profession and their improved abilities in critical thinking, research use, and the delivery of comprehensive dental hygiene care.

More information was needed for CDHBC decision making. To this end the CDHBC initiated a study to explore the differences, if any, between diploma and baccalaureate dental hygiene education with a specific focus on the required abilities in the BC Bylaw.

METHODOLOGY

A letter of invitation to participate in the online survey was sent through the CDHBC and the University of British Columbia, which offers a baccalaureate degree completion option. Registrants who had entered practice with a diploma education and then subsequently earned a baccalaureate degree were invited to participate. This criterion excluded those who went directly into full-time degree completion studies but not those who entered part-time studies after 4 months of practice. The survey included closed- and open-ended questions to collect both quantitative and qualitative data; this article will report on the quantitative results from the subset of respondents who had entered practice with a diploma education and then earned a baccalaureate degree with a dental hygiene specialization. The survey invitation included one follow-up message after a 2-week period.

Section I of the survey focused on the generic abilities identified in the literature on postsecondary education; it was open to all registrants who had earned a baccalaureate degree after entry into the profession. The subsequent section focused on the required competencies identified in the CDHBC Bylaw; it was only open to those respondents who indicated that they had earned a baccalaureate degree with a dental hygiene specialization. Each of the competencies was augmented with descriptive ability statements that were drawn from the literature on postsecondary education. In both sections, the respondents were asked to identify if their abilities had *improve*d, *not changed* or *worsened* as a direct result of their dental hygiene baccalaureate education; a *do not know* option was also provided. Demographic questions about the respondents' educational and practice backgrounds were also included.

All elements from the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (http://ethics.gc.ca/eng/index/) were included in the email invitation and the online survey introduction. They included but were not limited to statements about the voluntary nature of the survey, the possible benefits, how the results could be accessed, a request for consent to use the data for publications, their rights as participants, and contact information for questions about the survey as well as technical support.

The pilot phase involved dental hygiene educators with a minimum of a baccalaureate education and experience in diploma and/or baccalaureate dental hygiene education who did not meet the inclusion criteria of the study (n=6).

The quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS); frequency data were tabulated, and the Kruskal-Wallis one-way analysis of variance test was used to compare differences between the respondents based on demographic variables related to their educational and practice backgrounds.

Table 2. Rating of changes (expressed in %) in generic baccalaureate abilities related to client safety in health literature (n=123)

Abilities	Improved	No change	Worsened	Do not know
1. Critiquing literature	89	9	8	2
2. Using research	87	13	0	0
3. Critical thinking and problem solving	79	21	0	0
4. Communication (e.g., oral, written, using technology)	76	24	0	0
5. Self-directed learning (e.g. accessing information, numeric literacy, computer use, reading, and writing)	76	24	0	0
6. Coordination (e.g., organizing, arranging, bringing together)	56	42	8	2
7. Collaboration (e.g., working with others)	57	42	0	8
8. Managing self (e.g., responsibility, flexibility, adaptability)	58	42	8	0

The study has limitations in that it is based on the perceptions of participants and required them to reflect over time. Some respondents did indicate that it was challenging for them to remember their diploma education, while others stated that it was challenging to know if the changes in their abilities were a reflection of practice experience or their increased education. Despite these comments, few respondents used the *do not know* category. This suggested that overall respondents were comfortable in making judgments about the influence of their baccalaureate education on the required CDHBC Bylaw competencies.

RESULTS

The CDHBC survey's response rate was calculated using the 2009 BCDHA[44] and 2011 CDHA[45] job market and employment survey data, given the paucity of data about the educational background of registrants; it is conservatively estimated to be 51%. The respondents included 123 registrants with baccalaureate degrees in dental hygiene although the names of their degrees varied, ranging from bachelor's degrees with a dental hygiene specialization to Bachelor of Health Sciences and Science degrees. Portillo et al.[42] found a similar diversity of names among degree completion programs in dental hygiene.

The great majority of respondents (72%) worked in private practice settings with the remainder being employed in education (15%), community practice (8%), hospital (2%), residential care (2%) and administration (2%). Twenty per cent of respondents had been practicing for less than five years, 25% had practiced from 5 to less than 10 years, and a further 29% had been practicing from 10 to less than 20 years. Respondents' entry-to-practice (ETP) education consisted of 2-year diploma programs (30%) or 3-year diploma programs (57%), with the remaining 13% being dental therapists who had bridged to dental hygiene. Fifty-two per cent earned their baccalaureate degree within the past five years, which was to be expected given that degrees in dental hygiene are relatively new in British Columbia.

Section 1 included generic abilities that have been identified in the health professional literature as relevant to client safety and better health outcomes (see Table 2). More than 75% of respondents noted an improvement in the following abilities:

- critique and use of literature (89%);
- use of research (87%);
- critical thinking and problem solving (79%);
- communication (oral, written) and use of technology (76%); and
- self-directed learning such as accessing resources, numeracy, reading, and writing (76%).

In Section 2 the majority of respondents indicated that their abilities in the 4 competency areas of ADPIE, client safety, interprofessional practice, and referral had *improved* as a direct result of their undergraduate education. The ranges for the *improved* data are as follows:

A. ADPIE (see Table 3):
- assessment and evaluation (65% to 85%)
- diagnosis (55% to 65%)
- planning (50% to 67%)
- implementation (59% to 69%)

B. Interprofessional practice (see Table 4):
- 55% to 63%

C. Client safety (see Table 5):
- Critical thinking and research use (59% to 84%)
- Communication and collaboration (52% to 68%)
- Health promotion (60% to 72%)

D. Referral (see Table 6):
- 55% to 68%

The respondents' rating of their ability and their knowledge base seemed to align well. Their highest rated areas for improvement in their knowledge base (see Table 7) were

- critique and use of research (87%);
- population-based data / oral epidemiology (78%); and
- pathophysiology including immunology and microbiology (77%).

Table 3. Competency A – Rating of changes (expressed in %) in the ADPIE professional ability related to clients with complex needs or disabling conditions, as a direct result of a baccalaureate degree (n=123)

Abilities	Improved	No change	Worsened	Do not know
Assessment and evaluation				
1. Critiquing study methodology and conclusions for their relevance and application to oral care.	85	14	0	1
2. Navigating proficiently through diverse databases related to oral and general health issues.	77	21	0	2
3. Systematically examining group data related to services provided against epidemiological data, the effectiveness and /or cost-effectiveness of care outcomes.	72	21	0	7
4. Performing needs assessments grounded in evidence-based approaches for individuals and groups with multi-faceted medical histories, and complex and long term medical treatments including those living with limitations and impairments.	65	32	0	3
Diagnosis				
5. Prioritizing oral and general health issues grounded in oral health literature for clients living with limitations and impairments.	65	33	1	1
6. Developing diagnostic statements based on a comprehensive knowledge of pathophysiology.	60	39	0	1
7. Screening clients for oral and systemic conditions based on population health data.	55	42	1	2
Planning				
8. Incorporating epidemiological, social, and environmental data into planning of oral health interventions for clients with limitations and impairments living in diverse environments.	67	30	1	2
9. Planning strategies for gaining and maintaining informed consent for clients with learning and cognitive limitations and impairments.	54	44	1	2
10. Planning care with clients, families, guardians, and alternative decision makers.	50	48	1	1
Implementation				
11. Providing evidence-informed dental hygiene services for clients across the life stages including those living with limitations and impairments.	71	29	0	1
12. Managing primary oral health care for clients and groups effectively and safely with an emphasis on risk assessment, prevention, education, therapeutic services, and referrals.	61	35	1	3
13. Mentoring care workers and professionals on issues and protocols related to oral care.	59	34	1	7

Table 4. Competency B – Rating of changes (expressed in %) in the interprofessional ability as a direct result of baccalaureate degree education (n=123)

Abilities	Improved	No change	Worsened	Do not know
1. Using strategies related to coaching, mentoring, and networking to promote collaborative problem solving and decision making.	63	33	1	4
2. Initiating joint decision making with others to support continuity of care for individuals and groups.	58	37	0	5
3. Supporting the development of shared language to promote communication about roles, knowledge, abilities, and oral health care.	57	42	0	2
4. Building relationships between the client, family members, alternative decision makers, and other health care providers.	55	43	0	2

Table 5. Competency C – Rating of changes (expressed in %) in the professional ability related to the application of standards for client safety as a direct result of a baccalaureate degree (n=123)

Abilities	Improved	No change	Worsened	Do not know
Critical thinking including research use				
1. Synthesizing and extrapolating information from current and credible research to support evidence-informed decision making about oral health care.	84	15	1	0
2. Developing evidence-informed protocols/ standards of practice related to client safety including infection control, medical emergencies, referrals, dental hygiene services, and program protocols.	66	32	1	2
3. Analyzing the safety issues pertinent to the provision of dental hygiene services for clients in a variety of independent and dependent living situations including homeless environments.	63	31	2	5
4. Incorporating activities to solicit peer feedback to assess outcomes of services.	59	35	1	5
Collaboration and communication				
5. Using evidence-based strategies to communicate effectively with diverse individuals and groups including those with learning disabilities and/or cognitive impairments.	68	29	1	2
6. Working with others to advocate for access to oral care.	62	36	1	2
7. Creating and/or integrate systems to manage information within the practice context.	62	33	0	4
8. Working collaboratively towards continuous improvement of services to support client safety and quality of care.	56	42	1	1
9. Promoting the creation of a culture of safety in oral health practice contexts.	52	42	0	1
Health promotion				
10. Promoting the integration of oral health issues within chronic disease management programs.	72	27	0	2
11. Participating in the development of policies to promote client safety and better health outcomes.	63	30	0	7
12. Developing and monitoring quality assurance standards and protocols to ensure a safe and effective working environment.	65	33	0	2
13. Analyzing how to supervise personnel involved in the delivery of dental hygiene services including dental hygiene support workers, students, and volunteers.	61	33	0	7

Table 6. Competency D – Rating of changes (expressed in %) in this professional ability related to referral making as a direct result of a baccalaureate degree (n=123)

Abilities	Improved	No change	Worsened	Do not know
1. Grounding communications related to deviations from normal in a comprehensive knowledge of general and oral pathophysiology.	65	31	1	1
2. Seeking alternative care options for clients for whom the initiation or continuation of treatment is contra-indicated.	58	42	0	1
3. Coordinating care with other oral and general health professionals through timely and effective communications.	57	43	0	0
4. Initiating and monitoring referrals by sharing succinct and pertinent information with other oral and general health professionals.	55	45	0	1

Table 7. Rating of changes (expressed in %) in professional knowledge as a direct result of a baccalaureate degree (n=123)

Knowledge	Improved	No change	Worsened	Do not know
1. Critique and use of research	87	13	0	0
2. Population-based data / oral epidemiology	78	18	0	4
3. Pathophysiology including immunology and microbiology	77	22	1	0
4. Theories and approaches to outcome assessments	72	24	1	2
5. Strategies for client safety as defined in health care (including communication, collaboration, critical thinking, research use, and health promotion)	71	29	0	1
6. Interprofessional practice	63	37	0	0
7. Interpretation of best practice guidelines / standards	62	37	1	1
8. Living environments: organizational structure and culture	58	42	0	1
9. Regulatory and legal parameters of dental hygiene practice including but not limited to practice-oriented legislation, policy and guidelines	57	43	0	0
10. Process of care for clients with limitations and impairments	56	42	1	2
11. Workplace health and safety requirements including but not limited to safety oriented legislation, policy and guidelines	50	48	1	1

In each section some respondents indicated that their baccalaureate education worsened their abilities. They did not, however, provide any information from which to understand those ratings.

The Kruskal-Wallis one-way analysis of variance test was used to compare differences between three or more independent groups. No statistically significant differences were found between the respondents with regard to primary practice area, ETP education, and highest degree earned. Some statistically significant differences were found among groups with regard to years of practice and years since graduation from their baccalaureate education.

Respondents who had practiced for more than 21 years were more likely to indicate that their ability to "use evidence-based strategies to communicate effectively with diverse individuals and groups" had *not changed* (p=0.04) as a direct result of their baccalaureate education while those who had practiced for less than 5 years were more likely to indicate an *improved* ability (see Tables 8 and 9). Respondents who had practiced for less than 5 years and those who had practiced for 16 to 20 years were more likely to indicate that their ability to "analyze how to supervise personnel" (p=0.03) had *improved* (see Tables 8 and 10).

Respondents who had earned their baccalaureate degree less than 10 years ago were more likely to indicate that their abilities for "navigating proficiently through diverse data bases" (p=0.01) and "critiquing study methodology and conclusions" (p=0.02) had *improved* (see Tables 11–13). Respondents who had earned their baccalaureate degree more than 21 years ago were more likely to indicate that their knowledge in the "critique and use of research" (p=0.04) had *not changed* as a direct result of their degree education (see Table 14). The statistically significant findings are related to years of practice and years since graduation from the baccalaureate program; overall there were few statistically significant findings.

While the majority of respondents indicated *improved* abilities, there was a spectrum of views expressed with some writing about the reasons for selecting a category. Respondents talked about the influence of their diploma education and the influence of practice.

> *"In the degree program I further developed skills that were touched on in the diploma program. It seems like a necessary continuation."*

> *"The degree completion is not as significant as practical dental hygiene clinical experience."*

> *"Diploma [education] provided me with technical skills."*

> *"The bachelor education does not directly improve clinical skills."*

The combination of education and practice was described as being influential in supporting deeper abilities.

> *"I have marked down 'improved' for all these categories, but I think this [bachelor] education laid the ground work for this improvement, rather than facilitating it entirely. It did not all happen during the educational process."*

However, the learning was seen to be dependent on the nature of the practice.

Table 8. Respondents' views related to significant differences associated with years of practice: Kruskal-Wallis test statistics

Elements	Using evidence-based strategies to communicate	Analyzing how to supervise personnel
Chi-Square	10.227	11.051
df	4	4
Asymp. Sig.	0.037	0.026

Table 9. Frequency data related to years of practice and using evidence-based strategies to communicate (Competency C) expressed in percentages (n=123)

Years of practice	Improved	Not changed	Worsened	Do not know	Total
Fewer than 5 years	88	13	0	0	100
5 to less than 10 years	61	32	3	3	100
10 to less than 15 years	77	23	0	0	100
16 to less than 20 years	69	31	0	0	100
21 years or more	52	42	0	6	100
Total	**68**	**29**	**1**	**2**	**100**

Table 10. Frequency data related to years of practice and analyzing how to supervise personnel (Competency C) expressed in percentages (n=123)

Years of practice	Improved	Not changed	Worsened	Do not know	Total
Fewer than 5 years	79	17	0	4	100
5 to less than 10 years	55	36	0	10	100
10 to less than 15 years	41	46	0	14	100
16 to less than 20 years	85	15	0	0	100
21 years or more	57	39	0	3	100
Total	**61**	**33**	**0**	**7**	**100**

Table 11. Respondents' views related to significant differences associated with years since graduation from a baccalaureate program in dental hygiene: Kruskal-Wallis test statistics

Elements	Navigating proficiently through diverse databases	Critiquing study methodology and conclusion	Knowledge related to the critique and use of research
Chi-Square	12.859	12.317	9.826
df	4	4	4
Asymp. Sig.	0.012	0.015	0.043

Table 12. Frequency data related to years since graduation from a baccalaureate program and navigating proficiently through diverse databases (Competency A) expressed in percentages (n=123)

Years since graduation from a baccalaureate program	Improved	Not changed	Worsened	Do not know	Total
Fewer than 5 years	88	13	0	0	100
5 to less than 10 years	80	16	0	4	100
10 to less than 15 years	57	43	0	0	100
16 to less than 20 years	60	40	0	0	100
21 years or more	53	40	0	7	100
Total	**77**	**21**	**0**	**2**	**100**

Table 13. Frequency data related to years since graduation from a baccalaureate program and critiquing study methodology and conclusions (Competency A) expressed in percentages (n=123)

Years since graduation from a baccalaureate program	Improved	Not changed	Worsened	Do not know	Total
Fewer than 5 years	91	9	0	0	100
5 to less than 10 years	92	4	0	4	100
10 to less than 15 years	79	21	0	0	100
16 to less than 20 years	40	60	0	0	100
21 years or more	73	27	0	0	100
Total	**85**	**14**	**0**	**1**	**100**

Table 14. Frequency data related to years since graduation from a baccalaureate program and knowledge related to critique and use of research expressed in percentages (n=123)

Years since graduation from a baccalaureate program	Improved	Not changed	Worsened	Do not know	Total
Fewer than 5 years	94	6	0	0	100
5 to less than 10 years	80	20	0	0	100
10 to less than 15 years	86	14	0	0	100
16 to less than 20 years	100	0	0	0	100
21 years or more	67	33	0	0	100
Total	**87**	**13**	**0**	**0**	**100**

Table 15. Abilities with 75% or higher ratings of "improved" (n=123)

Abilities with the higher ratings of "improvement"	Improved	No change	Worsened	Do not know
Generic ability: critiquing literature	89	10	0	2
Generic ability: using research	87	13	0	0
Generic ability: critical thinking and problem solving	79	21	0	0
Generic ability: communication (e.g., oral, written, using technology)	76	24	1	0
Competency A – Assessment: critiquing study methodology and conclusions for their relevance and application to oral care.	85	14	0	1
Competency A – Assessment: navigating proficiently through diverse databases related to oral and general health issues.	77	21	0	2
Competency A – Systematically examining group data related to services provided against epidemiological data, the effectiveness and /or cost-effectiveness of care outcomes.	72	21	0	7
Competency C – Synthesizing and extrapolating information from current and credible research to support evidence-informed decision making about oral health care.	84	15	1	0
Competency C – Using evidence-based strategies to communicate effectively with diverse individuals and groups including those with learning disabilities and/or cognitive impairments.	68	29	1	2
Knowledge: critique and use of research	87	13	0	0
Knowledge: population based data / oral epidemiology	78	18	0	4
Knowledge: pathophysiology including immunology and microbiology	77	22	1	0

"The skills for ADPIE are different for every clinician based on their individual experiences and client base."

The concept of providing evidence-based care was a central focus of the discussions about better and safer care.

"The bachelor degree has improved my ability to review literature, which has led to an increase in client management by allowing me to communicate evidence based practice into my hygiene routine."

"Completion of the degree has given me the opportunity to … apply evidence to practice to answer clinical questions. I feel this is one of the biggest benefits and useful outcomes of completing my degree."

The written comments corroborated the ratings assigned by the respondents.

DISCUSSION

Overall respondents perceived their abilities as having improved in the 4 required competencies as a direct result of their baccalaureate education. In the ADPIE competency the abilities related to assessment and evaluation were more frequently rated as *improved*. The abilities to navigate proficiently through databases and critique research were identified as having *improved* for the greatest number of respondents.

The data under diagnosis, planning, and implementation suggested that these abilities had *improved* but not as frequently as those related to the cognitive aspects of the assessment and evaluation section. This was also the case for the ability to perform assessments. The ADPIE areas that had improved for more respondents were expressed through abilities associated with the concept of research use.[46,47] This was also true of the competency related to infection control and safe practice; in this competency, evidence-based decision making was rated 12% higher than the other abilities. The item most frequently identified as improved in the referral competency pertained to the communication of information grounded in general and oral pathophysiology.

The ratings in the required competencies were supported by those related to changes in their knowledge base. The respondents' rating of their ability and their knowledge base seemed to align well.

The ability which appears to have improved most often was expressed through the concept of research use (see Table 15). It was expressed through the abilities to

- access information
- critique methodology
- synthesize information
- prioritize information
- extrapolate information to other contexts
- make practice judgments

The ratings in the question about generic abilities confirmed the focus on cognitive abilities. The items rated as having most frequently *improved* as a direct result of baccalaureate education included the critique of literature, research use, critical thinking, problem solving, communication, and self-directed learning, all of which were rated 76% and above.

This focus on critical thinking, problem solving, and research use is supported by the recent study conducted by Portillo et al.[42] In their analysis of the learning experiences in US degree completion programs, 89% of program directors identified such experiences within their programs. A "research" course was most likely to be included as a core course; 35% of respondents also had a core course in "critical thinking" within their program.

The differences in diploma and degree abilities appear to lie in the cognitive rather than the technical/clinical elements. Many respondents expressed this point in their responses to the open-ended questions. They commented on their critical thinking and problem solving abilities and how these abilities had impacted the quality of their overall care. Kanji et al.[43] also identified the themes of more "comprehensive care" as well as critical thinking and evidence-based decision making.

The difference between diploma and baccalaureate education may not be found in the types of abilities acquired; rather, the difference may be in how those abilities that were initially developed at the diploma level are further enhanced. In particular, the difference may be in the deepening of knowledge and abilities related to practice judgments. The medical literature identifies three aspects to "surgical skill" acquisition: 1) a cognitive stage (**knowledge**); 2) an associative stage (**technical skill**); and 3) an autonomous stage (**adequate judgment**).[48] The data from this survey highlighted the knowledge and judgment aspects while the technical abilities were seen as being well developed in diploma education.

The information from the British Columbia Ministry of Advanced Education (BC MoAE) related to the approval of baccalaureate programs also aligns with the survey data. The transferable abilities that are required of all undergraduate degrees (http://www.aved.gov.bc.ca/degree-authorization/) include the following:

- application of knowledge
- communication skills
- awareness of limits of knowledge
- professional capacity / autonomy

These abilities must be grounded in a robust knowledge of research methodologies and knowledge of the discipline. The BC MoAE, McGahie,[48] and the Kanji et al.[43] study emphasize the issue of depth of knowledge and judgment as identifying differences between diploma and degree education.

The statistically significant areas with regard to years of practice support the learning that occurs with practice. Those who had practiced longer identified fewer changes in their communication abilities (p=0.04) while those who had practiced for less than 5 years and between 16 to 20 years had learned more about supervision of personnel (p=0.02) through their baccalaureate education. The finding related to the group with 16 to 20 years of practice may indicate that practice learning also depends on the type of practice experienced.

With regard to the years since graduation from a baccalaureate program, the two statistically significant differences (p=0.01 for navigating through databases and p=0.02 for critiquing study methodology) likely reflect the curriculum content of programs at the time of graduation. Those who graduated more than 16 years ago likely experienced curriculum that was not as developed in the area of research use. With the increased focus on evidence-based practice, those who had graduated less than 10 years ago were likely more involved in accessing and critiquing literature. The statistically significant differences in all of these areas were not viewed as being of practice significance; they appear to reflect expected changes over time.

A surprising finding was that there were no differences between the views of respondents from 2-year and 3-year diploma programs with regard to improvement in their abilities. This may be a reflection of the 3-point scale used in the survey; it may not have been sensitive enough to identify differences between the respondents' educational background if they existed. However, the scale was useful in providing evidence-based data for CDHBC decision making.

As previously discussed, the areas of improvement in the interprofessional competency were not rated as highly frequent areas of improvement. This may be a reflection of the current curriculum in degree completion programs. Three out of four Canadian degree completion programs include online courses; this is also true of many programs in the United States.[42] The online delivery method may limit the number of interprofessional activities within such programs. Portillo et al.[42] also explored the themes within US degree completion programs and the interprofessional theme was not articulated directly; it might have been expressed through practicums, internships or externships given that 66% of the programs included such a course as a core program course. In addition, it might have been clustered under the theme of "public health." Given the focus on interprofessional education for its impact on client safety and better health outcomes,[2–4,8-22] it might be helpful for faculty members involved in degree completion programs to explore this issue and assess how it is being addressed within their curricula.

CONCLUSION

This study reflects the commitment of the CDHBC to support evidence-based decisions. The CDHBC is using the data to support the development of educational components that would allow diploma dental hygienists to meet the criteria for the new registration category.

The respondents indicated differences between diploma and baccalaureate education with regard to the 4 required competencies. These differences were largely expressed through cognitive abilities including critical thinking, problem solving, and research use. Both the knowledge base and the practice judgments of respondents were seen as improved with degree education. The respondents

provided rich information in the open-ended questions; those data will be published in a separate article. The outcomes of this study highlight the importance of baccalaureate education in supporting dental hygienists to make evidence-based decisions. While the focus of the study was on 4 specific competencies, the data may be useful to regulatory and educational organizations throughout Canada as they work to meet their organizational mandates.

Acknowledgements

The authors would like to acknowledge the CDHBC Board members and the CDHBC Registrar, Jennifer Lawrence, for their support and input. It was their commitment to an evidence-based approach that resulted in the implementation of the study.

Duality of interests

Susanne Sunell was paid as a consultant for the design and analysis of this survey for the CDHBC Board decision-making purposes. The development of this article was not included in the contract work for the CDHBC. Rae McFarlane was elected to the CDHBC Board after the implementation and analysis of the survey data. Her term commenced on 1 March 2013. Heather Biggar is an employee of the CDHBC. At the time the research was conducted, she held the position of Acting Registrar and represented the CDHBC Board who contracted Susanne Sunell to develop and analyze the survey as part of a project to inform the implementation of the 365 Day Rule Exempt category of registration.

REFERENCES

1. Dickinson C, Beatty F, Marshall D. A pilot study: are dental hygienists in Texas ready for the elderly population explosion. *Int J Dent Hygiene.* 2012;10:128–37.
2. Public Health Agency of Canada (PHAC), Canadian Public Health Association (CPHA). *Moving ahead, together—launch of a national dialogue on public health and sustainable development in Canada. Workshop summary report*. Ottawa: PHAC; 2007.
3. Public Health Agency of Canada (PHAC). *Core competencies for public health in Canada: release 1.0*. Ottawa: PHAC; 2007. Available from www.phac-aspc.gc.ca/core_competencies and www.aspc-phac.gc.ca/competences_essentielles.
4. Canadian Association of Public Health Dentistry (CAPHD). *Discipline competencies for dental public health in Canada*. Edmonton, AB: CAPHD; 2008. Available from http://www.caphd.ca/sites/default/files/pdf/DisciplineCompetenciesVersion4_March31.pdf
5. Gilkey MB. Applying health education theory to patient safety programs: three case studies. *Health Promot Pract.* 2008;9(2):123–9.
6. Canadian Dental Hygienists Association (CDHA). *CDHA education agenda: pathways to the oral health of Canadians*. Ottawa: CDHA; 2009.
7. Stevenson L, McRae C, Mughal W. Moving to a culture of safety in community home health care. *J Health Serve Res Policy.* 2008;13(1):20–4.
8. Lowe GS. The role of healthcare work environments in shaping a safety culture. *Healthc Q.* 2008;11(2):43–51.
9. Connor M, Ponte PR, Conway J. Multidisciplinary approaches to reducing error and risk in a patient care setting. *Crit Care Nurs Clin North Am.* 2002;14(4):359–67.
10. Lau DT, Scandrett KG, Jarzebowski M, Holman K, Emanuel L. Health-related safety: a framework to address barriers to aging in place. *Gerontologist.* 2007;47(6):830–7.
11. Ponte PR, Connor M, DeMarco R, Price J. Linking patient and family-centered care and patient safety: the next leap. *Nurs Econ.* 2004;22(4):211–5.
12. Kilbridge PM, Classen DC. The informatics opportunities at the intersection of patient safety and clinical informatics. *J Am Med Inform Assoc.* 2008;15(4):397–407.
13. Ramadas K, Arrossi S, Thara S, Thomas G, Jissa V, Fayette JM, Mathew B, Sankaranarayanan R. Which socio-demographic factors are associated with participation in oral cancer screening in the developing world? Results from a population-based screening project in India. *Cancer Detect Prev.* 2008;32:109–15.
14. Feng X, Bobay K, Weiss M. Patient safety culture in nursing: a dimensional concept analysis. *J Adv Nurs.* 2008;63(3):310–19.
15. Federal/Provincial/Territorial Joint Task Group on Public Health Human Resources. Building the public health workforce for the 21st century: a pan-Canadian framework for public health human resources planning. Ottawa: Minister of Health; 2005.
16. World Health Organization. *A safer future: global public health security in the 21st century*. Geneva: WHO; 2007.
17. Health Canada. *Chief Public Health Officer's report on the state of public health in Canada*. Ottawa: Minister of Health; 2008.
18. International Union for Health Promotion (IUHP), Society for Public Health Education (SOPHE). *Toward domains of core competency for building global capacity in health promotion: the Galway consensus conference statement*. Washington DC: SOPHE; 2008. Available from http://www.sophe.org/.
19. Interprofessional Education Collaborative Expert Panel. *Core competencies for interprofessional collaborative practice: Report of an expert panel*. Washington DC: Interprofessional Education Collaborative Expert Panel; 2011. Available from www.aacn.nche.edu/education-resources/ipecreport.pdf.
20. World Health Organization. P*reparing a health care workforce for the 21st century: the challenge of chronic conditions*. Geneva: Non-communicable Disease and Mental Health Cluster, Chronic Disease and Health Promotion Department; 2005.
21. Minore B, Boone M. Realizing potential: improving interdisciplinary professional/paraprofessional health care teams in Canada's northern aboriginal communities through education. *J Interprof Care.* 2002;16(2):139–47.
22. Verma S, Paterson M, Medves J. Core competencies for health care professionals: what medicine, nursing, occupational therapy and physiotherapy share. *J Allied Health.* 2006 Fall;35(2):109–15.
23. Bloom MR, Kitagawa KG. *Understanding employability skills: draft report*. Ottawa: Conference Board of Canada, National Business and Education Centre; 1998.
24. Canada. Prosperity Secretariat. *Learning well … living well*. Ottawa: Minister of Supplies and Services; 1991.
25. Evers FT, Rush JC, Berdrow I. *The bases of competence: skills for lifelong learning and employability*. San Francisco: Jossey-Bass Publishers; 1998.
26. Hodgson A, Spours K, Savory C. *Improving the 'use' and 'exchange' value of key skills*. London: University of London, Institute of Education; 2001.
27. Queensland Department of Education, Queensland Vocational Education, Training and Employment Commission. *Cultural understandings as the eighth key competency*. Sydney, Australia: ERIC Document Reproduction Services No. ED 371 202; 1994.
28. New Zealand Qualifications Authority. *Essential skills and generic skills in the national qualifications framework*. Opinion papers. Wellington, New Zealand: ERIC Document Reproduction Services No. Ed. 367 835; 1994.
29. Secretary's Commission on Achieving Necessary Skills (SCANS). *Skills and tasks for jobs: a SCANS report for America 2000*. Washington DC: US Department of Labor; 1992.
30. Schmitz JA, editor. *Student assessment-as-learning at Alverno College*. Milwaukee (WI): Alverno College; 1994.

31. Wilson CD, Miles CL, Backer R L, Schoenberger RL. *Learning outcomes for the 21st century: report of a community college study*. Mission Viejo, CA: League for Innovation in the Community College, The Pew Charitable Trusts; 2000.
32. Hutmacher W. Key competencies in Europe. *Eur J Educa*. 1997;32(1):45–58.
33. Utley-Smith Q. 5 competencies needed by new baccalaureate graduates. *Nurs Educ Perspect*. 2004;25(4):166–70.
34. Shugars DA, O'Neil E, Bader JD, editors. Health America: *Practitioners for 2005, an agenda for action for US health professional schools*. Durham, NC: The Pew Health Professions Commission; 1991.
35. Canadian Dental Hygienists Association. *Task force on dental hygiene education: report to Canadian Dental Hygienists Association Board of Directors*. Ottawa: CDHA; 2000.
36. Sunell S, Wilson M, Landry D. *Learning outcomes in Canadian dental hygiene education: DEHC / EHDC Report*. Edmonton: DHEC/EHDC; 2004.
37. Dental Hygiene Educators Canada, Canadian Dental Hygienists Association, National Dental Hygiene Certification Board, Commission on Dental Accreditation of Canada, Federation of Dental Hygiene Regulatory Authorities. *National dental hygiene competencies for entry-to-practice: release 3*. Ottawa: DHEC, CDHA, NDHCB, CDAC, and FDHRA; 2008.
38. Sunell S, Richardson F, Udahl B, Jamieson L, Landry D. National competencies for dental hygiene entry-to-practice. *Can J Dent Hygiene*. 2007;42(1):27–36.
39. Pohlak M. University of Toronto BScD (dental hygiene) graduates 1978–95: where are they now? *Probe*. 1996;30(2):67–9.
40. Imai P, Craig BJ. Profile of the University of British Columbia's bachelor of dental science in dental hygiene graduates from 1994 to 2003. *Can J Dent Hygiene*. 2005;39(1):117–29.
41. Rowe DJ, Massoumi N, Hyde S, Weintraub JA. Educational and career pathways of dental hygienists: comparing graduates of associate and baccalaureate degree programs. *J Dent Educ*. 2008;72(4):397–407.
42. Portillo KM, Rogo EJ, Calley KH, Cellucci LW. A survey of degree completion programs in dental hygiene education. *JDE*. 2013;77(5):554–63.
43. Kanji Z, Sunell S, Boschma G, Imai P, Craig BJ. Outcomes of dental hygiene baccalaureate degree education in Canada. *JDE*. 2011;75:310–20.
44. British Columbia dental hygiene job market and employment survey. Vancouver: British Columbia Dental Hygienists Association; 2009.
45. CDHA 2011 job market and employment survey. Ottawa: Canadian Dental Hygienists Association; 2011.
46. Estabrooks C, Wallin L, Milner M. Measuring knowledge utilization in health care. *Int J Pol Eval Manag*. 2003;1(1):3–36.
47. Amara Ouimet M, Landry R. New evidence on instrumental, conceptual and symbolic utilization of university research in government agencies. *Sci Commun*. 2004;26(1):75–106.
48. McGaghie WC. Implementation science: addressing the complexity of medical education. *Med Teach*. 2011;33:97–8.

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Readiness of dental hygiene graduates for web-based or computer-aided learning

Wai Man Ariel Tsui, RDH, BSc, BScD(DH), MA(Ed)

ABSTRACT

Background: The purpose of this study was to evaluate current computer literacy and information and communication technology knowledge, skills, and opinions of recent dental hygiene graduates from a dental hygiene program at an Ontario community college in relation to computer-aided learning (CAL) or web-based learning environments for continuing education. **Methods:** Questionnaires were sent by postal mail and email to 63 dental hygiene graduates. Participants could either return the paper format survey by pre-paid mail or complete the online survey questionnaire. Descriptive statistics were used to analyse the data. **Results:** A 40% (n=25) response rate was obtained. All respondents had access to a computer and the Internet at home or at work; most felt that Internet access at home and work was necessary. General computer skills were perceived as competent, except for accounting skills. Email use and Internet searches were the most frequent computer activities. Most respondents felt that CAL should be part of formal dental hygiene education and were receptive to the use of CAL for furthering their dental knowledge. **Discussion:** Although the respondents might have used their computers daily, this did not imply that they possessed the competency required for computer use in educational settings or the required skills to navigate different software. Some experience with webinars, online quizzes, and online courses during the dental hygiene entry-to-practice formal education might increase the confidence level of graduates to participate in web-based or online continuing professional development courses in the future. **Conclusion:** Strategies to assist dental hygiene educators and school administrators in planning or modifying current dental hygiene programs to better equip their graduates for lifelong computer-based professional development are recommended.

RÉSUMÉ

Objet : Cette étude avait pour objet d'évaluer le savoir, les talents et les opinions des diplômées récentes du programme d'hygiène dentaire d'un collège communautaire d'Ontario en matière de littérature informatique et de technologie d'information et de communication (TOC) en ligne pour l'apprentissage assisté par ordinateur (AAO) ou la formation continue en ligne. **Méthodes :** Des questionnaires ont été envoyés par la poste ou courriel à 63 hygiénistes dentaires. Les participantes pouvaient retourner le format papier par la poste payée d'avance ou compléter le questionnaire du sondage en ligne. Des statistiques descriptives ont soutenu l'analyse des données. **Résultats :** Le taux de réponses a été de 40% (n=25). Toutes les répondantes avaient accès à un ordinateur et à Internet à la maison ou au travail; la plupart estimaient nécessaire l'accès à Internet à la maison et au travail. Les compétences informatiques générales étaient perçues comme étant compétentes, sauf pour la comptabilité. L'utilisation du courriel et la recherche dans Internet étaient les activités informatiques les plus fréquentes. La plupart des répondantes estimaient que l'AAO devrait faire partie de l'enseignement formel et semblaient utiliser l'AAO pour approfondir leurs connaissances dentaires. **Discussion :** Bien que les répondantes puissent utiliser leur ordinateur quotidiennement, cela n'impliquait pas qu'elles avaient la compétence requise pour utiliser l'ordinateur dans un cadre de formation ou les talents requis pour utiliser des logiciels différents. Certaines expériences de webinaires, de questionnaires et de cours en ligne pendant la formation formelle d'introduction dans la pratique meuvent hausser le niveau de confiance des diplômées pour participer éventuellement à des cours de formation professionnelle continue sur Internet ou en ligne. **Conclusion :** Les stratégies d'aide aux éducatrices en hygiène dentaire et aux administratrices des cours en matière de planification ou de modification des programmes courants d'hygiène dentaire, visant à mieux équiper leurs diplômées pour poursuivre pendant toute leur vie leur formation continue par informatique, sont recommandées.

Key words: continuing education, dental hygienist, education, information and communication technology, ICT competency, blended learning, web-based, computer-aided learning, computer-assisted education

INTRODUCTION

Online education, Internet-based learning, web-based learning, computer-assisted education, e-learning, and technology-based learning are all familiar terms that have appeared in numerous studies over the past decade. These new methods of delivering education and information have created new prospects for students, faculty, regulators of education, and educational institutions.[1] Yet these new web-based or computer-aided learning methods require certain basic technology skills and access to the Internet. Despite these digital barriers, the benefits of using technologies have been widely documented in other fields and among the allied health disciplines. Few researchers have studied e-learning or hybrid learning (blended learning) in relation to dental hygiene education in European countries or North America. However, these new technologies may help dental hygienists to meet the mandatory quality assurance program requirements set by the College of Dental Hygienists of Ontario (CDHO) under the *Regulated Health Professions Act, 1991*.[2] In addition, dental hygienists can utilize these new technology skills to ensure and enhance public safety and continue "to

THIS IS A PEER-REVIEWED ARTICLE. Submitted 31 May 2013; revised 22 July 2013; accepted 24 July 2013.
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promote continuing quality improvement"[2] among CDHO members. Some researchers have even concluded that "it is necessary for practicing health care professionals to update themselves by taking continuous education courses after graduation more conveniently via CAL methods."[3] Even so, the use of these technologies in dental hygiene practice and continuing education must be supported by research evidence in order to ensure that they are not another distraction from clinical work and research.[4]

Patterns of accessing the Internet for information or education purposes

Between 2005 and 2009, the use of the Internet from home for accessing medical and health information and for formal education and training increased from 57.9% to 69.9% and from 42.9% to 50.3%, respectively, in Canada.[5] According to the Canadian Dental Hygienists Association (CDHA) 2009 national labour survey, only 25.4% of respondents preferred online education programs; this had not changed since the previous survey was done in 2007, when 25.7% of respondents registered for formal education programs offered online.[6,7] However, another 26.8% of respondents indicated that they had no preference for either online or traditional delivery methods for their education.[7] Meanwhile, there are no data on how many Ontario dental hygienists actually registered for or had participated in any form of online continuing education. A recent dental hygiene educators' survey conducted by the CDHA[8] found that most dental hygiene educators' preferred educational activities were workshops (49.6%) and face-to-face lectures (19.5%); less than half of the educators preferred online courses (25.6%), webinars (16.3%) or podcasts (4.5%).[8] Moreover, studies by both Al-Wahadni, Elnasser, Azab, and Owais[3], and Edgington and Cobban[9] have shown that 80% of their study participants owned a computer while 38%[3] had a computer in the office. It is therefore surprising that dental hygienists in Canada, having more access to computers and the Internet, do not utilize these technologies either at the undergraduate level or for continuing professional development as much as the other health professions.[10,11]

The gender demographics of the dental hygiene profession are unique. In 2009, females made up 97.5% of the total population of dental hygienists in Canada.[7] A national study of dental hygienists conducted by CDHA[11] showed that 54.4% of respondents had either elderly or school-aged dependents. Over 47% of those were not pursuing professional development activities due to cost, 45.5% did not have sufficient time, 42% had family obligations to fulfill, and 33% did not want to travel far.[12] Only 6.8% and 2.3% could not pursue professional development activities due to lack of access to the Internet at home or a professional library, respectively. Family and financial commitments appear to be the main limitations for many women considering travelling long distances in order to pursue continuing education or professional development.[11] Edgington and Cobban[12] also found a similar pattern because the significant barriers to continuing education were the cost of travel (59%) and work schedule conflicts (47%).

Benefits of information and communication technology skills

With the many promises of newly emerging technologies, information and communication technologies (ICT) for professional development may eradicate some of the barriers for dental hygienists who want to continue their education and access the most current dental hygiene knowledge. Savukinas[13] asserted that the use of information technology in education is not new. Indeed, it has been developed and utilized by other health professions as a "supplemental learning environment" for over a decade.[14,15] In the past, information technology served as a means of improving education delivery. Currently, the latest generation of technology promises also to have an impact on teaching.[13,16] Not only can instructors reach students more effectively, but learners can also use this technology to access numerous resources, including teachers in remote locations and electronic library database that can enhance learning in ways never before possible.[13] The greatest impact may be found in the enhanced flexibility of the learning experience, enabling more people to participate in advanced education through distance learning and making learning possible at anytime from anywhere in order to meet the needs of each individual learner.[13] However, researchers have also questioned whether technology is a distraction, adding an unnecessary cost to education and even impeding the learning process, or simply the sign of a paradigm shift.[4,13] Nevertheless, information technology may be a pedagogical solution to the time constraints and various family obligations encountered by those in the female-dominated dental hygiene profession.

Pellegrini[17] argues that dental hygienists must keep abreast of the most current research and practice information in the profession in order to provide competent client care. An information-seeking behaviour study conducted by Finley-Zarse, Overman, Mayberry and Corry[18] further suggests the need for greater emphasis on computer skills in formal and continuing dental hygiene education. It is vital for dental hygiene students to develop appropriate skill sets to access and seek credible research information in support of evidence-based clinical decisions in dental hygiene practice.

New dental hygiene curriculum requirements

Outlined in the dental hygiene education framework of CDHA is the need to develop and embed technological innovation in dental hygiene education. Over the past decade, CDHA[19] has advocated innovative delivery systems for dental hygiene education programs in order to meet the needs of diverse learners. A recent report from CDHA[20] also indicated that critical thinking is one of the required national dental hygiene competencies to be covered in dental hygiene education curriculum. CDHA explains that a critical thinker is one who demonstrates the ability to access relevant and credible resources through various information systems and differentiates between more and less credible types of information.[20] Therefore, students should be taught how to access a vast amount of information and how to critique and determine

the credibility of the sources, such as when searching the Internet for information using PubMed or other Internet databases.[20] Dental hygiene students should be able to apply evidence-based decision-making approaches to the analysis of information and current practices. In addition, professionalism is another required competency for dental hygienists.[20] One of the professionalism performance indicators described by CDHA is to demonstrate competency by knowing how to access relevant and credible information.[19]

Importance of computer-aided learning

A study conducted by Al-Wahadni, Elnasser, Azab, and Owais[3] indicated that it is essential for health care professional practitioners to update themselves by taking continuing education courses after graduation more expediently via computer-aided learning (CAL) methods. Meanwhile, numerous research studies have indicated that CAL may also heighten learning and provide the clinician with information for decision making when treating patients.[15] Mattheos, Nattestad, Schittek, and Attström[21] also emphasized that the computer literacy of students would be critical for dental education in the near future. However, Mattheos[22] commented that most current practising oral health care practitioners are neither educated nor prepared to use the Internet for the benefit of professional practice and educational activities. Hence, there is a need to investigate the readiness of recent dental hygiene graduates for CAL or web-based learning.

There are few published research reports on the ICT skills of dental hygienists. In addition, the dental hygiene curriculum in Ontario recently adopted the new national curriculum changes to reflect the expanding knowledge of the dental hygiene profession. Because technologies keep evolving and required skill sets change over time, it is necessary to reassess the need for different types of technologies that can enhance the learning experience and determine how ICT can open up opportunities for dental hygiene continuing education.

Purpose of study

The purpose of this quantitative study was to evaluate the current perception of computer literacy and information and communication technology (ICT) knowledge, skills and opinions of recent dental hygiene graduates from a dental hygiene program at an Ontario community college. This study attempted to answer these questions and assist dental hygiene educators and school administrators in planning or modifying current dental hygiene programs to better prepare their graduates for lifelong professional development through CAL or web-based continuing education.

Research questions

This study, which was based on the analysis of a survey sent to 63 recent dental hygiene graduates, attempted to answer the following questions:

1. What are the recent dental hygiene graduates' perceptions of their ability to navigate the CAL or web-based learning environment?
2. What is their perceived level of ICT skills?
3. Is there any significant relationship between demographic characteristics of the participants and their perceived ICT skill level and comfort level in the CAL or web-based learning environment for continuing education?

Definition of terms

Computer-aided learning (CAL) refers to education and instruction that is facilitated by computer use.[15] *Information and communication technology (ICT)* is a comprehensive term, first coined by Stevenson in his 1997 report to the UK government[23] and promoted by the national curriculum documents for the UK in 2000. For the purposes of this paper, the definition of ICT is limited to the use of computers or the Internet to manage large quantities of information and communication required for learning pertinent to online continuing education.[24]

Limitations of the study

This study surveyed the most recent dental hygiene graduates from one urban Ontario community college. Therefore, it does not represent the whole population of recent dental hygiene graduates in Ontario, nor does it offer a comparison of ICT implementation in the dental hygiene curriculum across different dental hygiene education institutions. Moreover, the study assumed that there were some forms of ICT skills training incorporated into the dental hygiene curriculum and using classroom management software, such as Blackboard. In addition, the study only included dental hygiene graduates who had less than one year of oral health care professional work experience; these individuals may not have considered taking any professional development course or other informal education within the same graduation year or encountered any situation where they might have been required to use their ICT skills for continuing competency.

The findings of this study cannot be considered statistically significant given that the size of the sample was very small. Thus, the results can only apply to the particular school under study given the specificity of its curriculum. The results of this study also do not include pre- and post-tests to compare ICT training and experience in the CAL environment before and after formal dental hygiene academic training.

METHODS

A mixed research design method was chosen in order to better understand the research problem. Through a quantitative survey design, a sample of new dental hygiene graduates was used to identify trends in perception of and adaptation to CAL and web-based learning environments in information-seeking or continuing education, as well as the current level of ICT skills of a large number of new dental hygiene graduates in Ontario.[25]

The last part of the questionnaire contained one open-ended question to elicit deeper insights and participants' views on the element(s) that was/were important to incorporate into the dental hygiene curriculum in order to encourage participation in web-based or online continuing

professional development courses in the future.[25] It was hoped that the respondents would propose other possible elements that would assist dental hygiene educators and administrators to understand the needs of future dental hygiene students and implement curriculum changes accordingly.

A questionnaire was developed by modifying two surveys: one from the Jordan University of Science and Technology (JUST), Irbid, Jordan ("The Computer Assisted Learning Questionnaire");[3] one from a survey instrument of the University of Sheffield.[26] In addition to the modified survey questions, more questions related to current ICT skill sets were added. Since there was no focus group to refine the questionnaire, the quantitative questions could be seen to add bias to the data. Therefore, an open-ended question at the end of the questionnaire was added to collect qualitative data that could not be captured from the majority of the quantitative questions.

Before the questionnaire was finalized, it was validated by conducting a pilot survey with a small number of dental hygiene educators and practicing dental hygienists. Based on the feedback received from the pilot survey, the wording, the use of technical terms, and the format of the survey were modified prior to full implementation.

Data collection

Research participants

Study participants were recent dental hygiene graduates (2011) from a community college in Ontario. They had used the WebCT/Blackboard learning management system and had an introductory course to computers as part of their dental hygiene diploma education. They were chosen because of their basic ICT skills and experience in the CAL environment during their dental hygiene diploma education, and also because of the researcher's personal association with the college.

Instrumentation

Quantitative data and one open-ended question were collected anonymously through mail survey or online survey.

Research procedure

Of the 78 students in the dental hygiene 2011 graduating class, only those who successfully graduated from the dental hygiene program in 2011, registered with the College of Dental Hygienists of Ontario (CDHO), and were currently practicing in Ontario were chosen. Their contact information was accessible from the CDHO dental hygienist listings website.

A copy of the invitation letter and the paper questionnaire were mailed to participants for recruitment. Participants whose email addresses were available from the CDHO website also received the same information electronically, with the PDF questionnaire attached. A link to the SurveyMonkey™ questionnaire was included in both the letter to participants and the questionnaire. Therefore, participants could either return the paper format survey by pre-paid mail or fill out the online survey questionnaire on SurveyMonkey™. No participant response tracking system was established for the paper questionnaire or on SurveyMonkey™; the "tracks IP addresses" feature on SurveyMonkey™ was turned off manually, so that participants could remain anonymous.

A reminder postcard and/or email reminder, including the online survey link from SurveyMonkey™, was sent to all potential participants two weeks after the initial invitation. Participants were allowed to return their responses within one month. SurveyMonkey™ was employed for two months under the Gold Plan. Since there was a small proportion of male dental hygiene graduates, participants were not asked to identify their gender on the survey.

Data analysis

Data from the questionnaire were analyzed using the Statistical Package for the Social Sciences (SPSS) v19. Data collected from the paper survey were manually entered into SPSS, while data collected from SurveyMonkey™ were downloaded to SPSS and integrated with the paper survey results for statistical analysis. Descriptive statistics were used to summarize the demographic characteristics of the respondents with regard to age, computer and Internet access and usage patterns, and various computer-related activities and skills perception, information-seeking patterns, and the preference for CAL and online continuing education. Variables were coded for nominal and interval values. Measures of frequency counts and percentages were used as appropriate.

Ethical review

In accordance with the Institutional Review Board, Central Michigan University, and the college involved in this study, the researcher provided the required documentation and application forms before embarking on the study. It was anticipated that, as the questionnaire would be completed anonymously, the project would qualify for an expedited or exempt review. In order to prevent the possibility of identifying the participants, participants were not asked to identify their gender on the questionnaire. Although this questionnaire was designed to collect data from humans, it posed minimal risk to the participants. Only the researcher and capstone advisor had access to the data from the questionnaire. According to the Research Ethics Board policy of the urban community college involved in the study, the completed paper questionnaires will be destroyed after five years. A copy of the "Letter to Participants" was sent together with the questionnaire to participants to explain the purpose and possible benefits of this study. Participants gave implied consent by filling out the questionnaire and returning it anonymously.

RESULTS

Of the 78 students in the dental hygiene 2011 graduating class, only 63 met the research parameters: they had successfully graduated from the dental hygiene program in 2011, registered with the College of Dental Hygienists of Ontario (CDHO), and were practicing in Ontario. Only 53 of these 63 registered dental hygienists had email

addresses available. Sixty-three questionnaires by mail and 53 questionnaires by email were sent to the study participants.

Twenty-five graduates responded to the survey, resulting in a response rate of 40%. There were 22 respondents (88%) between the ages of 20 and 29, and 3 respondents (12%) between the ages of 40 and 49 years. All respondents had access to a computer at home or at work, and had access to the Internet at home. Twenty-one of the respondents (84%) had access to the Internet at work. All respondents felt that access to the Internet at home was necessary, while 20 of the respondents (80%) felt that access to the Internet at work was necessary.

Internet searching was rated as a very important computer activity by 21 of the respondents (84%), followed by email communications (19 or 79.2%) (Figure 1). Education was rated as the highest combined important and very important computer activity by all respondents, followed by Internet searching (25 or 96%), word processing (24 or 92%), and email (18 or 91.7%; see Figure 1). Accounting was rated as the highest very unimportant computer activity by 2 of the respondents (8%), and highest combined very unimportant and unimportant computer activity by 8 of the respondents (32%). One of the respondents (4%) rated word processing, dental practice management software, emails, Internet searching, video conferencing (e.g., Webinar, Skype, etc.) and social media (e.g., Facebook, Twitter, YouTube, LinkedIn) as very unimportant computer activities.

Twenty-three of the respondents (92%) used email daily, followed by Internet searching (19 or 79.2%) and social media communications (15 or 62.5%; see Figure 2). Respondents used word processing (9 or 36%), education (8 or 32%), and dental practice management software (7 or 28%) every few days. Education (9 or 36%), word processing (8 or 32%), and forums (5 or 20.8%) were used weekly. The three activities that respondents reported using computers for the least were presentations (21 or 84%), video conferencing (13 or 56.5%), and forums (9 or 37.5%) (Figure 2). Many respondents indicated that that never used their computers for certain activities: twelve (48%) never used computers for accounting; seven for forums (29.2%); four for dental practice management software (16%), two for video conferencing (8.7%); and two of the respondents (8%) never used computer software for presentations.

More than half of the respondents (16 or 66.7%) perceived themselves at the expert level for Internet searching and emailing (15 or 62.5%) but none for accounting (Figure 3). All respondents perceived themselves at or above a competent level for Internet searching and emailing, followed by word processing (23 or 96%), social media use (22 or 92%), education and presentations (20 or 83%), video conferencing (18 or 75%), dental practice management software (15 or 63%), forums (13 or 54%), and accounting (7 or 29%). Half of the respondents perceived themselves at a novice level for accounting, followed by forums (7 or 29.2%), dental practice management software (6 or 25%),

Figure 1. Perceived importance of various computer activities

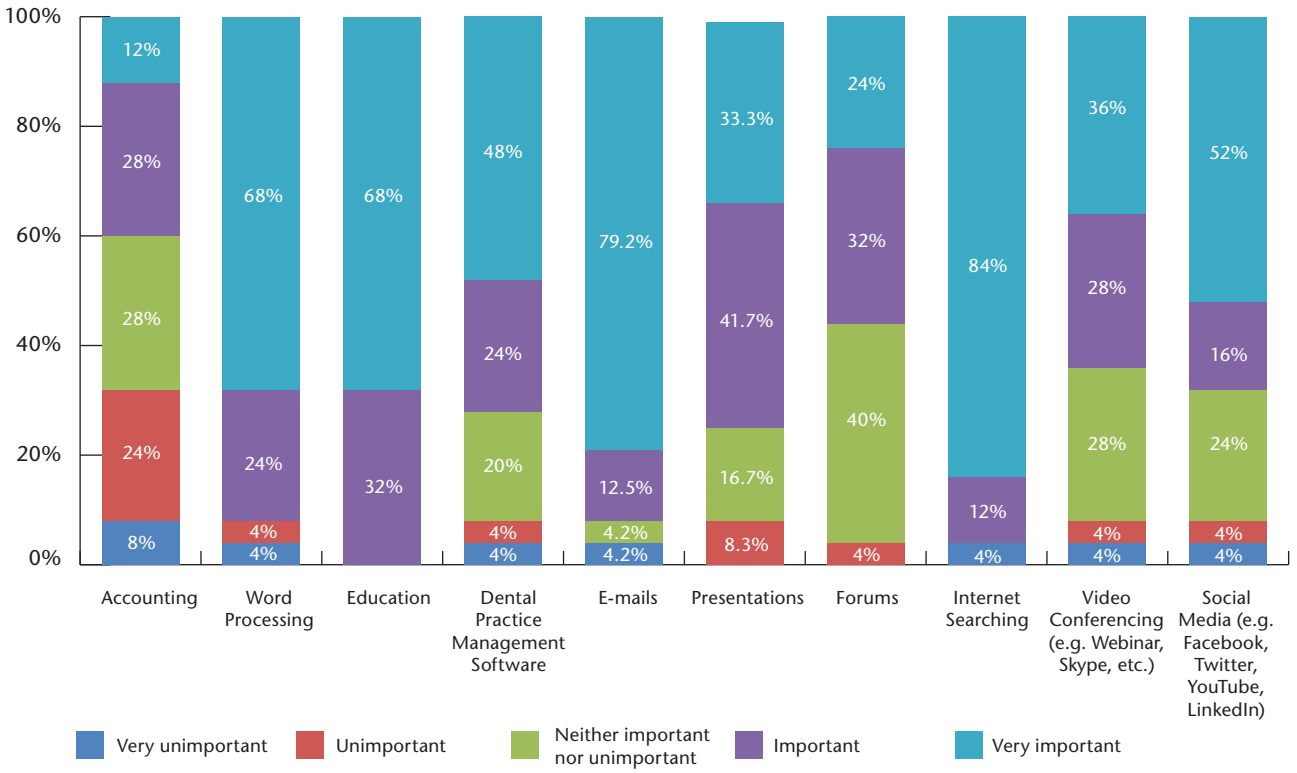


Figure 2. Usage frequencies for various computer activities

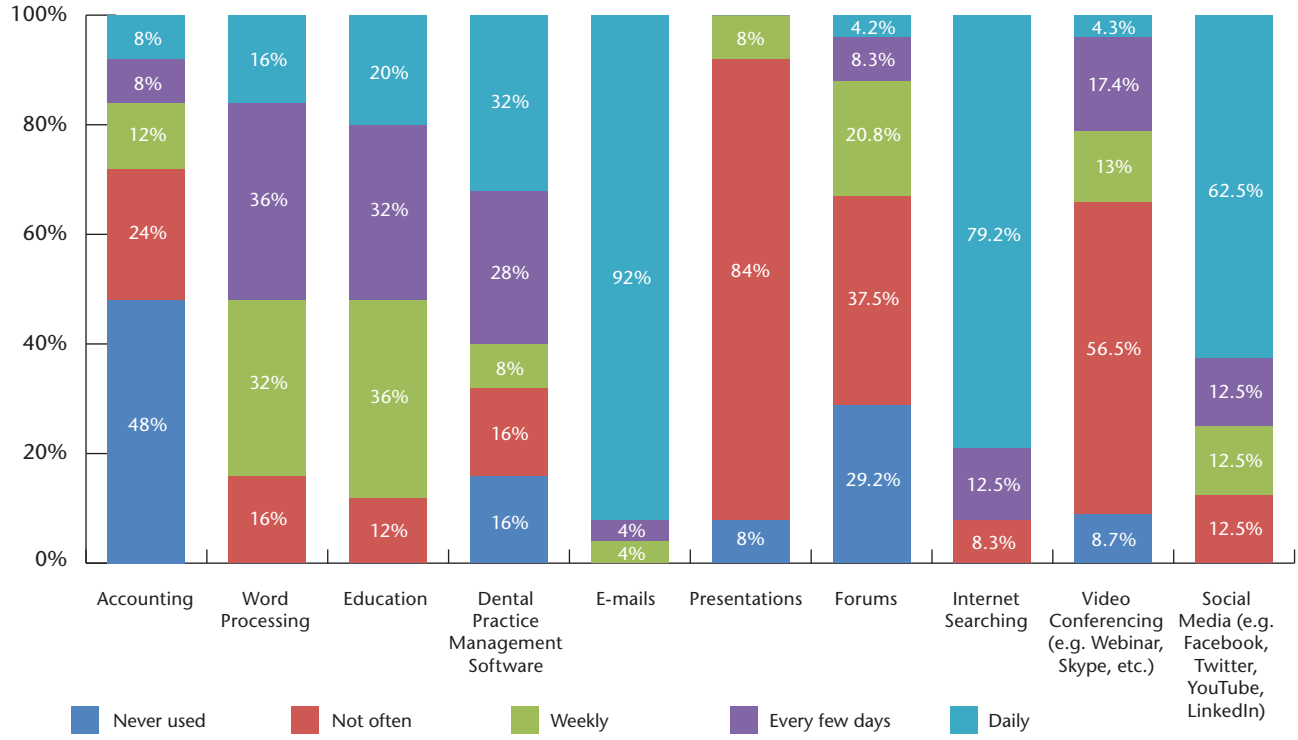


Figure 3. Perceived expertise level for various computer activities

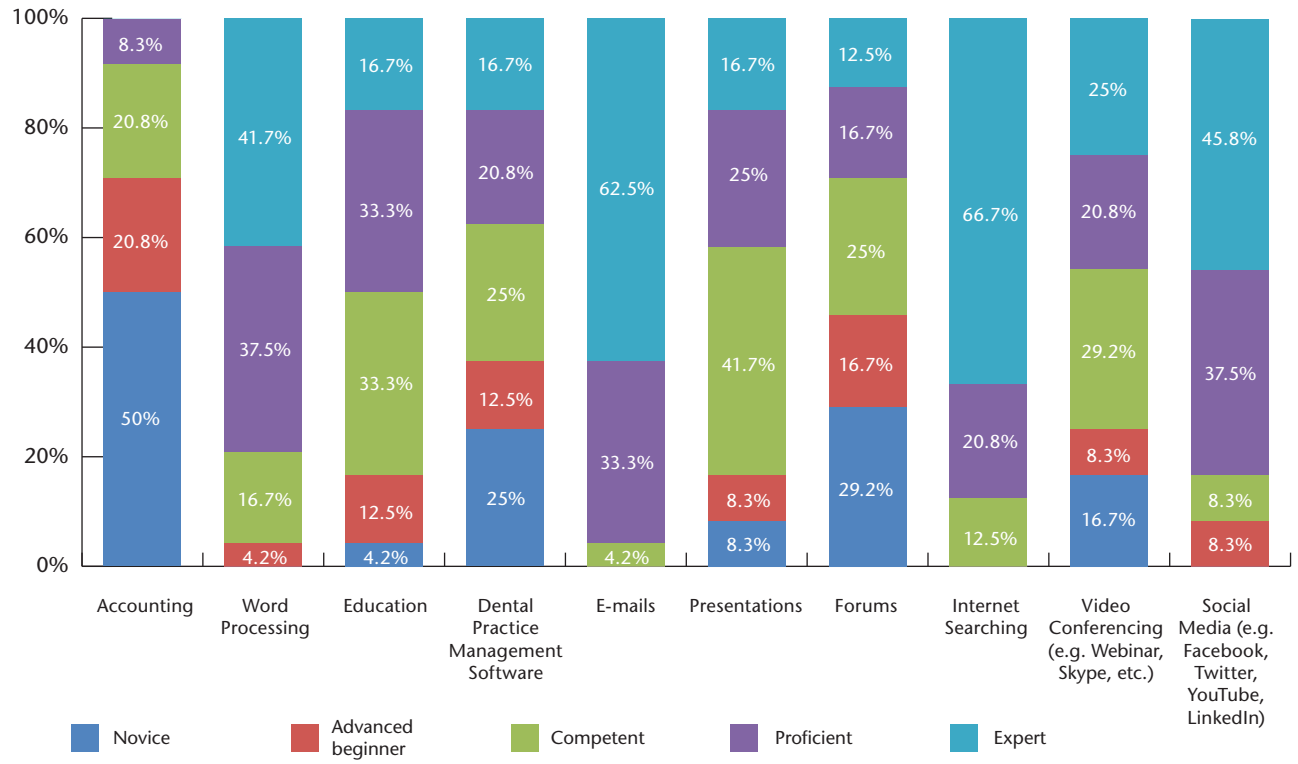


Figure 4. Information or resources on the dental hygiene profession: search patterns

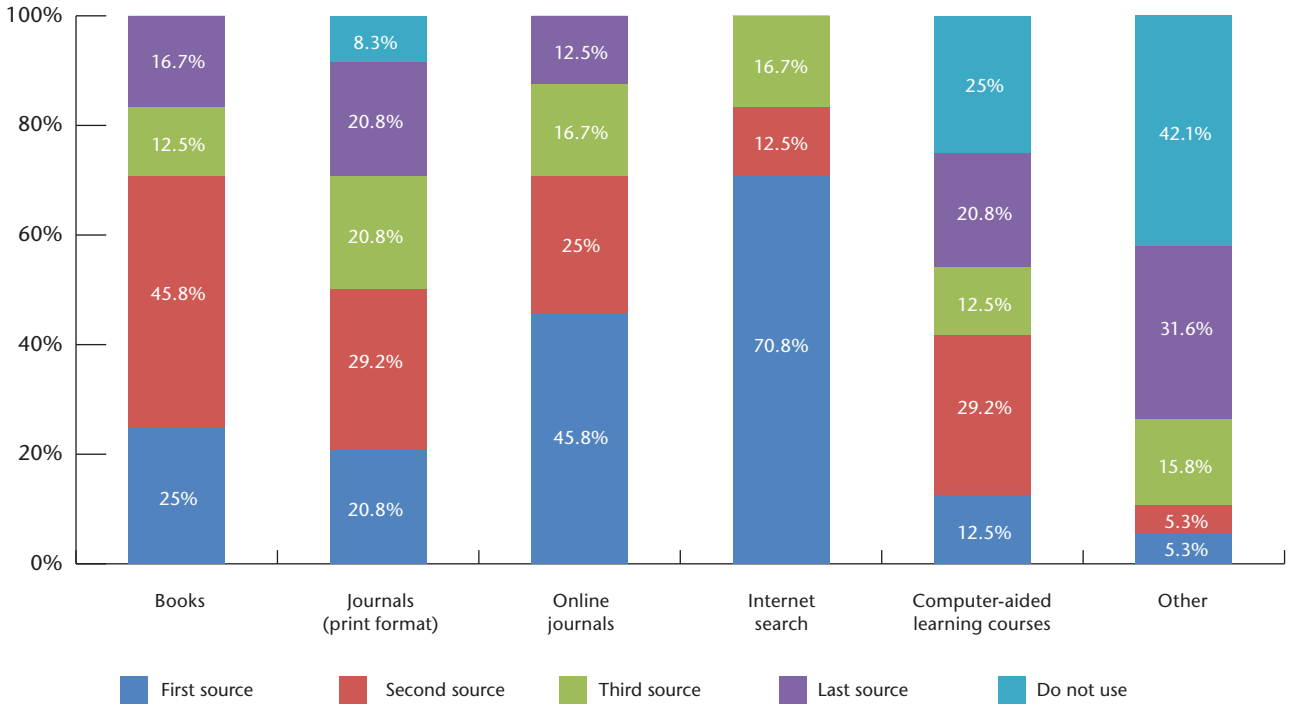
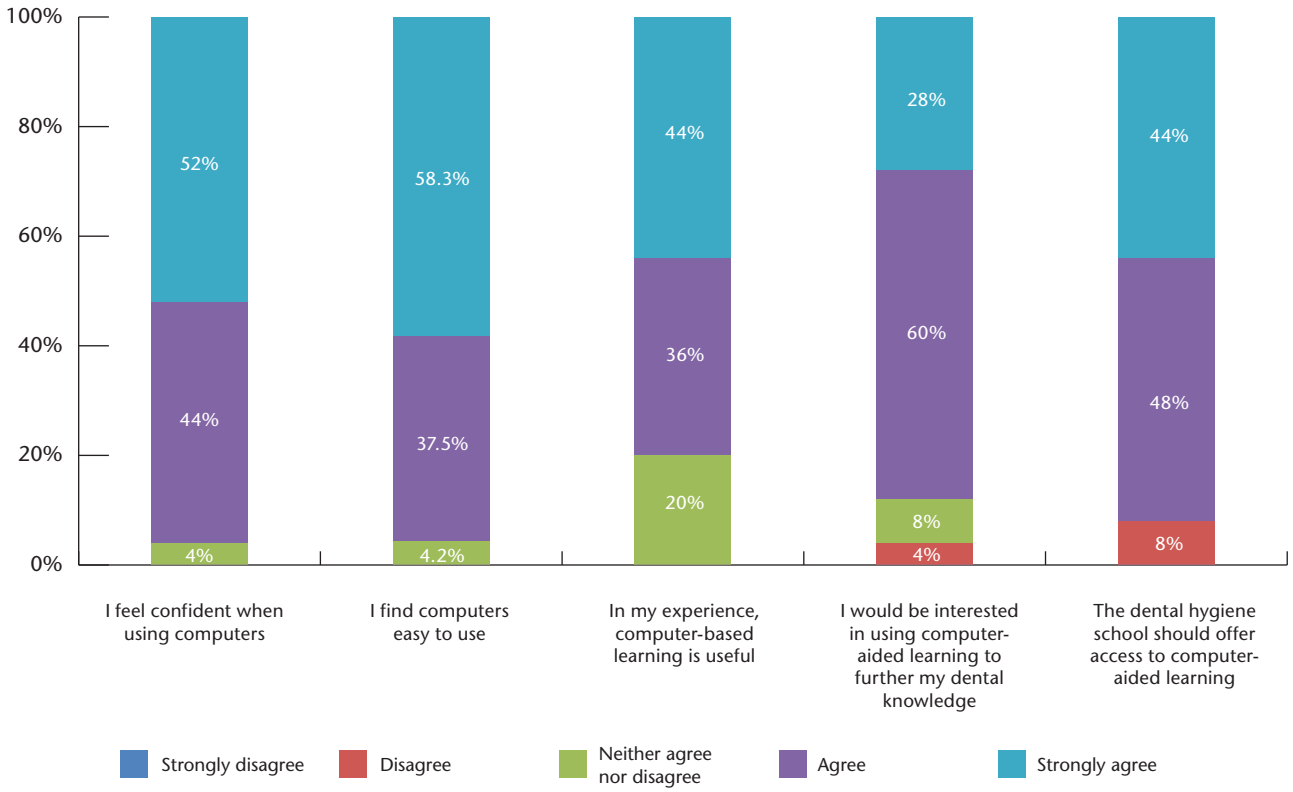


Figure 5. Self-assessment of computer literacy



video conferencing (4 or 16.7%), presentations (2 or 8.3%), and education (1 or 4.2%).

The majority (17) of respondents (70.8%) would first search the Internet for information or resources related to the dental hygiene profession, followed by online journals (11 or 45.8%) and books (6 or 25%), print journals available on the Internet (5 or 20.8%), CAL courses (3 or 12.5%), and others (1 or 5.3%) (Figure 4). The second source for information or resources on the dental hygiene profession was books (11 or 45.8%), followed by journals (print format) and CAL courses (both at 7 or 29.2%) (Figure 4). Respondents reported that they would not use the following sources to find information or resources related to the dental hygiene profession: other sources (8 or 42.1%), CAL courses (6 or 25%), and journals (print format) (2 or 8.3%).

Twenty-three of the respondents (92%) had experience with some form of CAL or computer-based learning (CBL) compared to only two (8%), who had no such experience. Most respondents (20 or 87%) who were familiar with CAL or CBL had their first experience with this type of learning while in school.

Thirteen of the respondents (52%) strongly agreed that they felt confident when using computers, 11 (44%) agreed, and one (4%) neither agreed nor disagreed with the statement (Figure 5). The majority (14) of respondents (58.3%) strongly agreed that they found computers easy to use, nine (37.5%) agreed, and one (4.2%) neither agreed nor disagreed with the statement. Less than half (11) of the respondents (44%) strongly agreed that computer-based learning was useful, nine (36%) agreed, and five (20%) neither agreed nor disagreed with the statement. Seven of the respondents (28%) strongly agreed that they would be interested in using CAL to further their dental knowledge, 15 (60%) agreed, two (8%) neither agreed nor disagreed with the statement, and one (4%) disagreed. Eleven of the respondents (44%) strongly agreed that dental hygiene schools should offer access to computer-aided learning, 12 (48%) agreed, and two (8%) disagreed.

All respondents had used e-learning packages or e-learning websites (such as WebCT/Blackboard or Elluminate) for dental hygiene professional development either at a dental hygiene school or elsewhere. Most of the respondents (16 or 64%) felt that more computer skills training or experience during their dental hygiene program would increase the likelihood of their taking online continuing professional education in the future.

Elements in the dental hygiene curriculum that would encourage future participation in web-based or online continuing professional development courses

Respondents were also asked to identify the elements that they thought were important to incorporate into the dental hygiene curriculum which would encourage them to participate in web-based or online continuing professional development courses in the future. Some of the respondents recommended including some online components to the dental hygiene curriculum. These components might include video conferencing, accessing online databases for the best health care practice, online quizzes, and offering online courses. Comments included:

> *"Completion of a webinar with quiz while still in school. E.g. use of the Cochrane database."*

> *"Offer some courses as online courses."*

> *"Address for students how to find correct online continuing professional development courses available, discussing the importance of them in relation to portfolios. Educating them how to improve with the continuing professional courses to help their clinical skills. Advising students where and how they can enroll in these courses online, Guidance!"*

> *"Offer one/two courses online from the curriculum."*

Some other respondents recommended a better experience with the classroom management system or employing computer technologies to make the online experience more interactive. Comments included:

> *"Healthcare is very hands on and interactive. Continuing ed. would be the only time I would like to have CAL"*

> *"In my experience using WebCT in school, sometimes the Web managing system was weak or completely off! Which was terrible situation for students."*

> *"More interactive programs."*

Some of the respondents recommended incorporating ICT components into the dental hygiene curriculum. Comments included:

> *"Networking through the net with professionals, providing courses and aids via online accounts, daily news feeds from dental media to help keep and update knowledge."*

> *"The use of a common course/program throughout dental hygiene schools so that students and professors can share ideas and resources."*

Some respondents were also concerned about the lack of exposure to current dental practice management software. Comments included:

> *"Dental software/program training & exposure - all the different types."*

> *"Introduction to some workplace dental software for billing & booking clients (e.g. Adeldent)."*

Summary

Most respondents had computer and Internet access at home and at the workplace. They also felt that access to computer and Internet at home and at the workplace was necessary.

Respondents perceived that accounting, forums, and video conferencing were the least important computer activities. Internet searching, education, emailing, and word processing were perceived as important computer activities. Emailing and Internet searching were

among the most frequent daily activities as opposed to accounting or using a computer for a presentation. Most of the respondents perceived themselves at the expert level for emailing and Internet searching. Meanwhile, they perceived themselves as novice for accounting.

The most popular information or resource search methods were Internet searches and accessing online journals. The least preferred methods were CAL courses or other methods. Most of the respondents had their first CAL experience at school prior to graduation from the dental hygiene program.

The majority of respondents felt confident when using computers and found them easy to use. It was commonly believed that computer-based learning was useful, and respondents expressed their interest in using CAL to further their dental hygiene knowledge. Most respondents felt that dental hygiene schools should offer access to CAL. All respondents had experienced some forms of e-learning packages or e-learning websites for dental hygiene professional development either at dental hygiene school or elsewhere. More than half of the respondents thought that more computer skills training or experience during their dental hygiene program would increase the likelihood of taking online continuing professional education in the future.

DISCUSSION

The final number of graduates included in this study was lower than expected. Possibly not all 2011 dental hygiene graduates had registered with the CDHO and were practicing in Ontario. In addition, some candidates might have married and changed their surname before registering with the CDHO. The poor response rate to the survey may have resulted from some incomplete or inaccurate addresses on the CDHO website even though most graduates had email contacts.

Most respondents were between the ages of 20 and 29; this study was more a reflection of this particular age group's characteristics than the wide age range presented in the whole dental hygiene 2011 graduate cohort. The results cannot be generalised due to the very specific nature and composition of the respondents. Moreover, information and computer technologies continue to advance, meaning that there were no two same instruments to measure or to compare the same elements. In other words, this study only captured a moment of computer and technologies advancement.

Computer access at home and work is now more common; all of the respondents to this study had no problem accessing a computer at home or at work compared to previous studies.[3,9] Similarly, Internet access is more prevalent. All of the respondents to this study had access to Internet from home, and a majority (84%) of the respondents had Internet access from work, which was much higher than the national level (77.1% and 33.7%, respectively) in 2009.[5]

Although physical access to a machine was not a problem for any of the respondents, some did not feel equipped to navigate different software. For example, half of the respondents (50%) perceived themselves only at the novice skill level when using computers for accounting; less than one third of the respondents (29.2%) perceived themselves at the novice skill level for use of forums. These data suggest that respondents might not have access to accounting software because they do not know how to use it or have never used it (48% of the respondents). Meanwhile, the results of this study also suggest that accounting software or using computers for accounting purposes might not be relevant. Only 40% of the respondents perceived accounting as an important computer activity. In contrast, respondents might tend to overestimate their actual computer competency through self-assessment and ordinal scales.[27] While the respondents might have used emails, performed Internet searches, and accessed social media daily, this did not imply that they automatically possessed the competency required for computer use in educational settings for dental hygiene continuing education.[27] Respondents to this study indicated concerns about their lack of exposure to relevant dental practice management software during their dental hygiene entry-level education, and stated that it was important to incorporate such training into the dental hygiene curriculum.

Even though most respondents felt confident when using computers and found them easy to use, there was wide diversity in perceived computer competency or expertise when specific computer activities were considered. All of the respondents perceived themselves at or above the competent level for emailing and Internet searching but below the competent level when using computers for accounting (70.8%), forums (45.9%), dental practice management software (37.5%), and video conferencing (25%). Given that some of the respondents commented on having some experience with webinars, online quizzes, online courses, and different dental practice management software during their dental hygiene formal education, such training might increase the confidence level of all graduates and encourage them to participate in web-based or online continuing professional development courses in the future. Thus, this study concurred with the previous studies which showed that health professionals' exposure to and use of computers led to an obvious increase in their comfort with electronic technology and a greater acceptance of the medium as a delivery format.[18,28]

Emailing and Internet searches were almost daily activities for the majority of respondents (96% and 91.7%), which concurred with the findings from Stokes et al.[26] Social media (e.g. Facebook, Twitter, YouTube, Linkedin) was also gaining in popularity, and more than half of the respondents (75%) used it at least every few days. Although there were some similarities between forums and other social media, almost half of the respondents (45.9%) perceived themselves as below competent expertise level and did not use forums very often or never used it (66.7%). Pahinis, Stokes, Walsh, Tsitrou, and Cannavina highlighted one of the learning theories—constructivism—often associated with e-learning.[29] Constructivism refers to the ways in which a learner absorbs information: by constructing his or her own meaningful knowledge and internalizing information

through active exploration, experimentation, discussion, and reflection.[30,31] In order to incorporate constructivist theory into an online learning environment, participants must be able to communicate with the instructor and other participants. Email was an asynchronous tool, allowing communication between instructor and participants or from participant to participant, but it did not allow for interactive communication within the group and the construction of a meaningful learning experience.[26] A well-designed CAL environment should promote facilitator–learner and learner–learner interaction and facilitate collaborative learning.[32] In other words, it should support learners' efforts in creating, sharing, and continuously building upon a rich communal database that reflects their best current understandings of the world, through text, graphics, links, and special sets of markers for different kinds of intellectual contributions.[33] Forums or similar electronic message board systems were the preferred choice for this type of communication. Some respondents also reported that they were looking for a common, web-based network that linked all dental hygiene students and professors from different dental hygiene schools for sharing resources and ideas, and for obtaining up-to-date dental news and knowledge of best practices. Rindal et al.[34] also recommended a similar forum model that would use colleague discussions as part of a continuing education course to help dental clinicians align the best clinical practice with scientific evidence.

While the majority of respondents (79.2%) perform Internet searches daily, all of them perceived themselves at or above competent expertise level in this area, and it was the preferred choice (70.8%), followed by online journals (45.8%), for retrieving information or resources related to the dental hygiene profession. However, respondents expressed concerns about using the Internet correctly. Respondents stated that they could be overwhelmed by the large quantity of Internet information and might not have the ability to distinguish the credible sources.[2,35,36] For example, respondents wanted to learn how to use the Cochrane database and how to locate CDHO-approved online continuing professional development courses during their dental hygiene formal education. These issues should be addressed through the implementation of the new dental hygiene curriculum.[20]

Furthermore, the respondents chose Internet searches and online journals over traditional methods as their first sources of dental hygiene information, reflecting a shift in the pattern of information seeking as reported in previous studies.[18,34] However, the Internet search option did not specify the type of Internet search activities. Respondents could be using scholarly electronic library databases, such as PubMed, the Education Resources Information Center (ERIC) or Cochrane; performing general Internet searches through Google Scholar or the general Google search engine; accessing social media; or searching forums or blogs for information. Further investigation in this area is necessary for future research.

No respondents reported any negative attitudes toward computer use; all found CAL useful. There were more respondents (88%) interested in using CAL to further their dental knowledge than in the previous study.[9] Moreover, most respondents reported that dental hygiene schools should offer access to CAL, at least some online components or a few CAL courses in the dental hygiene curriculum to encourage them to participate in web-based or online continuing professional development courses in the future.

CONCLUSIONS

There are some logistical concerns about computers, the Internet, and computer-based education. In order to take advantage of CAL or web-based education, learners must first know how to use these tools. Otherwise, they will be focused on understanding the tools themselves rather than enhancing their professional knowledge. Educators must be trained in the pedagogical uses of computers and the Internet. Some teachers felt that they were not at all or only somewhat prepared to use technology in their teaching. Although the younger generation of teachers more readily uses these technologies, they too felt unprepared to integrate their skills into their teaching, because training in educational technology is not part of the curriculum in most schools of education, as well as a lack of experience in their previous learning environments. There is a call for the implementation of CAL and acquisition of ICT skills in the health professions. However, the dental hygiene profession has been slow to respond and there is a shortage of Canadian studies on this topic. Computers and the Internet can do little to enhance the quality of education without sufficient technical support. Even with training in web-based education or CAL, dental hygienists are not guaranteed success in dental hygiene knowledge advancement. The Internet is a good source of information, but it can also smother the dental hygiene clinician with extraneous information. Dental hygienists must learn to assess the information and translate it into knowledge that will help them in their practice.[36] This article does not suggest that technology-based education should be a substitute for traditional education; only that it may be a viable option for supplementing traditional education, especially in professional continuing education, clinical decision making, and lifelong professional development in general.

The following recommendations may assist dental hygiene educators and school administrators in planning or modifying current dental hygiene programs to better prepare their graduates for lifelong professional development.

Planning for dental hygiene students

1. Offer some online components to the dental hygiene diploma program, such as online quizzes or tests, a module, webinar, a hybrid course or an online course.
2. Utilize classroom management software to provide an interactive online environment. Do not simply use emails or other asynchronous tools to communicate with students, but choose ICT tools that will encourage constructivism to enrich learning experiences.

3. Provide opportunities and guidance to students on how to access a vast amount of information and how to critique and differentiate between credible and questionable sources by introducing different scholarly electronic library database systems.
4. Set up guidelines for evaluating Internet resources.
5. Encourage dental hygiene students to join dental hygiene online forums or networks, such as the CDHA online community, which is "a digital gathering place for dental hygienists who want to connect, communicate and collaborate with other members in the profession" (http://community.cdha.ca/welcome.htm).

Planning for dental hygiene educators

1. Create networks for sharing resources and ideas on ICT implementation among dental hygiene educators within the college and at all other dental hygiene colleges across Ontario.
2. Provide training for dental hygiene educators on ICT and keep them abreast of the ICT skill set.

Further research areas

1. Modify the assessment tool to adapt to emerging ICT and continue to assess dental hygiene students' actual computer competency.
2. Further investigate the Internet searching behaviour for information-seeking patterns.

REFERENCES

1. Mayadas AF, Bourne J, Bacsich P. Online education today. *Science* (New York, N.Y.) [Internet]. 2009 Jan 2;323(5910):85–9 [cited 2010 Jul 1]. Available from: http://www.sciencemag.org/content/323/5910.toc
2. College of Dental Hygienists of Ontario. *Quality Assurance Program* [Internet]. Toronto: CDHO; 2013 [cited 20 Jan 2011]. Available from: http://www.cdho.org/QA+English.asp.
3. Al-Wahadni A, Elnasser Z, Azab M, Owais A. Learning priorities and attitudes towards computer-assisted learning of general medical practitioners, general dental practitioners and dental hygienists. *Int J Dent Hyg*. 2006 May;4(2):91–7.
4. Spallek H, O'Donnell J, Clayton M, Anderson P, Krueger A. Paradigm shift or annoying distraction: emerging implications of Web 2.0 for clinical practice. *Appl Clin Inform* [Internet]. 2010 Apr 21;1(2):96–115 [cited 2011 Nov 18]. Available from: http://www.schattauer.de/index.php?id=1214&doi=10.4338/ACI-2010-01-CR-0003
5. Statistics Canada. *Information and communications technology (Canada year book).* Catalogue no. 11-402-XPE, pp. 243–54. Ottawa: Minister of Industry; 2011. Available from: http://www.statcan.gc.ca/pub/11-402-x/2010000/pdf/information-eng.pdf
6. Canadian Dental Hygienists Association. *National Dental Hygiene Labour Survey 2006-2007*. Ottawa: Canadian Dental Hygienists Association; 2007.
7. Canadian Dental Hygienists Association. *National Dental Hygiene Job Market and Employment Survey 2009*. Ottawa: Canadian Dental Hygienists Association; 2009.
8. Canadian Dental Hygienists Association. *CDHA educators' survey report*. Ottawa: Canadian Dental Hygienists Association; 2011.
9. Covington P, Craig BJ. Survey of the information-seeking patterns of dental hygienists. *J Dent Educ*. 1998 Aug;62(8):573–7.
10. Gravois SL, Bowen DM, Fisher W, Patrick SC. Dental hygienists' information seeking and computer application behavior. *J Dent Educ*. 1995 Nov;59(11):1027–33.
11. Canadian Dental Hygienists Association. *Dental Hygiene Labour Survey Canada 2002*. Ottawa: Canadian Dental Hygienists Association; 2002.
12. Edgington EM, Cobban SJ. Dental hygienists' preferences for continuing education content and delivery formats. *Probe*. 2004;38(2):59–64, 90.
13. Savukinas, J. E-learning: impacts of IT on education. *Digital economy 2002*. 2002;59–64. http://www.esa.doc.gov/sites/default/files/reports/documents/de2002r1.pdf
14. Broudo M, Walsh C. MEDICOL: online learning in medicine and dentistry. *Academic Medicine* [Internet]. 2002;77(9):926–7. Available from: http://journals.lww.com/academicmedicine/Fulltext/2002/09000/MEDICOL__Online_Learning_in_Medicine_and_Dentistry.28.aspx
15. Schittek M, Mattheos N, Lyon HC, Attström R. Computer assisted learning: a review. *Eur J Dent Educ*. 2001 Aug;5(3):93–100.
16. Mattheos N, Stefanovic N, Apse P, Attström R, Buchanan J, Brown P, et al. Potential of information technology in dental education. *Eur J Dent Educ* [Internet]. 2008 Feb;12 Suppl 1:85–92 [cited 2011 Nov 21]. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1600-0579.2007.00483.x/pdf
17. Pellegrini JM. Information-seeking behaviours of practicing dental hygienists in Virginia [dissertation]. Richmond, VA: Virginia Commonwealth University; 2008.
18. Finley-Zarse SR, Overman PR, Mayberry WE, Corry AM. Information-seeking behaviors of U.S. practicing dental hygienists and full-time dental hygiene educators. *J Dent Hyg*. 2002 Jan;76(2):116–24.
19. Canadian Dental Hygienists Association. *Policy framework for dental hygiene education in Canada 2005*. Ottawa: Canadian Dental Hygienists Association; 2000.
20. Canadian Dental Hygienists Association. *Entry-to-practice competencies and standards for Canadian dental hygienists*. Ottawa: Canadian Dental Hygienists Association; 2010.
21. Mattheos N, Nattestad A, Schittek M, Attström R. A virtual classroom for undergraduate periodontology: a pilot study. *Eur J Dent Educ*. 2001 Nov;5(4):139–47.
22. Mattheos N. The Internet and the oral healthcare professionals: potential and challenges of a new era. *Int J Dent Hyg*. 2007 Aug;5(3):151–7.
23. Stevenson D. *Information and communications technology in UK schools: an independent inquiry* [Internet]. London: The Independent ICT in Schools Commission; 1997. p. 1–44. Available from: http://web.archive.org/web/20070104225121/http:/rubble.ultralab.anglia.ac.uk/stevenson/ICT.pdf
24. Bhatvd, Gopinathdsert, Hariprasadrie, Jtouzi, Kumaraswamydsert, Kumaraswamyrie, et al. ICT in education [Internet]. 2011 [cited 2012 Feb 6]. p. 1–3. Available from: http://wikieducator.org/index.php?oldid=692642
25. Creswell JW. *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Upper Saddle River, NJ: Pearson Prentice Hall; 2008.
26. Stokes C, Cannavina C, Cannavina G. The state of readiness of student health professionals for web-based learning environments. *Health Informatics J* [Internet]. 2004 Sep 1;10(3):195–204 [cited 2011 May 6]. Available from: http://jhi.sagepub.com/cgi/doi/10.1177/1460458204045434
27. Mattheos N, Schittek MJ, Nattestad A, Shanley D, Attström R. A comparative evaluation of computer literacy amongst dental educators and students. *Eur J Dent Educ* [Internet]. 2005 Feb;9(1):32–6 [cited 2012 Jul 19].
28. Andersson EP. Continuing education in Sweden--to what purpose? *J Contin Educ Nurs*. 2001;32(2):86–93.
29. Pahinis K, Stokes CW, Walsh TF, Tsitrou E, Cannavina G. A blended learning course taught to different groups of learners in a dental school: follow-up evaluation. *J Dent Educ* [Internet]. 2008 Sep;72(9):1048–57. Available from: http://www.jdentaled.org/content/72/9/1048.full.pdf+html

30. Resnick LB. Instructional psychology. *Annu Rev Psychol.* 1981 Jan;32(1):659–704.
31. Resnick M. Rethinking learning in the digital age. In: Kirkman G, Sachs J, Schwab K, Cornelius P, editors. *The global information technology report 2001-2002: readiness for the networked world* [Internet]. Massachusetts: Oxford University Press; 2002. p. 32–7. Available from: http://www.cid.harvard.edu/archive/cr/pdf/gitrr2002_ch03.pdf
32. Schilling K, Wiecha J, Polineni D, Khalil S. An interactive web-based curriculum on evidence-based medicine: design and effectiveness. *Family Medicine* [Internet]. 2006 Feb;38(2):126–32. Available from: http://www.stfm.org/fmhub/fm2006/February/Katherine126.pdf
33. Scardamalia M, Bereiter C. Computer support for knowledge-building communities. *Journal of the Learning Sciences*. 1994 Jul 1;3(3):265–83.
34. Rindal DB, Rush WA, Boyle RG. Clinical inertia in dentistry: a review of the phenomenon. *J Contemp Dent Pract* [Internet]. 2008 Jan;9(1):113–21 [cited 2012 Feb 9]. Available from: http://www.jaypeejournals.com/eJournals/ShowText.aspx?ID=1838&Type=FREE&TYP=TOP&IN=_eJournals/The Journal of Contemporary Dental Practice.jpg&IID=157&AID=24&Year=2008&isPDF=YES
35. Straub-Morarend CL, Marshall TA, Holmes DC, Finkelstein MW. Informational resources utilized in clinical dentistry. *J Dent Educ*. 2011;75(4):441–52.
36. Mazurat R. Online educational resources: will more information make us wiser? *J Can Dent Assoc* [Internet]. 2001 Jan;67(1):32–3. Available from: http://www.cda-adc.ca/jcda/vol-67/issue-1/32.pdf©CDHA

Beyond cervical cancer: Human papillomavirus (HPV) and its role in oropharyngeal squamous cell carcinoma

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ABSTRACT

Oral cancer is a disease with a multifactorial etiology. While this disease may arise with no prior risk history, traditional risk factors have included smoking and alcohol consumption in a demographic population made up predominantly of males in the 5th to 7th decade of life and involving higher risk intraoral sites such as the floor of mouth, lower lip, and ventral and lateral surfaces of the tongue. However, there is an increasing amount of research linking a viral etiology to oral carcinogenesis and, in particular, the role of human papillomavirus (HPV) in the pathogenesis of this disease. HPV is now considered to be an independent risk factor for a subset of oral squamous cell carcinoma, namely, oropharyngeal squamous cell carcinoma. This subset is also defined by a younger demographic, involving primarily non-smokers and non-drinkers, and favours high-risk sites such as the base of tongue, soft palate, and the tonsillar region. This short communication will highlight the emerging evidence surrounding the role of HPV in oropharyngeal carcinoma.

RÉSUMÉ

Le cancer buccal est une maladie ayant une étiologie multifactorielle. Alors que cette maladie peut survenir sans risque antécédent, les facteurs de risque traditionnels ont compris le tabagisme et la consommation d'alcool dans une population dont la démographie comprenait surtout des mâles de la 5e à la 7e décennie de vie et impliquant des sites intrabuccaux à risque plus élevé, tels le plancher de la bouche, la lèvre inférieure et les surfaces ventrale et latérales de la langue. Toutefois, une somme croissante de recherches relie une étiologie virale à une carcinogénèse buccale et, particulièrement, le rôle du papillomavirus humain (PVH) dans la pathogénèse de cette maladie. Le PVH est maintenant considéré comme étant un facteur de risque indépendant de carcinome buccal à cellules squameuses, notamment le carcinome oropharyngé à cellules squameuses. Ce sous-ensemble se définit aussi par une démographie plus jeune, impliquant d'abord les non-fumeurs et les non-buveurs, et favorise les sites à risque élevé tels que la base de la langue, le palais mou et la région tonsillaire. Cette courte communication mettra en relief l'évidence émergeante entourant le rôle du PVH dans le carcinome oropharyngé.

Key words: human papillomavirus; oral cancer; oropharyngeal carcinoma

INTRODUCTION

The role of viruses and, in particular, the human papillomavirus in the pathogenesis of oral cancer has been described in the literature for many years.[1,2] The human papillomavirus (HPV) is a double-stranded DNA virus that infects only humans. With a special affinity for epithelial cells, the virus has a natural tendency to infect both cutaneous and mucosal surfaces including the mucosal epithelium of the cervix, anogenital region, tonsillar crypts, and oropharynx.[3,4]

Over 120 types of HPV have been identified; these have been further subdivided into either low-risk or high-risk groups.[3] Low-risk forms of HPV infection (e.g., types 6 and 11) can manifest as benign, wart-like lesions such as oral squamous papilloma, verruca vulgaris (common skin wart), focal epithelial hyperplasia (Heck's disease), and condyloma accuminatum (venereal warts).[4,5,6] The more serious aspect of HPV infection, however, is through the high-risk subtypes of the virus, particularly HPV types 16 and 18—the so-called sexually transmissible forms of HPV.[3,7,8,9] These two subtypes are currently associated with over 70 per cent of cases of cervical cancer,[9] and HPV 16 is linked to up to 70 per cent of oropharyngeal squamous cell carcinoma.[9,10,11]

However, not all cervical HPV infections lead to cancer, and studies on the natural history of these infections indicate that most HPV-related infections remain asymptomatic and resolve within a couple of years.[3,9] Low-risk HPV infections, such as those responsible for ordinary warts, condyloma accuminatum or focal epithelial hyperplasia, tend to clear more often and more quickly than those oral HPV infections associated with the high-risk subtypes such as HPV-16. It is the persistence of these high-risk infections that raises the potential for malignant transformation and the development of oropharyngeal carcinoma.[3,4,9]

The mechanism by which HPV infection affects cell immortality and progression to malignancy in the oropharyngeal region is still uncertain. Current research is focusing on the expression of viral E6 and E7 oncoproteins and their effects on specific tumour suppressor proteins such as p53 and pRb, rendering them useless and thereby impacting the normal regulatory mechanisms surrounding cell division within the epithelium. This deregulation can promote tumour cell proliferation within the tissues.[4] Unlike the natural history of cervical HPV infections, that of oral HPV infection in either sex is still unclear. Unanswered questions include the rate of

THIS IS A PEER-REVIEWED ARTICLE. Submitted 25 June 2013; revised 16 July 2013; accepted 18 July 2013.
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Table 1. Epidemiologic trends in the development of HNSCC

	HPV-positive	HPV-negative
Incidence	Increasing	Decreasing
Age	Younger	Older
Gender	4:1 men[12]	3:1 men
Risk factors	Sexual behaviour	Tobacco, alcohol, betel quid
Cofactors	Marijuana, Immunosuppression	Immunosuppression
Anatomic site	Base of tongue, tonsillar pillars, soft palate	All sites (high risk: floor of mouth, ventro-lateral tongue)
Survival	Better	Worse

Adapted from Westra WH. The changing face of head and neck cancer in the 21st century: the impact of HPV on the epidemiology and pathology of oral cancer. *Head and Neck Pathol*. 2009;3(1):79.

clearance of oral HPV infections, the risk of an individual's developing oropharyngeal cancer once HPV infection is detected, as well as the length of latency between onset of infection and cancer development, and finally, the possible contribution of other more traditional co-factors such as tobacco and alcohol use to the development of HPV-positive oropharyngeal cancer.[9]

CURRENT LANDSCAPE OF ORAL HPV INFECTION

The traditional demographic of head and neck squamous cell carcinoma (HNSCC) has been the elderly male client (50–70 years), chronic smoker often with concomitant alcohol use. Epidemiologic trends in the development of HNSCC in North America have been changing over the years due in large part to a decline in the incidence of smoking.[3,7] This is contrasted by an emergence of a subtype of HNSCC: HPV-associated oropharyngeal carcinoma that is now characterized by a younger, male demographic (40–50 years) with no history of either smoking or alcohol consumption.[9] Tobacco and alcohol consumption—traditional risk factors—have now been replaced by risk factors related to sexual practices including oral–genital or oral–anal sex as well as an increased number of sexual partners.[3,9] Certainly concomitant use of tobacco, alcohol or even betel quid can work synergistically with HPV oncogenes, leading to malignant epithelial cell transformation. One study has also reported on another independent risk factor that may play a significant role in the transformation of an HPV infection of the oral mucosa into an HPV-related malignancy: the use of marijuana, taking into account the frequency, intensity and duration (years) of usage. Marijuana smoke may exert more significant effects on the modulation of one's immune surveillance system particularly in human tonsillar tissue whereby host immune responses become diminished in favour of accelerated tumour activity [8] (Table 1).

While the primary mode of transmission of HPV to the oral cavity is through sexual contact, specifically oral–genital sex (horizontal transmission), other pathways can include autoinoculation and, less frequently, perinatal transmission from the infected mother to the neonate during birth (vertical transmission).[9] The probability of high-risk oral HPV acquisition via sexual contact is increased with each new sexual partner as well as with a younger age for first sexual activity. Risk is also increased with same-sex contacts.[3,8]

A higher prevalence of oral HPV has been reported in older HIV-positive clients particularly since the effectiveness of highly active antiretroviral therapy (HAART) for HIV-positive clients has greatly lengthened their life span, such that HIV is considered another chronic disease of humankind. Because of the heightened role of oral HPV in the development of oropharyngeal squamous cell carcinoma, these clients may now be at a much higher risk for this HPV-associated malignancy in addition to the previously reported malignancies such as Kaposi's sarcoma and lymphoma reported in this client group. An explanation for this increased risk may be found in the presence of more risk factors among this group, such as a history of sexually transmitted diseases and the frequency of same-sex encounters. The degree of immunosuppression in HIV-positive individuals as reflected, for example, by CD4 counts being < 200 cells/mm,[3] will also influence the likelihood of oral HPV infection.[13]

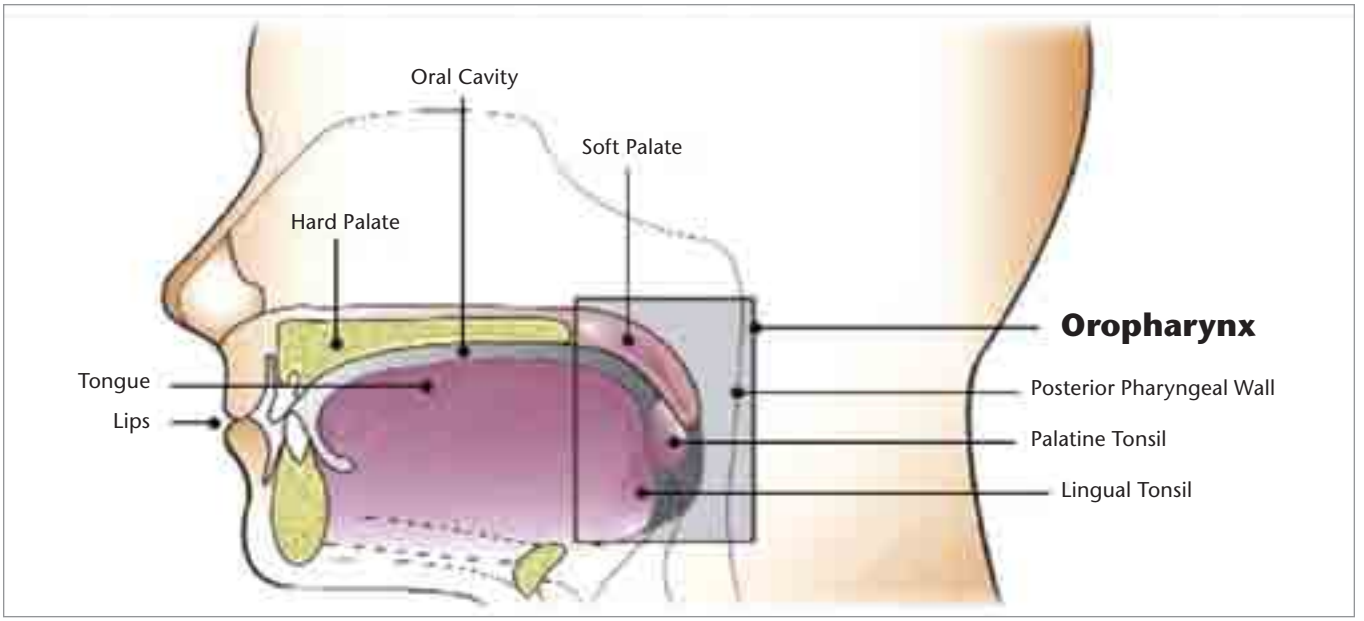
Oral lesions in children associated with HPV are considered to be uncommon, and generally these lesions will be related to low-risk types of HPV such as the common wart (verruca vulgaris), often developing as a result of autoinoculation. However, it is recommended that all such lesions be investigated given the multiplicity of modes of transmission, with particular attention being paid to the potential of childhood sexual abuse (e.g., condyloma acuminatum or venereal wart).[6]

CLINICAL IMPLICATIONS FOR THE DENTAL PROFESSIONAL

Historically, dental professionals have been taught that a significant number of cases of oral squamous cell carcinoma are preceded by visible, premalignant changes to the oral mucosa in the form of so-called red or white lesions (i.e., erythroplakia or leukoplakia). However, less information is available on any well-defined or different clinical features of HPV-associated premalignant lesions; this dearth of information is exacerbated by the less accessible locations of most HPV-positive oropharyngeal carcinomas, namely at the base of tongue and tonsillar crypt regions in the oropharynx.[7]

The oropharynx is anatomically defined as including the palatine and lingual tonsils, the posterior one-third or base of the tongue, the soft palate, and the posterior pharyngeal wall (Figure 1). HPV is preferentially attracted to the lymphoid tissue present in the lingual and palatine tonsillar areas (Waldeyer's ring of lymphoepithelial tissue) and within these tonsillar crypts the more immature basal epithelial cells become exposed to the virus. As these basal cells mature, the virus then replicates into squamous cells,

Figure 1. The oral cavity and oropharynx



Cleveland JL and colleagues. The connection between human papillomavirus and oropharyngeal squamous cell carcinomas in the United States: implications for dentistry. *JADA*. 2011;142(8):915–24. Copyright © 2011 American Dental Association. All rights reserved. Reprinted by permission.

expressing viral genes and progeny viruses which are subsequently shed.[4]

Performing a detailed, systematic visual and tactile examination of the oral cavity/oropharynx is imperative, not only as a screening method for oral cancer, but also as a means to identify all forms of pathology whether they be neoplastic, infectious, reactive (inflammatory) or developmental in origin.[14] This must follow a thorough client medical and dental history-taking, including questions that may reveal early and troublesome signs and symptoms of underlying disease.[9] Such questions may include:

- difficulty and/or pain in swallowing
- recent hoarseness to the voice
- non-healing lesions
- unusual bleeding into the mouth and/or throat
- feeling of something being "stuck" in the throat
- persistent sore throat (i.e., non-responsive to antibiotics).

Given the limited amount of available research, it would be premature to extrapolate on the possibility that HPV vaccines currently available for prevention of cervical cancer will contribute to a reduction in HPV-related oropharyngeal cancers.[3,4] Rather, from a dental practitioner perspective, preventive client education (e.g., pamphlets, website links) on the potential role of oral transmission of HPV in the causation of a variety of oral lesions including oral cancer should be increasingly pursued.

Evolving research and studies into various treatment modalities for clients with HPV-positive oropharyngeal squamous cell carcinoma have described these lesions as more sensitive to both chemotherapy and radiotherapy, thereby resulting in better survival and overall prognosis than HPV-negative oropharyngeal squamous cell carcinomas.[9,15,16]

CONCLUSION

Head and neck squamous cell carcinoma remains the sixth most common malignancy worldwide. The 5-year survival rate has also remained relatively unchanged over the past 50 years despite advances in various oncologic treatment modalities. The etiology of the more classical form of HNSCC has focused on chronic exposure to both tobacco and alcohol. However, evidence now clearly shows that the high-risk forms of human papillomavirus (types 16 and 18) are major causative factors in the genesis of oropharyngeal squamous cell carcinoma (a subtype of HNSCC), located primarily on the base of tongue, tonsil and oropharynx. Ongoing efforts at early detection and diagnosis of all forms of HNSCC remain crucial to improving the current 5-year survival rate for this disease. Both visual and tactile examinations remain critical for all clients in order to detect any and all forms of pathology, in combination with a thorough medical/dental history. Clinicians will need to become more comfortable with including the specific oropharyngeal structures as part of their overall intraoral examinations. Future research may refine current oral screening modalities to provide sufficient specificity as to be practical in the dental office setting.[17,18] However, any such screening tests must be proven to demonstrate precise scientific acumen in order to be of unequivocal value to the clinician's overall diagnostic and decision-making processes.

REFERENCES

1. Scully C, Prime S, Maitland N. Papillomaviruses: their possible role in oral disease. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1985;60:166–74.
2. Steele C, Shillitoe EJ. Viruses and oral cancer. *Critical Reviews in Oral Biology and Medicine.* 1991;2(2):153–75.
3. Prabhu SR, Wilson DF. Human papillomavirus and oral disease – emerging evidence: a review. *Aust Dent J.* 2013;58:2–10.
4. Rautava J, Syrjanen S. Human papillomavirus infections in the oral mucosa. *JADA.* 2011;142(8):905–14.
5. Sapp JP, Eversole LR, Wysocki GP. *Contemporary oral and maxillofacial pathology.* 2nd ed. St. Louis: Mosby; 2004.
6. Pinheiro RS, de Franca TRT, Ferreira DC, Ribeiro CMB, Leao JC, Castro GF. Human papillomavirus in the oral cavity of children. *J Oral Pathol Med.* 2011;40:121–26.
7. Lingen MW. The changing face of head and neck cancer [Editorial]. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2008;106(3):315–16.
8. Westra WH. The changing face of head and neck cancer in the 21st century: the impact of HPV on the epidemiology and pathology of oral cancer. *Head and Neck Pathol.* 2009;3:78–81.
9. Cleveland JL, Junger ML, Saraiya M, Markowitz LE, Dunne EF, Epstein JB. The connection between human papillomavirus and oropharyngeal squamous cell carcinomas in the United States: implications for dentistry. *JADA.* 2011;142(8):915–24.
10. Radoi L, Luce D. A review of risk factors for oral cavity cancer: the importance of a standardized case definition. *Community Dent Oral Epidemiol.* 2013;41:97–109.
11. McCord C, Xu Jing, Xu Wei, Xin Qiu, McComb RJ, Perez-Ordonez B, et al. Association of high-risk human papillomavirus infection with oral epithelial dysplasia. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2013;115:541–49.
12. Center for Disease Control and Prevention. Human papillomavirus-–associated cancers—United States, 2004–2008. *MMWR.* 2012;61(15):258–61.
13. Fatahzadeh M, Schlecht NF, Chen Z, Bottalico D, McKinney S, Ostoloza J, et al. Oral human papillomavirus detection in older adults who have human immunodeficiency virus infection. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2013;115:505–14.
14. Rethman MP, Carpenter W, Cohen EEW, Epstein J, Evans CA, Flaitz CM, et al. Evidence-based clinical recommendations regarding screening for oral squamous cell carcinomas. *JADA.* 2010;141(5):509–20.
15. Ang KK, Harris J, Wheeler R, Weber R, Rosenthal DI, Nguyen-Tan PF et al. Human papillomavirus and survival of patients with oropharyngeal cancer. *N Engl J Med.* 2010;363:24–35.
16. Nichols AC, Faquin WC, Westra WH, Mroz EA, Begum S, Clark JR, et al. HPV-16 infection predicts treatment outcome in oropharyngeal squamous cell carcinoma. *Otolaryngology –Head and Neck Surgery.* 2009;140:228–34.
17. Lingen MW. Can saliva-based HPV tests establish cancer risk and guide patient management? [Editorial]. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2010;110(3):273–74.
18. Shoushtari AN, Rahimi NP, Schlesinger DJ, Read PW. Survey on human papillomavirus/ p16 screening use in oropharyngeal carcinoma patients in the United States. *Cancer.* 2010;116:514–19.

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School-based oral health screening in the Region of Peel — Combining dental hygienist expertise with evidence to better identify high-risk populations

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ABSTRACT

Objective: Ontario public health units conduct dental screenings of specific grades in elementary schools as mandated by the Ontario Public Health Standards (OPHS). However, this presents the challenge of how best to manage resources in order to meet these mandates. Recognizing that the OPHS directives for selecting the target populations for screenings do not adequately capture hidden high-risk populations, this project sought to capitalize on the dental hygienists' experiences in the schools, in conjunction with local data, to maximize the impact of school screening in Peel.

Methods: Three marginalization indices (Social Risk Index and two components of the Ontario Marginalization Index) were used to prepare maps to identify high-risk populations. The results were combined with oral health screening data and dental hygienists' knowledge of the school populations. These data were used to determine which grades in each school would be screened in the 2012–2013 school year.

Results: School screenings began in September 2012 with positive preliminary results, including increased numbers and rates of urgent cases. Final results will be available following the completion of the school year in June 2013.

Outcomes: The project has demonstrated that a "one size fits all" approach makes it difficult to assess accurately the dental risk in schools with a diverse population. The project enabled us to target our resources to high-needs areas and better identify children in need of dental treatment.

RÉSUMÉ

Objet : Les bureaux de santé publique de l'Ontario poursuivent l'examen des niveaux de dépistage dans les écoles élémentaires, comme le prescrivent les Normes de santé publique de l'Ontario (NSPO). Cela pose cependant le défi de la meilleure gestion des ressources pour respecter ces mandats. Reconnaissant que, concernant la sélection des populations cibles de ce dépistage, les directives des NSPO ne permettent pas de capter adéquatement les populations à risques élevés et cachés, ce projet cherchait à capitaliser sur les expériences des hygiénistes dentaires dans les écoles, en conjonction avec les données locales, pour maximiser l'impact du dépistage scolaire dans la région de Peel.

Méthodes : Trois indices de marginalisation (l'Indice du risque social et deux composantes de l'Indice de marginalisation de l'Ontario) ont servi à préparer les cartes d'identification des populations à risques élevés. Les résultats ont été combinés avec les données de dépistage de santé buccale et le savoir des hygiénistes dentaires des populations scolaires. Ces données ont servi à établir quels seraient les niveaux de dépistage pour l'année scolaire 2012-2013.

Résultats : Le dépistage scolaire a commencé en septembre 2012 avec des résultats préliminaires positifs, y compris les nombres et les taux plus élevés de cas d'urgence. Les résultats finaux seront disponibles après la fin de l'année scolaire en juin 2013.

Conclusions : Le projet a démontré qu'une approche « uniforme » rend difficile l'évaluation avec précision du risque dentaire dans les écoles ayant une diversité de population. Le projet nous a permis d'orienter nos ressources vers des secteurs à besoins élevés et de mieux identifier les enfants qui ont besoin de soins dentaires.

Examining ability of the RAI–MDS 2.0 to predict dental need among long-term care residents

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ABSTRACT

Objective: This project seeks to determine whether the Resident Assessment Instrument–Minimum Data Set (RAI–MDS) 2.0 is capable of predicting dental need in a sample of elderly long-term care (LTC) residents. The RAI–MDS is conducted by nursing staff and is designed to address LTC residents' needs and to develop care plans. Therefore, it is important to know if the dental and oral health components of this assessment provide accurate and valuable information.

Methods: A chart review is in progress to compare results of the RAI–MDS and an onsite dental assessment using assessments from 2008–2012 on residents aged 65 years and older.

Variables: The primary outcome considered in this study will be "treatment need" as defined in the dentist's assessment. The affirmative responses will be further analyzed using the categories assessed by the dentist, such as oral pain, xerostomia, oral hygiene, caries, root tips, gingivitis, plaque, calculus, and inflammation of soft tissues. Considering the date of the dental assessment, the most recent complete RAI–MDS will be used for the predictor data. Gender, age, length of stay, cognitive performance, and activities of daily living performance will be noted from the RAI–MDS. The primary predictors from the RAI–MDS will be mouth pain, chewing problems, broken/loose/carious teeth and inflamed gums/bleeding/abcesses/ulcers. From a clinical perspective, each of these areas should have a strong association with treatment need.

Results: Data collection is not complete. Results will involve a statistical comparison of the two assessments.

Conclusions: The results will help to identify strengths and weaknesses of the RAI–MDS dental components, and bring awareness to the dental needs of Alberta's LTC population. The next steps for addressing oral health for this population will be discussed, with a focus on improving the assessment process.

RÉSUMÉ

Contexte : Ce projet cherche à déterminer si l'Instrument d'évaluation des résidents – Jeu de données minimum (IÉR–JDM) 2,0 est capable de prévoir les besoins dentaires dans un échantillon de soins de longue durée (SLD) pour les résidents âgés. L'IÉR–JDM est dirigé par le personnel soignant et conçu pour répondre aux besoins des résidents des SLD et élaborer des régimes de soins de santé. Il est donc important de savoir si les composantes dentaires et de santé buccale de cette évaluation procurent une information exacte et valable.

Méthodes : Un examen des dossiers se poursuit visant à comparer les résultats de l'IÉR–JDM et une l'évaluation dentaire sur place de 2008 à 2012 chez des résidents de 65 ans et plus.

Variables : Le premier résultat examiné dans cette étude portera sur le « besoin de traitement » défini par l'évaluation du dentiste. Les réponses affirmatives seront analysées de nouveau selon les catégories évaluées par le dentiste, telles que la douleur buccale, la xérostomie, l'hygiène buccale, les caries, les extrémités radiculaires, la gingivite, la plaque, le calcul et l'inflammation des tissus mous. Considérant la date de l'évaluation dentaire, le plus récent IÉR–JDM complet servira à la prédiction des données. Le genre, l'âge, la durée du séjour, la performance cognitive et les activités de la vie quotidienne seront notés à partir de l'IÉR–JDM. Les premiers prédicteurs tirés de l'IÉR–JDM seront la douleur de la bouche, les problèmes de mastication, les dents brisées/mobiles/cariées et les gencives enflammées/saignements/abcès/ulcères. Dans une perspective clinique, chacun de ces secteurs devrait avoir une forte association avec le besoin de traitement.

Résultats : La collection des données n'est pas complète. Les résultats impliqueront la comparaison statistique des deux évaluations.

Conclusions : Les résultats aideront à identifier les forces et les faiblesses des composantes dentaires de l'IÉR–JDM et éveilleront la sensibilisation aux besoins dentaires de la population LTC de l'Alberta. À l'étape suivante, la discussion abordera la question de la santé buccale de cette population en mettant l'accent sur l'amélioration du processus d'évaluation.

Identification and characterization of novel HPVs in oropharyngeal squamous cell carcinoma

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ABSTRACT

Background: Worldwide, about 400,000 people will be diagnosed with oral squamous cell carcinoma (OSCC) and oropharyngeal squamous cell carcinoma (OPSCC), with a 50% mortality rate. Well-established risk factors for OSCC include tobacco use and alcohol consumption. However, recently there has been an increase in the incidence of cancers arising in the oropharynx and at the base of the tongue, especially among younger individuals, without the typical risk factors, such as tobacco and alcohol use. Human papillomavirus (HPV) infection has now been identified as an etiologic agent for OSCCs, especially for oropharyngeal and tonsillar cancers; HPV has been detected in 29% of OPSCC patients, and only 3.9% of OSCC cases. In our own study we detected HPV in 33.3% of OPSCC case patients. The increasing incidence of HPV-related OPSCCs is of considerable public health importance. To date, no study has used state-of-the-art approaches to search for novel HPVs in OPSCC now considered "HPV negative" OPSCC.

Objectives: The aims of our study are as follows: 1) discover novel HPVs using high throughput sequencing technology in oral lavage samples collected from newly diagnosed and untreated OPSCC patients; 2) determine prevalence of novel HPVs in archived OPSCC tissue samples; and 3) determine frequency of novel oncogenic HPVs in cancerous and noncancerous oral lavage samples.

Expected results: We hope to detect novel types of HPV, as we have already detected and sequenced three new types of HPV from noncancerous samples. The prevalence of the new HPVs is expected to be greater in OPSCC archived tissue samples and in much higher concentrations compared to controls. The novel HPVs will have a higher frequency in the cancerous oral lavage samples compared to the controls.

Expected conclusions: Novel types of oncogenic HPVs do exist in OPSCC, which warrant further research to provide new information for detection, treatment, and prevention.

RÉSUMÉ

Contexte : Dans le monde, environ 400 000 personnes auront un diagnostic de cancer carcinome épidermoïde buccal (CCÉB) et de cancer carcinome épidermoïde oropharyngé (CCÉOP), avec un taux de mortalité de 50%. Les facteurs de risque bien établis de CCÉB incluent l'utilisation du tabac et la consommation de l'alcool. Toutefois, il y eut une hausse de l'incidence des cancers survenant dans l'oropharynx et à la base de la langue, surtout chez les plus jeunes individus, sans facteurs typiques de risque, comme le tabac et l'alcool. L'infection du papillomavirus humain (PVH) a maintenant été identifiée comme étant un agent étiologique des CCÉB, notamment pour les cancers oropharyngés et tonsillaires; la PVH a été détectée dans 29% des cas de CCÉOP et seulement 3,9% des cas de CCÉB. Dans notre propre étude, nous avons détecté l'infection PVH chez 33,3% des patients atteints de CCÉOP. L'incidence croissante du CCÉOP associé à la PVH a une importance considérable en santé publique. Jusqu'à présent, aucune étude n'a utilisé de méthodes de recherche d'appoint pour les nouvelles infections PVH dans ce qu'on considère maintenant un CCÉOP avec « PVH négatif ».

Objets : Notre étude a un triple objet : 1) découvrir de nouveaux PVH à l'aide d'une technologie de séquençage à haut débit dans les exemples de lavage buccal recueillis chez les patients qui, ayant un nouveau diagnostic de CCÉOP, n'avaient pas été traités; 2) déterminer la prévalence des nouveaux PVH, dans les exemples de tissus de CCÉOP des archives; et 3) déterminer la fréquence de nouveaux PVH oncogènes dans les exemples de lavage buccal cancéreux et non cancéreux.

Résultats attendus : Nous espérons détecter de nouveaux types de PVH, comme nous avons déjà détecté et séquencé trois nouveaux types de PVH dans les exemples non cancéreux. Nous prévoyons que la prévalence des nouveaux PVH sera plus grande dans les échantillons de tissus archivés et beaucoup plus concentrée comparativement aux groupes témoins. Les nouveaux PVH seront plus fréquents dans les échantillons cancéreux de lavage buccal comparés aux témoins.

Conclusions attendues : Les nouveaux types de PVH oncogènes existent dans les CCÉOP, qui exigent plus de recherche pour fournir plus d'informations de détection, traitement et prévention.

The use of adjunctive screening devices by Canadian dental hygienists

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ABSTRACT

Background: Screening for oral cancer should be easy: the exam is fast, non-invasive and the site is easy to visualize, yet more than 60% of oral cancers are diagnosed late when the treatment is complex and prognosis is poor. Adjunctive screening devices (ASDs) such as toluidine blue (TB), fluorescence visualization (FV), chemiluminescence (CL), and brush biopsies have been designed to assess risk of oral lesions and aid in the identification and localization of oral premalignant and malignant lesions.

Objective: To evaluate the use and level of comfort using ASDs for oral cancer screening among dental hygienists.

Method: A stratified random sample of about 3000 dental hygienists from four Canadian provinces were contacted by email and provided with a link to an online survey that included questions related to the use and comfort level of using ASDs.

Results: 369 hygienists completed the survey section on ASDs, 93 (25%) had used an ASD of some type. Use of ASDs was associated with 6 continuing education (CE) courses per year (P=0.030), having taken a recent CE course in oral pathology (P=0.003) and having an established screening protocol (P=0.008). FV was the most commonly used ASD and the one that dental hygienists felt most comfortable using. Very few dental hygienists used brush biopsies. Older graduates were more comfortable using TB (P=0.014) and CL (0.033) than newer graduates.

Conclusion: Current evidence and education appear to help hygienists feel more comfortable using ASDs. ASDs with minimal research, and which have not been specifically targeted to dental hygienists, are not well utilized.

RÉSUMÉ

Contexte : Le dépistage du cancer buccal devrait être facile : l'examen est rapide, non invasif et le site est facile à visualiser; pourtant, le diagnostic de 60% des cancers buccaux est tardif et alors le traitement est complexe et le pronostic, faible. Des appareils accessoires de mesure (AAM), comme le bleu de toluidine (BT), la visualisation par fluorescence (VF), la chimioluminescence (CL) et les biopsies par brossage conçues pour évaluer le risque de lésion buccale et aider l'identification et la localisation des lésions précancéreuses et malignes.

Objet : Évaluation de l'utilisation et du niveau de confort de l'usage des AAM pour dépister le cancer buccal parmi les hygiénistes dentaires.

Méthode : Un échantillonnage aléatoire stratifié d'environ 3 000 hygiénistes dentaires de quatre provinces canadiennes ont été rejointes par courriel et reçu un lien leur permettant de participer en ligne à un sondage comprenant des questions sur l'utilisation et le niveau de confort d'utilisation des AAM.

Résultats : 369 hygiénistes ont rempli la section du sondage sur les AAM; 93 (25%) avaient utilisé un certain type d'AAM. L'utilisation de l'AAM était associée à 6 cours de formation continue (FC) par année (P=0,030), au suivi récent d'un cours de FC en pathologie buccale (P=0,003) et à un protocole établi de dépistage (P=0,008). La VF était l'AAM le plus communément utilisé et celui avec lequel les hygiénistes dentaires se sentaient le plus confortables. Les diplômées plus âgées se sentaient plus à l'aise d'utiliser le BT (P=0,014) et la CL (0,033) que les jeunes diplômées.

Conclusion : L'évidence et la formation actuelles semblent aider les hygiénistes à se sentir plus à l'aise d'utiliser les AAM. Avec une recherche minimale et n'ayant pas été ciblées spécifiquement vers les hygiénistes dentaires, les AAM ne sont pas bien utilisées.

The effects of daily power toothbrushing on caregiver compliance and on oral and systemic inflammation in a nursing home population

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ABSTRACT

Objectives: The aim of this study is to investigate whether twice-daily use of a rotating–oscillating power toothbrush (Oral-B Professional Care 1000™) in nursing home residents will 1) increase caregiver compliance with oral care; 2) reduce oral inflammation; and 3) reduce systemic inflammation.

Methods: In this repeated-measures, single-blind, randomized controlled trial begun in November 2012, sixty residents of a large nursing home in Winnipeg, Canada, were randomized to receive either twice-daily toothbrushing with a rotating–oscillating power toothbrush or standard care by caregivers. The study received institutional ethics approval, and consent was obtained from residents directly or from their proxies. Participants had the following characteristics: some natural teeth present, oral inflammation, non-aggressive behaviour, no communicable diseases, non-smokers, and non-comatose. Outcomes were recorded at baseline and 6 weeks and included measures of oral inflammation (MGI, Lobene); bleeding (PBI, Loesche); plaque (Turesky); systemic inflammation (hsC-reactive Protein); caregiver compliance (daily oral care chart); and an 11-item caregiver survey. Primary and secondary analyses of oral and systemic measures will employ the Kruskal-Wallis test while caregiver compliance will be analyzed with descriptive statistics.

Expected results: Caregivers of nursing home residents will get better compliance with the use of power toothbrushes for twice-daily oral care delivery as compared to standard care. Twice-daily tooth brushing with a rotating–oscillating power toothbrush will result in significant reductions in plaque, oral, and systemic inflammation.

Expected conclusion: Introduction of a rotating–oscillating power toothbrush for daily oral care in nursing homes will contribute to improved resident oral and systemic health.

RÉSUMÉ

Objet : Cette étude a pour objet d'examiner si l'utilisation deux fois par jour d'une brosse à dents ayant un pouvoir rotatoire et oscillatoire (Oral-B Professional Care 1000TM) chez les résidents de foyers de soins 1) accroîtra la conformité du soignant concernant les soins buccaux, 2) réduira l'inflammation buccale et 3) réduira l'inflammation systémique.

Méthodes : Dans ces mesures répétées, un essai à simple insu, aléatoire et sous contrôle, a commencé en Novembre 2012. Soixante résidents d'une grande maison de soins infirmiers de Winnipeg, au Canada, ont été choisis au hasard pour se faire brosser les dents deux fois par jour avec une brosse à dents électrique rotative et oscillante ou recevoir un traitement standard par le personnel soignant. L'étude a reçu l'approbation éthique institutionnelle et le consentement a été obtenu des résidents eux-mêmes ou de leurs mandataires. Les participants avaient les caractéristiques suivantes : présence de dents naturelles, inflammation buccale, comportement non agressif, absence de maladie transmissible, état de non-fumeur et état non comateux. Les résultats ont été enregistrés au départ et après 6 semaines et comprenaient des mesures d'inflammation buccale (MGI, Lobene), de saignement (PBI, Loesche), de plaque (Turesky), d'inflammation systémique (Protein HSC-réactive), de conformité du soignant (tableau d›hygiène buccale quotidienne) et celles d'une enquête de l›aidant sur 11 points. Les analyses primaires et secondaires de mesures orales et systémiques reposeront sur le test de Kruskal-Wallis alors que l'analyse de la conformité des soignants reposera sur les statistiques descriptives.

Résultats attendus : Les aidants des résidents des foyers de soins utiliseront de façon plus conforme les brosses à dents électriques pour la prestation des soins par voie buccale deux fois par jour, en regard des soins standard. Le double brossage quotidien des dents avec une brosse à dents électrique rotative et oscillante se traduira par des réductions significatives par voie buccale de la plaque et de l'inflammation systémique.

Conclusion prévue : L'introduction de la brosse à dents électrique rotative et oscillante pour les soins buccaux quotidiens dans les maisons de soins infirmiers, contribuera à améliorer la santé bucco-dentaire et systémique des résidents.

Professional development of dental hygiene students based on experience in long-term care settings

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ABSTRACT

Background: Dental hygiene students self-selected to take an advanced practicum in long-term care during the final year of a baccalaureate dental hygiene program. These settings are complex, with clients having a range of medical, physical, psychological, and cognitive conditions. With the growing older adult population who may end up in long-term care, it is critical to provide advanced learning opportunities for students to better prepare them for practice in such settings.

Purpose: The purpose of this project was to examine the professional development and experiences of dental hygiene students to these settings. The experience is examined from both the student and clinical educator perspective.

Methods: Student reflective journals and interview transcripts with students and registered dental hygienist (RDH) clinical educators were analyzed using a constant comparative analysis approach. One researcher reviewed the journals and transcripts to develop the initial set of thematic codes and their definitions. Together with a second researcher, the data were independently coded. Inter-rater reliability was calculated using Cohen's Kappa. The two researchers met to compare analyses and achieve consensus.

Results: Preliminary data analysis identified the following thematic codes: 1) increased student confidence and preparedness for practice; 2) increased ability to put into practice verbal and nonverbal communication techniques with older adults; 3) enriched understanding of establishing rapport with residents and staff; and 4) enhanced value and appreciation for applying educational theory to practice.

Conclusion: The professional development of undergraduate dental hygiene students following varied experiences in long-term care settings requires repeated exposure to the population involving hands-on experiences with residents and staff coupled with supportive guidance from a dental hygiene clinical instructor.

RÉSUMÉ

Contexte : Les étudiantes en hygiène dentaire ont elles-mêmes choisi de suivre des stages avancés de soins à long terme dans leur dernière année du programme de baccalauréat en hygiène dentaire. Ces paramètres sont complexes, avec des clients ayant une gamme d'états pathologiques, physiques, psychologiques et cognitifs. Avec l'accroissement de la population vieillissante qui peut se retrouver avec des soins à long terme, il devient critique d'offrir aux étudiantes des possibilités de formation avancée pour mieux se préparer à la pratique dans ces milieux.

Objet : Ce projet vise à examiner la formation et l'expérience professionnelles des étudiantes en hygiène dentaire de ces milieux. L'examen de l'expérience se fait dans une double perspective, celle des étudiantes et celle des enseignantes cliniques.

Méthodes : Les journaux de bord et les transcriptions des entrevues avec les étudiantes et les éducatrices cliniques des hygiénistes dentaires inscrites (HDI) ont été analysés dans une perspective d'analyse comparative constante. Une recherchiste revoit constamment les journaux et les transcriptions pour élaborer la série initiale de codes thématiques et leurs définitions. En accord avec une deuxième recherchiste, les données sont codées indépendamment. La fiabilité entre les évaluatrices a été calculée selon le Kappa de Cohen. Les deux recherchistes se rencontrent pour comparer les analyses et parvenir à un consensus.

Résultats : L'analyse préliminaire des données a permis d'identifier ce qui suit selon les codes thématiques : 1) confiance et préparation accrues des étudiantes pour la pratique; 2) capacité accrue de mettre en pratique les techniques de communication, verbales et non verbales, avec les adultes plus âgés; 3) compréhension enrichie de l'établissement des rapports avec les résidents et le personnel; 4) valorisation et appréciation plus grandes pour la mise en pratique de la théorie reçue.

Conclusion : Le développement professionnel des étudiantes du premier cycle en hygiène dentaire suivant diverses expériences dans des cadres de soins à long terme demande une présence fréquente dans la population, comprenant des expériences pratiques avec les résidents et le personnel ainsi que le soutien et les conseils de l'instructrice en clinique d'hygiène dentaire.

Clinical and molecular risk factors for second oral cancers

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ABSTRACT

Background: Oral cancer has a poor survival rate mainly due to late-stage diagnosis and high risk of developing of secondary oral cancers. Despite considerable improvements in treatment and intensive follow up, there is a need to identify clinicopathological risk factors and reliable molecular markers for monitoring patients after initial treatment.

Objectives: To discover clinicopathological and molecular risk factors associated with the development of a second oral malignancy (SOM) in former oral cancer patients.

Methods: Patients diagnosed with high-grade dysplasia (HGD) or squamous cell carcinoma (SCC) and treated with curative intent were recruited to the ongoing longitudinal BC Oral Health study. Data collected included 1) demographic and habit information; 2) primary tumour information; 3) allelic imbalance at 12 chromosomal regions; and 4) clinicopathological features within the oral cavity during follow up.

Results: 309 patients with a HGD or SCC were treated with curative intent; 60 (19%) developed a premalignant lesion at a different site. Of these patients, 11 (18%) progressed to HGD or SCC. Clinical and molecular data are being analyzed.

Conclusion: Determining reliable prognostic indicators will aid in the identification of patients who are at high risk for SOM development and enhance surveillance, targeted treatments, and chemoprevention. Ultimately translating this knowledge to the clinical management of patients will improve morbidity and long-term survival rates.

RÉSUMÉ

Contexte : Le cancer buccal a un faible taux de survivance à cause du diagnostic tardif et du risque élevé de développement des cancers buccaux secondaires. Malgré l'importante amélioration du traitement et le suivi intense, il faut identifier les facteurs de risque clinicopathologiques et les marqueurs moléculaires fiables pour surveiller les patients après le traitement initial.

Objets : Découvrir les facteurs de risque clinicopathologiques et les marqueurs moléculaires associés aux développements d'une seconde malignité buccale (SMB) chez les anciens patients ayant eu un cancer buccal.

Méthodes : Les patients ayant un diagnostic de dysplasie de haut-degré (DHD) ou un carcinome cellulaire squameux (CCS) et soignés avec intention curative ont été recrutés pour participer à une étude longitudinale de santé buccale en C.-B. Les données colligées furent : 1) information démographique et indicateurs d'habitudes; 2) information sur la première tumeur; 3) déséquilibre allélique dans 12 secteurs chromosomiques; et 4) caractéristiques clinicopathologiques dans la cavité buccale pendant le suivi.

Résultats : 309 patients ayant une DHD ou un CCS ont été traités avec une intention curative; 60 (19%) ont développé une lésion prémaligne à un autre endroit. Parmi ces patients, 11 (18%) ont progressé vers une DHD ou une CCS. L'analyse des données cliniques et moléculaires se poursuit.

Conclusion : La détermination d'indicateurs de pronostic fiables aidera à identifier les patients qui sont à risque élevé de développement de SMB, et à accroître la surveillance, les traitements ciblés et la chimioprévention. Finalement, la communication de ces connaissances à la prise en charge clinique des patients améliorera les taux de morbidité et de survivance à long terme.

From soup to nuts: *The Canadian Dental Hygienist/ L'hygiéniste dentaire du Canada*

Stephanie Nagle, RDH, BScD, MA

Stephanie Nagle

A few months after graduating from the University of Toronto's BScD program for dental hygienists in 1978, I noticed an advertisement from the CDHA for an editor for their quarterly publication, then called *The Canadian Dental Hygienist/L'hygiéniste dentaire du Canada*. With little thought as to what I was getting into, I applied for the position and was selected…quite possibly because there were no other applicants. Nevertheless, as "green" as I was, I approached the job with great enthusiasm.

For a person who hadn't been outside of Ontario except on a family trip to Expo '67 in Montreal, it was exciting to be flown to Vancouver to meet the outgoing editor, Marjorie Dimitri, a most dynamic, organized, and visionary woman. Over one weekend, she gave me the benefit of her editorial experiences with the journal over the previous six years of its life. She let me know that I would be sent a typewriter and office supplies and that she would mentor me through my first few issues. I remember her telling me at the end of the weekend that there was one thankless task involved with the position: labeling 1800 envelopes and stuffing them with copies of the journal for each quarterly mailing. It was a soup-to-nuts operation at that time. The editor solicited news items, self-assessment tests, textbook reviews, articles and original manuscripts, wrote editorials, took photos at the annual conferences, designed the covers, prepared the mock-ups (literally a cut-and-paste job), proofread every word, and mailed the journals once they were printed. The editor was also expected to manage the publication's budget and prepare periodic reports for the CDHA Board of Directors.

Over my term as editor (1978–1984), the journal served as both newsletter and scientific publication. Its content included previously published articles from other journals, the annual Statistics Canada dental hygienist employment survey, and the odd original research report from dental hygienists pursuing advanced education. The CDHA sponsored me to attend its annual conferences (an enriching experience where I met incredibly talented dental hygienists from across Canada), and I would approach guest speakers after their presentations with the hope of convincing them to send a paper to the journal for consideration for publication. Sometimes it worked. I will always be grateful to Lynn James, who was the first dental hygienist to submit her original paper to me on the feminization of the dental hygiene profession—work she had done for her master's thesis in sociology. I was also happy to visit the University of Toronto at the request of the director, Mai Pohlak, to connect with the dental hygiene degree students and appeal to them to submit their course papers to the journal for publication.

Towards the end of my term, more papers started trickling in. They would arrive in my mailbox like an unexpected gift. I also learned that refereed scientific journals had an editorial review committee to which papers were sent anonymously for feedback and consideration for publication. In this way, the decision to publish and, consequently, the editorial content were no longer at the sole discretion of the editor. I enlisted a few reviewers to assist with this process—a precursor of a formal editorial review board. In addition, I knew that the editorial style of our publication could benefit from a more professional appearance, but for that to happen, more than one person needed to be involved with its management and creation. Production was shifted to the main office in Ottawa, and the CDHA leadership earmarked more support for dental hygiene research. The influx of more degree graduates following the launch of other baccalaureate programs in Canada, an emphasis on research methodology in the undergraduate curriculum, more financial support for research, and more dental hygienists continuing their education at the master's and doctoral levels brought a plethora of scholarly reports and original research articles to our journal to make it what it is today…a well-respected, peer-reviewed scientific publication.

I thank CDHA for the opportunity to have been involved in the journal's evolution, for the learning experiences, and for the lifelong friends that I have made.

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Reflecting, inspiring, and informing: The journal as collective voice for the profession

Marilyn Goulding, RDH, BSc, MOS

An association's journal is the collective voice of its members. It should speak to the hunger for knowledge and support professional evolution. It should inspire and inform.

These were the responsibilities weighing on my mind when I accepted the pen from former editor Fran Richardson and took on the position of scientific editor in 1989. The journal was 23 years in publication at the time and, like any "twenty-something," anxious to step forward into adulthood.

Marilyn Goulding

It was an era of great change in Canadian dental hygiene: health care structure was reformatted, professions were vying for self regulation, educational opportunities were opening up to keep pace, and our first PhDs were being born. We needed our journal to be all things; it was our sole source for information, professional development, and discussion. In a time before listservs, mass email, and the common use of MEDLINE, it was our "go-to" spot for everything dental hygiene.

The journal's name was the first to mark this evolution, changing from *The Canadian Dental Hygienist* to *Probe*, in honour of its twentieth anniversary. A shiny new look was adopted with glossy coloured photos and inviting cover art to draw the reader's eye.

Our CDHA staff (and budget) was quite a bit smaller in those days and thus the execution of these changes fell to myself as the editor, along with my resident cheering section, Carol Worobey, CDHA's executive director, and Dianne Tivy, our business manager. Out of necessity I became very hands on with not only the scientific content of the journal but also the technical aspect of the publication. I learned how to judge the weight and quality of paper, explore the intricacies of font, weigh in on page layout, and take my first tentative steps into the world of cover art. I also found myself involved with meeting the advertisers and developing corporate relationships under the watchful eye of Keith Health Care (now Keith Communications). The job was diverse, challenging, all consuming, and a good lot of fun! My boss at the time was Robert Genco, director of the Periodontal Research Center, SUNY Buffalo, and also editor of the *Journal of Periodontology*. He was very supportive and allowed me to restructure my time at work to devote one full day each week to journal activities. I became immersed and loved every minute of it!

The journal's evolution mirrored the association's growth, and both supported the maturation of the profession. I was amazed at the quality and foresight of leadership at the national level; CDHA was both smart and strategic. The volunteer representatives on the board and the executive who steered the course of action were dedicated and hard-working members and, let's face it, what is more formidable than a dynamic group of dental hygienists focussed on a better future for health care? Being a part of this collective of smart of women (notwithstanding Henry King, who was our president in my inaugural year) forged my dental hygiene personae and pride.

My first issue was "winter 1989" (there were 4 issues per year); the cover featured that year's Conference on Ethics with a striking set of hand-drawn scales over a sunrise on the horizon (done by my friend and colleague Lynn Norris). My first editorial was entitled "I Believe"; it was aimed at introducing myself to the members and challenging them to step forward and take part in the journey upon which dental hygiene was embarking. The issue also celebrated CDHA's 25th anniversary and our very first professional conference, which took place that year (you could register for $175.00 and book your room for $80.00), featuring three power-house speakers: Dr. Irene Woodall and Dr. Esther Wilkins along with Dr. Jane Fulton, the host of CBC's "Health Watch." The profession was in good hands for moving forward. That issue of the journal was a good reflection of our growth, featuring articles on professional liability, our CDHA planning strategy, training and employment in the Canadian Forces, the CDA/CFDE ethics conference, the future of dental hygiene practice and regulation, a reflection on the consequences of a feminized profession, a series of scientific abstracts, a hearty debate on whether hygienists are trained or educated, and a very personal interview with Esther Wilkins.

In the early years fewer dental hygienists were involved in scholarly pursuit and thus scientific submissions to the journal were sparse. Since I had connections through my employer (SUNY Buffalo) with world-class scientific experts on a variety of topics of interest to dental hygiene, we began to "theme" the journal to research areas such as regenerative therapy, microdiagnostics, surface studies,

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implants, and caries. Over time, as our members produced more research in furtherance of their education, we began to feature their work, and a series was launched with colleagues from across the country not only on the covers but also within the pages. In 1992 we featured our entire Canadian contingent at the 12th International Symposium on Dental Hygiene in The Hague and, in 1993, our cover highlighted "An Exploration into the Future," the North American Research Conference held in Niagara Falls on the border. Roberta Bondar was our dynamic keynote speaker that year; she was not only a rocket scientist and astronaut but a brain surgeon as well—how appropriate for our profession and its aspiring goals! The first issue of 1995 featured Arlynn Brodie on the cover standing in front of her own (and Canada's first) independent dental hygiene clinic in Kelowna, BC.

By 1999 we reformatted once again and set aside two issues per year to "Probe Scientific," in which we dedicated the entire content to original work by dental hygienists. Our members, going on to achieve Master's level degrees and PhDs, exposed us to an increasing number of scientific submissions, and we were proud to host these dental hygiene pioneers within our pages.

As we turned the page of time into the next century, planning began for another new look and focus for the journal. By 2004 the new *Canadian Journal of Dental Hygiene* was born. It was time to pass the pen to a new leader; we welcomed Susanne Sunell into the editor's seat later that same year.

Probe and I started and finished virtually in tandem, 15 years together, a time of mutual growth and development. Being a part of our history and evolution was a greater honour and source of professional satisfaction than I can truly express here in this short summary. In reflection I am proud to say that the final words of my first editorial still ring true for me: "I believe in you . . . we are a group to be heard and recognized. I believe we can forge the future of dental hygiene. Do you?"

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Evolution of research in Canada: Curiosity, commitment, and collaboration

Susanne Sunell, BA, DipDH, MA, EdD

The 50th anniversary celebration of CDHA leads to many ruminations including those surrounding the evolution of dental hygiene research in Canada. I am proud to have been a dental hygienist for almost 40 years of that time!

My memories of my diploma dental hygiene education include hours spent in the library at the University of Toronto but my main resources were textbooks. We largely used the interpretations of others to guide our practice decisions; it was only for the occasional assignment that we delved into studies.

Susanne Sunell

Since that time, our exploration of literature has broadened. While we have always collected information to guide our practices, we are now frequently using a systematic approach. While this may sound like a trivial distinction, the shift from general data collection to a systematic approach for analyzing the outcomes of studies is substantive. Such an approach underpins the research process as well as being a key strategy in the effective use of research.

Our understanding of knowledge has also broadened. In the past, when searching for primary sources, we commonly directed our attention to experimental designs and had little awareness of other approaches to the construction of knowledge. Our understandings were largely based on positivist concepts, in which knowledge is thought to exist in the world and must simply be discovered. The scientific method, with its testing of hypotheses, was employed to find this knowledge. Now our knowledge acquisition embraces other perspectives such as a constructivist approach, in which knowledge is constructed through experiences and perceptions. This highlights the importance of understanding how our communities and society create knowledge, adding an interpretive dimension to knowledge creation.

Today we have a more eclectic understanding of the construction of knowledge and value the knowledge generated by varied research approaches. However, there are no easy answers to the question of what type of knowledge is the best, and many divergent views exist about this issue. Regardless of the controversies, we have the opportunity to use research generated through diverse approaches, which often leads to a deeper and richer understanding of our practices.

Baccalaureate degrees with specializations in dental hygiene have opened up the world of graduate studies for many Canadian dental hygienists; this access has been strengthened through technology and the online delivery of courses across our vast nation. Our education has shifted from a dead-end cul-de-sac to a continuous pathway without limits. While the limited number of places in undergraduate programs still creates a bottleneck for academic advancement, the completion of a baccalaureate degree has provided avenues to graduate studies in many disciplines. Through graduate studies our members have learned the complexities of conducting research. We now have a growing cadre of dental hygienists with strong research abilities working in educational organizations as well as public and corporate environments.

In 2009 I wrote an editorial with Rebecca Wilder[1] which focused on curiosity and collaboration in regard to our international research conference. Now I will add another important dimension: commitment. The shifts described in this current editorial have been brought about by our curiosity, commitment, and collaboration. Our curiosity motivates us to explore the literature when practice issues arise. It also prompts us to pose practice questions which are then often explored by others using systematic research methodologies.

A respondent in a recent study published in this issue[2] indicated that her baccalaureate education had increased not only her abilities to analyze research, but also her "interest" in using research. As with critical thinking, well-developed abilities are not enough; one also needs to have a commitment to think critically[3] and in this case to use research. Dental hygienists are spending more time in developing their abilities to apply research through formal and informal education, as evidenced by growing participation in conferences, study clubs, journals as well as postsecondary education.

Dental hygienists collaborate to gain abilities to use research; they also collaborate in conducting research. These past 50 years have seen an increased use of research by all health professionals as well as the emergence of dental hygiene research. The *CJDH* reflects this growing thirst for research and the growing body of knowledge being created by dental hygienists. Collaborative approaches help to

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create deeper and richer knowledge and understanding. The links between oral and general health necessitate that we work collaboratively in our practices and this includes the practice of research. By working collaboratively with others we can more effectively meet the oral health needs of Canadians.

As we honour all the landmarks of the past 50 years, we are reminded of the importance of history in the shaping of our future. In this short time period, our educational pathways have gone from diploma to doctoral education; we have yet to create graduate programs with a specialization in dental hygiene but our members are working on that issue. Education and research go hand in hand to provide avenues for the continued growth of our profession. Our curiosity and collaboration will open many pathways that we have yet to imagine. While we celebrate our history, let's also look to our future by making a commitment to strengthen our education and research.

REFERENCES

1. Sunell S, Wilder RS. It's all about curiosity and collaboration [editorial]. *Can J Dent Hygiene.* 2009;43(6):264.
2. Sunell S, McFarlane R, Biggar H. Differences between diploma and baccalaureate dental hygiene education: A quantitative perspective. *Can J Dent Hygiene.* 2013;47(3):109–21.
3. Balin S, Case R, Coombs JR, Daniels LB. Conceptualizing critical thinking. *Journal of Curriculum Studies.* 1999;31(3):285–302.
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1 Than a manual toothbrush. M. Ward, K. Argosino, W. Jenkins, J. Milleman, M. Nelson, S. Souza. Comparison of gingivitis and plaque reduction over time by Philips Sonicare FlexCare Platinum and a manual toothbrush. Data on file, 2013.

2 Defenbaugh J, Liu T, Souza S, Ward M, Jenkins W, Colgan P. Comparison of Plaque Removal by Sonicare FlexCare Platinum and Oral-B Professional Care 5000 with Smart Guide. Data on file, 2013. Single use study.