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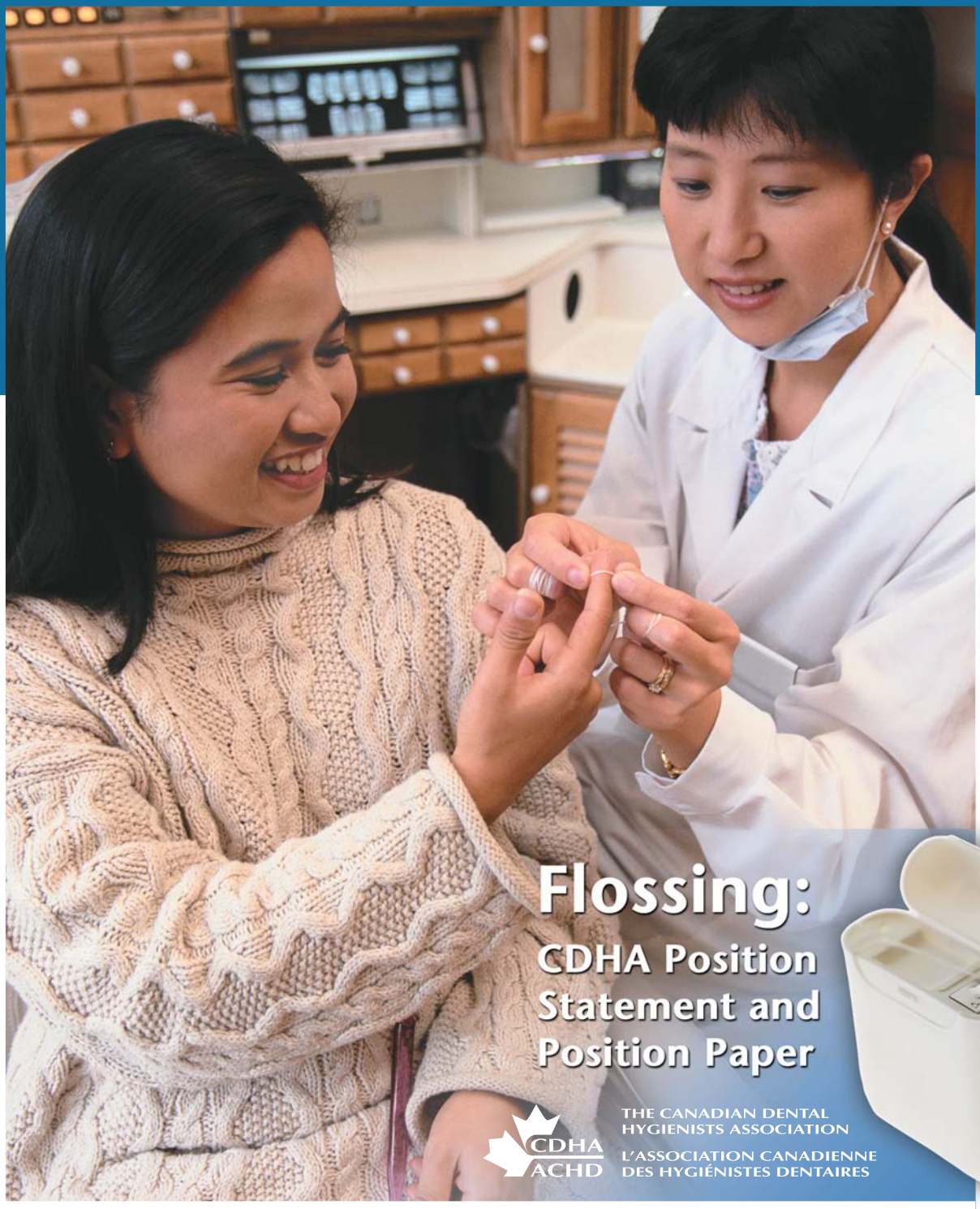

Flossing: CDHA Position Statement and Position Paper

THE CANADIAN DENTAL HYGIENISTS ASSOCIATION

L'ASSOCIATION CANADIENNE DES HYGIÉNISTES DENTAIRES

THE OFFICIAL JOURNAL OF THE CANADIAN DENTAL HYGIENISTS ASSOCIATION

Past, Present, and Future

by Diane Thériault, RDH

THE PROFESSION OF DENTAL HYGIENE HAS come a long way since the CDHA Board of Directors adopted the Carver Policy Governance model in 2000. Those of you who have been in our association for the past five or six years—and have a long memory—will remember that the Board embraced this new governing structure so the Board could focus on developing a vision of the profession while spending less time on the operational aspects of the organization. Since then, the Board has set the goals or "ends" that it wishes to achieve and the limitations that the Executive Director must respect in pursuit of these goals.

During the Board's last meeting in March, we listened to a presentation by Jeff Chapleau of Marketlink Solutions, who gave us a detailed look at how far our association has progressed over the past five years. I am pleased to report that, working within the vision and values set forth by the Board of Directors, and with our members' input, our association as a whole has become much stronger. I must commend all the members, volunteers, and staff of CDHA who have worked so hard over the years to create such a dynamic organization.

I am pleased to report that… our association as a whole has become much stronger.

On the heels of this glowing report card, the Board decided to review the original goals or "ends" of CDHA in the context of present and future issues facing our profession. I was very impressed by the quality and depth of the debate that your representatives to the Board brought to these discussions. After a full day of hard work, your CDHA Board of Directors decided that our goals (ends) needed some fine tuning and we made a few changes.

The following are the new goals or "ends" that were developed and revised by your Board of Directors in March. These new goals will take effect in October.

CDHA exists so that its members are able to provide quality preventive and therapeutic oral health care for all Canadians.

Past, Present, and Future *…continued on page 139*

Le passé, le présent et le futur

par Diane Thériault, RDH

LA PROFESSION D'HYGIÉNISTE DENTAIRE A fait du chemin depuis que le conseil d'administration de l'ACHD a adopté le modèle de gouvernance Carver en 2000. Ceux et celles d'entre vous qui ont été membres de notre association au cours des cinq ou six dernières années – et qui n'oublient pas facilement – se rappelleront que le conseil a intégré cette nouvelle structure de gouvernance afin de pouvoir se concentrer sur le développement d'une vision de la profession tout en passant moins de temps sur les aspects opérationnels de l'organisation. Depuis, le conseil a fixé les objectifs ou les « fins » qu'il désire atteindre ainsi que les limites que doit respecter la directrice générale dans la poursuite de ces objectifs.

Je suis fière de dire que… notre association, en tant qu'entité, est devenue beaucoup plus forte.

Lors de la dernière réunion du conseil d'administration en mars, nous avons écouté un exposé de Jeff Chapleau, de Marketlink Solutions, qui nous a montré de façon détaillée jusqu'à quel point notre association a progressé au cours des cinq dernières années. Je suis fière de dire que, en se concentrant sur la vision et les valeurs établies par le conseil d'administration et en tenant compte des commentaires de ses membres, notre association, en tant qu'entité, est devenue beaucoup plus forte. Je dois féliciter tous les membres, tous les bénévoles et tout le personnel de l'ACHD qui ont travaillé si fort au cours des années pour créer une organisation aussi dynamique.

Juste après avoir pris connaissance de cette fiche de rendement élogieuse, le conseil d'administration a décidé de réviser les objectifs ou « fins » originaux de l'ACHD dans le contexte des enjeux présents et futurs auxquels notre profession est ou sera confrontée. J'ai été impressionnée par la qualité et la profondeur des questions que vos représentants et représentantes ont exprimées au conseil d'administration lors de ces discussions. Après une journée complète de travail acharné, le conseil d'administration de votre ACHD a décidé que nos objectifs (fins) demandaient certains ajustements et nous avons fait quelques changements.

Le passé, le présent et le futur *…suite page 148*

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New Ways of Thinking in the World

by Susan Ziebarth, BSc, MHA, CHE

The parallel between antifeminism and race prejudice is striking. The same underlying motives appear to be at work, namely fear, jealousy, feelings of insecurity, fear of economic competition, guilt feelings, and the like. Many of the leaders of the feminist movement in the nineteenth-century United States clearly understood the similarity of the motives at work in antifeminism and race discrimination and associated themselves with the anti slavery movement.

– Ashley Montagu*

IN THE MARCH 2006 ISSUE OF THE *JOURNAL OF THE Canadian Dental Association*, Editor John O'Keefe says that "while the regulation of our sector is implemented provincially, the policy climate is moulded globally" (p. 101). Dr. O'Keefe's comments were directed toward the increasing recognition of arguments by the OECD and the

> ***There is a detrimental health outcome cost to populations when one profession serves as the gatekeeper.***

U.S. Federal Trade Commission regarding the need to improve access to care by breaking monopolistic strongholds on health care services. He believes that "the oral health care sector is ripe for such actions because it is conducted primarily within the non-governmental sector." I agree with Dr. O'Keefe that the world is getting smaller each day and that the oral health care sector is ripe for being targeted. I suspect where our philosophies differ is in the *why* the oral health care sector is being targeted.

While Dr. O'Keefe attributes the cause to the non-governmental sector, I attribute it to the realization by policy makers that there is a detrimental health outcome cost to populations when one profession serves as the gatekeeper. Consumers are no longer passive; they are knowledgeable and demand accountability. Policy makers are listening to those who have assertive voices and to those whose disenfranchised voices are usually heard only when raised in

New Ways of Thinking in the World *…continued on page 139*

* Ashley Montagu. Man in Process. Chapter 12. Cleveland (OH): World, 1961.

Nouvelles façons de penser dans le monde

par Susan Ziebarth, B.Sc., M.H.A., C.H.E.

« Le parallèle entre l'antiféminisme et les préjugés raciaux est frappant. Les mêmes motifs sous-jacents semblent être présents, soit la peur, la jalousie, les sentiments d'insécurité, la peur de la concurrence économique, les sentiments de culpabilité et les apparences. Plusieurs leaders du mouvement féministe américain du dix-neuvième siècle ont clairement compris la similarité des motifs amenant l'antiféminisme et la discrimination raciale et se sont associées au mouvement anti-esclavagisme. » [Traduction]

– Ashley Montagu*

DANS LE NUMÉRO DE MARS 2006 DU *JOURNAL DE l'Association dentaire*, le rédacteur en chef, John O'Keefe, déclare que « bien que la réglementation de notre secteur relève des provinces, le climat politique est défini mondialement » (p. 101). Les commentaires du Dr O'Keefe étaient dirigés vers la reconnaissance accrue par l'OCDE et la U.S. Federal Trade Commission des arguments concernant la nécessité d'améliorer l'accès au

> ***Il y a un effet préjudiciable à la santé des populations lorsqu'une profession sert de contrôleur d'accès.***

soins en brisant les forteresses monopolistiques sur les services de soins de santé. Il croit que « le secteur des soins buccodentaires est mûr pour de telles mesures parce qu'il agit surtout dans le secteur non gouvernemental ». Je suis d'accord avec le Dr O'Keefe sur le fait que le monde devient plus petit chaque jour et que le secteur des soins buccodentaires est mûr pour être ciblé. Je pressens que là où nos philosophies diffèrent est le *pourquoi* le secteur des soins buccodentaires est ciblé.

Alors que le Dr O'Keefe en attribue la raison au secteur non gouvernemental, je l'attribue plutôt au fait que les décideurs réalisent qu'il y a un effet préjudiciable à la santé des populations lorsqu'une profession sert de contrôleur d'accès. Les consommateurs ne sont plus passifs ; ils sont bien renseignés et exigent qu'on leur rende compte. Les

Nouvelles façons de penser dans le monde *…suite page 148*

* Ashley Montagu. Man in Process. Chapître 12. Cleveland (OH): World, 1961.

FLOSSING

Canadian Dental Hygienists Association Position Statement

Based on current research, dental hygienists are strongly encouraged to make recommendations to clients supporting mechanical interdental cleansing as an adjunct to toothbrushing in order to control plaque accumulation and to prevent and/or control periodontal diseases. While studies have shown it is difficult to stimulate change in patients' oral health care behaviours, others have shown that it can be influenced and provoked. Dental hygienists should be aware of possible personal biases toward flossing, particularly manual finger flossing and specific floss types, and preferably make interproximal cleansing recommendations based on clients' oral conditions, preferences, and abilities.

CDHA Position Paper

by Joanna Asadoorian, AAS(DH), MSc

INTRODUCTION

DENTAL HYGIENISTS ARE OFTEN THE PRIMARY SOURCE for professional information on oral disease prevention for those members of the public who are able to access oral care.[1,2] Dental hygienists are viewed as having both the appropriate knowledge base and an acute understanding of the individual needs of their clients. Chairside oral health education is considered a traditional dental hygiene service and is believed to improve oral health.[2,3] With studies continuously being conducted on preventive oral hygiene strategies and technological advances that occur steadily, dental hygienists are required to monitor and update their knowledge to ensure it is current.

This places oral bacteria, in the form of plaque biofilms, as an essential component in the disease process.

In contemporary understanding, the origin and progression of periodontal diseases and dental caries is believed to occur through the colonization and subsequent accumulation of bacterial plaque,[4-9] mediated by the host inflammatory response.[6,8] This places oral bacteria, in the form of plaque biofilms, as an essential component in the disease process. While mechanical plaque removal, either by toothbrushing and/or flossing, has a lesser effect on caries prevention compared with fluoride,[10] this has not been considered true for gingivitis. Therefore, much of preventive oral health care—particularly educating clients about home care—has focused on thorough plaque removal to prevent, reduce the severity of, or reverse these disease processes.[4,8]

The American Academy of Periodontology has attributed the decline in the prevalence of gingivitis in the United States to improved oral hygiene practices.[11] Despite this, clients appear to be less than ideally effective in maintaining their oral health.[7] While U.S. data have reported that almost two-thirds of the population has gingivitis,[12] measuring the prevalence of periodontitis is less straightforward.[13] The American Academy of Periodontology position paper on the epidemiology of periodontal diseases states that the milder forms of periodontitis are nearly universal, while those forms leading to a risk of tooth loss are less prevalent.[13] Although few oral sites with gingivitis progress to periodontitis, the paper states that preventing gingivitis is the first step in preventing periodontitis.[13]

In addressing plaque-mediated oral disease, dental professionals, including dental hygienists, have traditionally recommended daily mechanical plaque removal and more specifically, toothbrushing in conjunction with flossing.[7,8] Both the Canadian Dental Hygienists Association (CDHA) and the American Dental Hygienists' Association (ADHA), along with the Canadian Dental Association (CDA), support this practice on publicly accessible websites.[14-16] The American Dental Association (ADA) has recommended for nearly a century that individuals follow this routine at least once every 48 hours in order to maintain gingival health.[12,17,18]

The purpose of this paper is to investigate the current state of the evidence of flossing as a home care procedure to control periodontal diseases, and more specifically gingivitis, in order to provide dental hygienists with up-to-date evidence on which to base recommendations for their clients.

LITERATURE REVIEW

Theoretical basis for flossing

Despite recent advances in oral chemotherapeutics, mechanical removal of plaque remains the primary method for controlling supra-gingival accumulations.[19]

Toothbrushing with dentifrice takes place nearly everywhere and has been documented as the most widely used oral hygiene habit in the industrialized world.[17,20] While toothbrushing is an effective means for removing plaque on many tooth surfaces, it is incapable of removing plaque completely on its own.[4] Research has shown that toothbrushing is less effective than other means of interproximal plaque removal[9,21,22] and that proximal surfaces of posterior teeth are the least accessible smooth surfaces.[20] This limitation has contributed to the inefficiency of toothbrushing in controlling interproximal gingival bleeding.[8]

Research has shown powered toothbrushing to have improved efficacy in interproximal plaque removal compared with manual toothbrushing even when combined with flossing.[20] Caution should be exercised when assessing these particular findings, however. The findings are based on a short-term study with relatively young (mean age 25) study subjects, the outcome measure was limited to the wet weight of interproximal plaque, and no gingival assessment was made.[20] Systematic reviews of powered toothbrushing have been conducted and should be accessed when making oral hygiene recommendations.[23]

Conversely, flossing has been shown to be effective in cleaning interproximal surfaces of teeth from the contact point to the sulcus[7,10,24] and has not been shown to produce unfavourable consequences.[25] The ADA has reported that flossing is capable of removing up to 80% of plaque

Flossing has been shown to be effective in cleaning interproximal surfaces of teeth from the contact point to the sulcus.

interdentally in a "normal" dentition, meaning that "the interdental space is filled with gingival papilla."[5] The improved access of floss into the interdental sulcular area has translated into improved interproximal gingival health beyond that which can be achieved with conventional toothbrushing alone.[8,17] Studies have shown that both plaque and gingivitis scores are reduced when clients incorporate flossing into their toothbrushing home care regimen.[8,18] As periodontal disease most commonly affects the interproximal sites,[5,9,18,21,26,27] it is important that these areas benefit from a concentrated effort in home care regimens.

It is important to recognize that when one is assessing the effectiveness of interdental cleansing methods, two points of reference should be considered. The first and most obvious is the theoretical efficacy of the method, based on the clinical evidence. A second point of reference is the practical efficacy influenced by the acceptability of the method to clients and therefore their compliance.[9,27] Historically, client compliance with regular flossing has been far less than ideal. The routine use of dental floss has

Déclaration de l'ACHD sur l'utilisation de la soie dentaire

En se fondant sur la recherche actuelle, les hygiénistes dentaires sont fortement encouragées à recommander aux clients des méthodes nettoyage interdentaire mécaniques, en plus du brossage de dents, afin de contrôler l'accumulation de plaque et prévenir ou contrôler les maladies parodontales. Bien que certaines études ont démontré qu'il est difficile d'inciter des clients à modifier leur comportement en matière de soins de santé buccodentaire, d'autres ont démontré qu'il est possible d'influencer des clients et de provoquer des changements de comportement. Les hygiénistes dentaires doivent être conscientes des préjugés personnels possibles sur l'utilisation de la soie dentaire, particulièrement concernant la technique manuelle pour le passage de la soie dentaire à l'aide des doigts, ainsi que sur les différents types de soie dentaire, et, préférablement, devraient recommander un nettoyage interdentaire en tenant compte des affections buccales, des préférences et des habiletés des clients.

RECOMMANDATIONS

1. Le brossage quotidien des dents devrait toujours être complété par quelques-unes des méthodes de nettoyage interdentaire afin de prévenir, réduire et traiter la gingivite chez les adultes.
2. L'utilisation quotidienne de la soie dentaire avec n'importe lequel des types de soie dentaire peut être incluse comme une aide possible de nettoyage interdentaire, en plus du brossage de dents.
3. L'utilisation de la soie dentaire devrait être reconnue comme présentant des limites d'efficacité dans les cas où il y a présence de récession/perte de l'attachement et /ou embrasures.
4. Plusieurs aides à l'utilisation de la soie dentaire et plusieurs nettoyeurs interdentaires, incluant les porte-soie, les porte-soie électriques, les brosses interdentaires, les cure-dents en plastique ou en bois, et certains irrigateurs buccaux à utiliser à la maison sont des alternatives viables au passage de la soie dentaire à l'aide des doigts.
5. Les hygiénistes dentaires devraient être conscientes qu'il peut y avoir des préjugés personnels contres les aides « traditionnelles » d'hygiène buccale, comme l'utilisation de la soie dentaire, et essayer d'être plus réceptives concernant les autres types d'aides et les alternatives mécaniques.
6. Les hygiénistes dentaires devraient adapter leur éducation et leurs directives en hygiène buccale selon les besoins et les préférences spécifiques de leurs clients.

consistently been shown to be dramatically low. Research has shown a range of daily use among adults ranging from 10% to as high as 30%.[4,17,18,22,28-30] The reasons for this lack of compliance apparently encompass two issues: first, a lack of patient ability;[18,20,21,24,31,32] second, a lack of motivation.[18,20,21,24,32] Of course, the second factor may be highly related to the first.

Studies are inconsistent in their ability to demonstrate that educational attempts to influence floss frequency can be successful. While it has been shown that flossing is like other skills in that it can be taught and clients who are given appropriate instruction will increase their flossing frequency,[18,33] other studies have shown that educational attempts to modify client behaviour have not been successful in improving floss frequency.[8] While ethnicity, socio-economic status, age, and gender have all been shown to affect the frequency of flossing,[18,22] the literature has repeatedly suggested that less-demanding means of cleansing interproximal tooth surfaces are required for a real impact on behaviours to be realized.[20,32]

Dental hygienists and their clients are faced with a myriad of new products designed for interproximal tooth cleansing and this influx will continue, if not increase. It is therefore important that the effectiveness of these products be assessed and understood.

Floss holders, interproximal brushes, and power flossers had all demonstrated plaque-removal ability and reduction of gingival inflammation.

Previous reviews

Several reviews have been conducted on the efficacy of manual flossing, flossing aids and devices, and other interproximal cleansing aids (see table 1).[1,9,34] However, few reviews are systematic or provide the methodology used by the review, and as of yet the Cochrane Collaboration has not conducted a meta-analysis. These reviews, dating as recently as 2004, consistently report that toothbrushing is insufficient for interdental cleansing.[9,34]

Table 1. Summary of review papers

Review paper	Topic	Floss	Other aids	Concluding remarks
Warren PR et al.[9] An overview of established interdental cleaning methods. J Clin Dent. **1996**;7(3 Spec No): 65-69	Established interdental cleaning methods	Difficult to do, thus low compliance; claims to damage junctional epithelium; less effective in patients with attachment loss	Embrasure dependent; more effective than toothbrushing alone; may be easier to use than floss; results are equivocal	Interproximal cleaning success depends on ease of use and patient motivation; all interproximal devices appear to be effective, but each is suited to particular patient and situation within the mouth; each patient must be assessed individually
Brothwell DJ et al.[34] An update of mechanical oral hygiene practices: evidence-based recommendations for disease prevention. J Can Dent Assoc. **1998**;64(4):295-306	Mechanical oral hygiene practices update	Optimal frequency not determined; less effective as recession increases and interdental spaces enlarge; no differences between flosses; more effective than toothbrushing alone in controlling gingivitis in adults	No differences between interproximal aids and no additional benefit to flossing	Updates a 1986 state of the science review on mechanical oral hygiene practices; recommends reviewing effects beyond plaque removal—only an intermediate outcome; a single superior interproximal device has not been identified
Jahn C.[1] Evidence for self-care products: power brushing and interdental aids. J Pract Hyg. **2004**;13(1):24-29	Self-care products: power tooth brushes and interdental aids	Practitioners often perceive floss as superior to other methods, but this perception was not shown to be true	Floss holders, interdental brushes, power flossers have all demonstrated ability to remove plaque and reduce inflammation the same as manual flossing; many individuals preferred the alternatives	No systematic reviews exist on interdental aids, but literature reviews have been conducted. Whether an interproximal aid is effective ultimately hinges on whether the individual uses it or not

A Canadian systematic review (Brothwell et al., 1998) used the findings of the 1986 State-of-the-Science Workshop of the National Institute of Dental Research Conference on mechanical oral hygiene practices as a departure point for their update.[34] The 1986 review reported that interdental cleansing was required to supplement toothbrushing.[34] The 1998 update, which focused on studies that evaluated disease outcomes and that were published up until 1995, found no difference between floss types. It concluded that using the levels of evidence developed by the Canadian Task Force on the Periodic Health Examination, there was level I evidence to support flossing as "more effective than toothbrushing alone in controlling gingivitis in adults" and level II evidence that flossing was "more effective that toothbrushing alone in controlling periodontitis."[34] Based on these findings, it was concluded that there was good evidence to recommend flossing in addition to toothbrushing for controlling gingivitis in adults.[34]

Even in a cohort of health professionals, including dentists, fewer than two-thirds flossed daily.

The report also showed there was a moderate level of evidence to recommend, for the adult population, personal home water irrigation devices for controlling gingivitis and that wooden interdental cleansers provided an adjunctive affect to toothbrushing.[34] However, the review found that interdental brushes and gingival massagers were no more effective that toothbrushing alone in reducing gingivitis and therefore concluded that moderate evidence exists not to recommend these methods.[34]

It was reported that most oral health practitioners favour flossing as an interdental cleanser, believing it to be superior to other methods under all conditions.[1] However, according to the review, this has not been demonstrated.[1] At proximal sites where recession has occurred, rendering a larger interdental space, floss is less effective than some other methods.[9,34]

The most recent review (Jahn, 2004) concluded that floss holders, interproximal brushes, and power flossers had all demonstrated plaque-removal ability and reduction of gingival inflammation to the same degree as manual flossing. This review noted that many individuals preferred these alternatives.[1]

The effect of health behaviours on oral health status

Health behaviours are defined as those activities performed by individuals in order to protect, maintain, or promote one's health.[10,35] Several cross-sectional and longitudinal studies have been conducted evaluating the relationship between oral hygiene practices and behaviours and oral disease and tooth retention.[5,11,17,29,30,35-37] The aim of these studies is often to identify both risk indicators, described as those factors associated with disease experience that may play a causal role in the disease process, and risk markers, which are not necessarily causally related to the disease process but can aid in identifying high-risk groups for oral disease.[36,38] These studies can play a role in how oral health professions, including dental hygiene, devise strategies for improving the oral health of individuals, communities, and populations.

These studies confirm that flossing as a preventive oral health behaviour is used much less widely than toothbrushing in all examined populations.[17,29,30,35-37] Even in a cohort of health professionals, including dentists, fewer than two-thirds flossed daily.[11] Results regarding the association between flossing and periodontal disease measures have been mixed. Some of these studies indicate that behavioural factors including flossing were associated with reduced periodontal disease,[17,36,37] and more specifically, that more frequent flossing was associated with less attachment loss.[17,36,37]

Conversely, other studies, including the health professionals' study, showed that those who flossed more than once daily were as likely to have periodontal disease as those who flossed less than once a day.[11] Findings were similar for other oral hygiene aids, even when the analysis controlled for other confounders.[11] However, the study did show that this population had better oral hygiene practices than general populations and better overall oral health status.[11]

MATERIALS AND METHODS

This position paper, commissioned by the CDHA, is a comprehensive review and critical analysis of the literature focused on dental flossing in order to develop a position statement on the use of dental flossing as a preventive oral health behaviour. The first step in the investigation was to develop a PICO question, which subsequently guided the literature search and the development of this report. The question is: Do adults who have plaque and/or gingivitis and/or early periodontitis (the **P**opulation) who manually finger floss (the **I**ntervention) compared to using other flossing aids or interproximal cleansers (the **C**omparison) have improved plaque, bleeding, and/or gingivitis scores (**O**utcome)?

The literature search was conducted in stages beginning in November 2005 up to January 20, 2006. The search included the following databases: MedLine, CINAHL (Cumulative Index of Nursing and Allied Health Literature), and the Cochrane Controlled Trials Register. The literature search included all relevant papers including randomized controlled trials (RCT) (including both in vivo and in vitro studies), meta-analysis/systematic reviews, reviews, and various other sources including media reports and websites.

The first stage of the search was of the three databases and included combinations of the following keywords: floss, gingivitis, periodontitis, and plaque. The search was limited to articles written in English over the period from 1995 to 2005. This search resulted in 207 articles from the MedLine and CINAHL databases; the search of the Cochrane database did not produce any literature pertain-

ing to flossing (existing systematic reviews or study protocols). Papers were selected for retrieval if they measured the impact of flossing compared with another mechanical interproximal intervention in adult populations who had either plaque, and/or gingivitis, or early periodontitis and an outcome variable was measured, such as plaque, bleeding or gingival indices. Other relevant literature was identified at this point if it was deemed to provide background information. This selection process was conducted using titles, abstracts, and the full text if necessary. A total of 72 papers were identified and subsequently retrieved in full text. The second stage of the search used all papers found in the initial search and involved manually checking their bibliographies and references for additional pertinent materials. Retrieval criteria at the second stage were more purposeful and less restricted to the original keywords and the PICO question as the literature may have been necessary for further understanding or background information. Several websites were also subsequently examined.

A unique element of a position paper is the solicited input from recognized content experts and researchers. For this paper, expert input was sought from within the fields of periodontology and oral biology. The rationale for this combination was to provide expertise in each scientific theme of inquiry pertaining to this topic. A draft of this paper was then available for comment via the CDHA website. Additional input was solicited from targeted individuals and organizations, and appropriate revisions were made.

RESULTS

Floss types, comparisons

The literature available prior to 2000 did not reveal show that one specific floss type was superior to others.[5,39-41] In a study conducted in 2000, four types of floss were compared: woven, waxed, unwaxed, and shred-resistant.[5] This was a well-designed study, although it had a small sample size consisting of dental hygiene students as study subjects. A potential limitation of the study was that it considered plaque removal from each floss type on only one occasion, which took place after three days of plaque accumulation.[5]

The study measured total, anterior, and posterior interproximal plaque scores, and none of the scores for the floss types were significantly different among these sites.[5] The study also evaluated comfort and time and neither of these resulted in significant findings between floss types. The authors concluded that all floss types were equally effective in plaque removal under these controlled conditions and all cleaned anterior regions better than posterior regions.[5] Overall, the study demonstrated only 65% plaque reductions among the four types of floss.[5] While not statistically significant, it was reported that unwaxed floss received the most negative feedback from the study subjects.[5]

Floss compared with floss aids or devices (see table 2)

Not only is manual or "finger" flossing being utilized by a relatively small proportion of adults, but even when it is being used, studies have shown that the technique is often suboptimal. In one study, approximately 40% of the study subjects were found not to be using proper flossing technique.[18] This finding has implications for the plaque removal efficacy of flossing. At least in part for these reasons, floss aids and automated flossing devices have been developed.

Prior to the mid-1990s, few clinical trials were conducted that compared flossing to flossing aids,[4] but those that had been carried out suggested that floss-holding devices were as effective as manual or hand-held flossing methods.[21,22] One RCT compared toothbrushing and the use of a disposable plastic pre-threaded floss holder with unwaxed floss with toothbrushing and manual finger flossing on plaque and gingival outcome measures.[22] Thirty-five subjects took part in this well-designed cross-over study.[22] The results demonstrated no significant difference between the groups in bleeding, plaque, or gingival indices.[22] Although there were no significant differences between the two groups for preference and compliance measures, open-ended questions revealed a preference for the floss holder.[22]

It was noted, however, that the floss-holding device was preferred to the manual method.

A subsequent cross-over study (Carter-Hanson et al., 1996) involving 30 adults compared the use of manual flossing to another manual floss holder device and measured plaque removal, bleeding and gingival response, safety, and study subject satisfaction.[4] All clinical outcome measures, plaque, bleeding and gingival indices, showed significant improvements but again there were no significant differences between the test and the manual floss group.[4] There was no apparent trauma in either group and no difference in satisfaction between the two methods.[4] It was noted, however, that the floss-holding device was preferred to the manual method.[4]

Studies in the last decade have shown similar results in that the use of flossing aids and devices does not have a negative impact on plaque and gingival outcome scores as compared to manual finger flossing. In the mid-1990s, toothbrushing and manual finger flossing were compared with toothbrushing and an automated flossing device over six weeks (Pucher et al., 1995).[21] The first phase of the study used dental students, while the second used periodontal maintenance clients. In both phases of the study, both groups had significant decreases in plaque and gingival scores, and between-group scores were not significantly different.[21] The investigators found no evidence of damage to the tissues from either of the two methods and concluded that the flossing device was as effective as manual flossing.[21] While no statistical test was conducted, the study subjects reported the flossing device to be helpful and preferred it.[21]

A similar study (Anderson et al., 1995) compared manual toothbrushing and finger flossing with toothbrushing and an electromechanical flossing device in a RCT involving 60 adult subjects measuring plaque and gingival scores over 30 days.[26] Again, both groups showed significant reductions in plaque and gingival indices from baseline, and there were no significant differences between groups.[26] Interestingly, in the test group, three subjects had to drop out of the study because of mechanical malfunctions with the floss device.[26] The investigators concluded that the floss device was as effective as manual flossing in reducing plaque and gingival scores and no soft tissue trauma was detected in either group.[26]

A more recent RCT (Shibley et al., 2001) compared an automated floss device to manual flossing in a 30-day study of 70 subjects using bleeding, plaque, and gingival indices along with comfort and preference indices as outcome measures.[24] Consistent findings again emerged from this study with all three clinical measures improving significantly from baseline scores, with no differences evident in outcome measures between groups.[24] The comfort index also showed no difference between groups, whereas the preference index showed an inclination for the power flosser, but this finding was not tested for significance.[24]

Table 2. Summary of floss and floss aid studies

Study	Description	Design	Purpose	Outcome measures	Results
Anderson NA et al.[26] Clinical comparison of the efficacy of an electromechanical flossing device or manual flossing in affecting interproximal gingival bleeding and plaque accumulation. J Clin Dent. **1995**; 6:105-7	Manual TB + F vs. Manual TB + EMF (electro-mechanical flossing device)	RCT; n=60; 1 month	Compare the efficacy of EMF device to manual flossing	GI, PI	**GI:** within group improvements ($p<0.0001$); no difference between groups ($p=0.91$ **PI:** both groups improved ($p<0.0001$); no difference between groups ($p=0.59$)
Carter-Hanson C. et al.[4] Comparison of the plaque removal efficacy of a new flossing aid (Quik Floss®) to finger flossing. J Clin Periodontol. **1996**; 23:873-8	Manual F vs. F device (Quik Floss®)	RCT; cross-over; n=29; 30 days	Evaluate the plaque removal, satisfaction, and safety of flossing device	PI, BI (Eastman), GI (Loe and Silness), trauma	**PI, GI & BI:** within group improvements ($p<0.01$); no differences between groups **Trauma**: none **Satisfaction**: none
Pucher J et al.[21] Clinical evaluation of a new flossing device. Quint Int. **1995**;26:273-8	Manual TB + manual F vs. Manual TB + automatic flosser	RCT; 2 phase: n=36; n=26; 6 weeks	Evaluate the effectiveness of flossing device in plaque removal and reducing inflammation	MGI (Loe & Silness); MPI (Quigley-Hein)	**GI & PI:** within group improvements ($p<0.0001$); no differences between groups
Shibley O. et al.[24] Clinical evaluation of an automatic flossing device vs. manual flossing. J Clin Dent. **2001**;12(3):63-66	Manual F vs. Automated F (waterpik flosser)	RCT; n=70; 30 days	Compare the effectiveness of a powered flossing device to manual flossing	Eastman BI, PI, MGI & comfort index & preference	**BI & MGI**: within group improvements ($p<0.01$); no difference between groups; **PI:** within group improvements ($p<0.01$); manual outperformed power day 15 only ($p=0.008$); no difference day 30; **Comfort:** no difference between groups **Preference:** powered flosser (but not tested for significance)

TB = toothbrushing; F = flossing; GI = gingival index; PI = plaque index; MGI = modified gingival index

Where embrasures are wide, plaque removal was more efficient with interdental brushes than with floss.

Floss compared with other interdental cleansing aids (see table 3)

While flossing has been shown to improve various outcome measures over toothbrushing alone, flossing has been shown to be less effective where there has been interproximal recession with a subsequent increase in the interdental spaces.[5,10,17,42] In these situations, other aids may be advantageous in reducing plaque and gingival scores. However, studies that have compared flossing to interproximal cleansing aids have also been equivocal. For example, studies conducted prior to 1990 have shown that interdental aids are less effective in plaque removal than flossing.[8,32] Conversely, later studies have demonstrated at least comparable efficacy from interproximal cleansing devices such as interdental brushes.[24] Other studies have shown that where embrasures are wide, plaque removal was more efficient with interdental brushes than with floss,[19] possibly demonstrating a site-specific efficacy.

More recent studies have been conducted with the aim of further clarifying the efficacy of these methods. A 1996 study by Gordon et al. compared toothbrushing and manual flossing, and toothbrushing and cleaning with an electrically powered interdental device with a disposable rotating filament.[32] This RCT included 52 early or middle-aged

Table 3. Summary of floss and other interdental cleansing aids studies

Study	Description	Design	Purpose	Outcome measures	Results
Gordon JM et al.[32] A clinical study of the safety and efficacy of a novel electric interdental cleaning device. J Clin Dent. **1996**; 7:70-3	Manual TB + electrical powered cleaning device (Oral B interclean ID2) vs. Manual TB + F	RCT; cross-over; n=52; 4 weeks	Evaluate a new electrically powered interdental cleaning device that extrudes & rotates a small filament	MGI, PI & MPBI (interprox only); Preference	**MGI, PI, MPBI:** within group improvements ($p<0.001$); no difference between groups; **Preference**: majority preferred ID2 over floss (69.4%)
Cronin M. et al.[43] The safety and efficacy of gingival massage with an electric interdental cleaning device. J Clin Dent. **1997**; 8:130-3	Manual F vs. Electrical cleaning device (Oral–B Interclean ID2 –flexitip attachment	RCT; n=59; 4 weeks	Compare the safety and efficacy of an electrical cleaning device	IPI, IGI, BI & safety	**PI, GI, BI :** within group improvements ($p<0.0001$); no difference between groups; **Safety**: no irritation in either group
Lewis MW et al.[8] Comparison of the use of a toothpick holder to dental floss in improvement of gingival health in humans. J Periodont. **2004**; 75:551-6	Manual F vs. toothpick holder device (TP)	RCT; n=55; 2, 6, 12 weeks	Assess the ability of flossing or perio aid (toothpick in a handle) to reduce IP bleeding	Pocket depths, O'Leary PI, Eastman BI, IP PI,	**PI, BI; IPI:** within group improvements ($p<0.05$); no difference between groups
Barnes CM et al.[6] Comparison of irrigation to floss as an adjunct to toothbrushing. J Clin Dent. **2005**;16:71-7	Manual TB + floss vs. Manual TB + Water Pik (WP) vs. Sonic TB (STB)+ WP	RCT; n=95; 14 & 28 days	Compare adding oral irrigation to brushing vs. brushing & flossing alone	IP BI, Loe & Silness GI, Proximal-Marginal PI	**PI, BI & GI:** within group improvements ($p<0.05$); (except TB + F group at 14 days); **Between groups (at 4 weeks)**: **BI & GI**: Manual TB + WP & STB + WP outperformed Manual TB + floss ($p<0.05$) except for Li surfaces for GI; **PI:** STB + WP outperformed Manual TB + floss ($p<0.05$)

TB = toothbrushing; F = flossing; GI = gingival index; PI = plaque index; BI = bleeding index; MGI = modified gingival index

adult subjects over a four-week period and measured plaque, bleeding, and gingival outcomes.[32] Results indicated that both groups had significantly improved values from baseline, and there were no differences between groups.[32] The study assessed participant preference and found that the majority of participants (almost 70%) preferred the powered flossing device.[32] The authors concluded that the product preference may encourage better compliance with interdental cleansing.[32]

In the late 1990s, Cronin et al. compared manual flossing with an electrical gingival massager where plaque, bleeding and gingival indices, and safety were measured.[43] Previous studies had shown that the primary benefit of gingival massage was its plaque removal ability rather than the massaging action,[43,44] and that such devices were at least as effective as flossing in reducing plaque, bleeding, and gingival scores.[44] Participants were excluded from the study if they presented with wide embrasures or advanced recession, suggesting that study subjects may have had a range of gingival conditions from none to moderate recession with some slightly open embrasures. Study subjects were assigned to either toothbrushing and manual dental floss or toothbrushing and the automated gingival massager group.[43] It was noted that two sizes of gingival massager tips were available for different sizes of interdental spaces. However, it is unclear if both sizes were used by study subjects. Results indicated that all three indices were significantly reduced from baseline values and no difference was detected between the groups.[43] Neither group demonstrated soft tissue irritation, and the authors concluded that both interventions were equally effective and safe.[43]

Most dental hygienists primarily provide instruction in manual finger flossing techniques.

A recent 12-week RCT (Lewis et al., 2004) examined the effectiveness of manual toothbrushing and a toothpick holder compared with manual toothbrushing and flossing on subjects with gingivitis and early periodontitis.[8] Outcome measures included plaque (whole mouth and interproximal) and interdental bleeding scores.[8] No gingival indices were evaluated. Both plaque and bleeding scores significantly decreased for both groups, and again no difference was detected between groups.[8] The authors concluded that their results, which were in conflict with previous studies, could be attributed to continuing reinforcement of the oral hygiene aid at the 2-, 6-, and 12-week follow-up appointments.[8]

Another recent study (Barnes et al., 2005) randomly assigned approximately 30 adult study subjects to one of three study groups: manual toothbrushing and flossing, manual toothbrushing and dental water jet, and sonic toothbrush and dental water jet for a period of almost one month.[6] Plaque, bleeding, and gingival indices were evaluated and demonstrated reduced values for all three groups at 28 days.[6] At the four-week point, both of the dental water jet groups had significantly reduced bleeding and gingival scores compared with the manual flossing and toothbrushing group (except on lingual surfaces), and the sonic toothbrush combined with dental water jet group had significantly better plaque scores than the toothbrushing and flossing group.[6] The investigators concluded that an effective alternative to flossing for reducing bleeding and gingival inflammation is combining home oral irrigation with toothbrushing.[6]

DISCUSSION

Dental hygienists justly continue to remain committed to motivating clients to regularly cleanse interdentally. While there is limited existing documentation of what dental hygienists recommend to their clients for oral hygiene home care methods, the literature suggests that most dental hygienists primarily provide instruction in manual finger flossing techniques.[2,28] Studies have demonstrated that individuals who have established manual flossing habits are resistant to flossing aids or devices and remain loyal to their established methods.[28] One study has suggested that dental hygienists are situated within this group as they often develop a manual flossing habit during their dental hygiene education.[28] Subsequently, dental hygienists may develop and maintain a bias towards manual finger flossing. They therefore

could have a predisposition to recommending this method of flossing to clients.[28] This has considerable implications for dental hygiene curriculum surrounding the education provided to clients of oral health behaviours.

Another study concluded that the oral hygiene instruction provided by dental hygienists does not appear to be adapted to individual and specific client needs. Even more disconcerting was the finding that one-third of the dental hygienists in these practice settings failed to perform any oral hygiene education.[2] This study confirmed that dental hygienists in this setting typically perform "traditional" oral hygiene instructional behaviours, meaning manual toothbrushing and finger flossing techniques, rather than incorporating alternative aids and devices when indicated.[2]

Oral health education is based on improving clients' knowledge and skills, which will ideally lead to improved behaviours.[3] While some studies have shown that it is difficult to stimulate change in clients' oral health care behaviours, others have shown that it can be influenced and provoked.[3] In one study examining the development of habitual flossing, it was demonstrated that six months after the initial study ended, 50% of the previous non-flossers were still flossing regularly.[28] Interestingly, and statistically significant, of those in this group, 85% were using the flossing aid to which they had been introduced during the study, whereas only 15% were using manual flossing techniques.[28]

CONCLUSIONS

In light of the results of this comprehensive literature search and critical analysis, it is concluded that dental hygienists are well advised to make recommendations to clients supporting mechanical interdental cleansing as an adjunct to toothbrushing. While flossing with any type of floss is substantiated within this literature as an effective method of interproximal plaque removal, for some clients and/or for certain oral sites, other methods of interdental cleansing are warranted. Dental hygienists should be aware of possible personal biases towards flossing, particularly manual finger flossing, and preferably make interproximal cleansing recommendations based on each client's oral condition, preference, and ability. In summary, the following six recommendations have been developed.

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RECOMMENDATIONS

1. Daily toothbrushing should continue to be augmented by some method of interdental cleansing in order to prevent, reduce, and reverse gingivitis in adults.
2. Daily flossing with almost any type of floss (if not all types) can be included as one possible interdental cleaning aid as an adjunct to toothbrushing.
3. Flossing should be recognized as having limitations in effectiveness in sites where recession/attachment loss and/or embrasure spaces have occurred.
4. Many flossing aids and interdental cleansers including floss holders, automated flossers, interdental brushes, picks, wooden sticks and some home irrigators, are viable alternatives to manual finger flossing.
5. Dental hygienists should be aware of personal biases towards "traditional" oral hygiene aids, such as flossing, and aim to be more receptive to other aids and mechanical alternatives.
6. Dental hygienists should tailor their oral hygiene education and instructions based on client/site-specific needs and preferences.

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From Quality Assurance to Continuous Quality Improvement: Why Dental Hygiene Needs to Change – Continuous Quality Improvement Ideas from the Nursing Profession

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ABSTRACT

Quality assurance is an ongoing concern for self-regulated health professions to ensure that the public is receiving quality, competent health care by its members.[1,2] In British Columbia, quality assurance mechanisms for dental hygienists consist of mandatory continuing competencies credits or mandatory continuing education.[1] It has been shown in the literature, however, that mandatory continuing education does not promote behavioural changes in health professionals.[3-6] The recent trend in health care has been from quality assurance, which focuses on ensuring individual compliance with clearly established standards, to continuous quality improvement, which uses specific approaches through people to improve practices.[11] This paper examines specific continuous quality improvement activities of the nursing profession, such as professional portfolios, personal profiles, and peer reviews and discusses the applicability of these tools for the dental hygiene profession. If the philosophy of a self-regulating profession is to empower its registrants to be responsible and accountable for their practices, then continuous quality improvement is beneficial for dental hygienists, the dental hygiene profession, and the public it serves.

Keywords: Quality assurance, health care; total quality management; dental hygienists; peer review; continuous quality improvement; professional portfolios; personal profiles

INTRODUCTION

Dental hygiene in British Columbia

DENTAL HYGIENISTS IN BRITISH COLUMBIA HAVE BEEN self-regulated since March 1, 1995, under the provincial *Health Professions Act* and the *Dental Hygienists Regulation and Bylaws*.[1] Self-regulation means the government considers the profession to have sufficient expertise to govern its own registrants appropriately.[1] However, with this privilege of self-regulation comes the responsibility of ensuring public safety. Self-regulated professions protect the public by having its registrants comply with quality assurance mechanisms, which are based on the established practice standards of the profession.[1,2] Quality assurance is an ongoing concern for self-regulated health professions to ensure that the public is receiving quality, competent health care by its members.[1,2] The College of Dental Hygienists of British Columbia's (CDHBC) concern for public safety is contained in its mission statement: "The mission of the College of Dental Hygienists of British Columbia is to protect the public by developing, advocating and regulating safe and ethical dental hygiene practice in British Columbia."[1]

The quality assurance mechanism of the CDHBC consists of mandatory continuing competencies credits[1] or mandatory continuing education. To qualify for re-registration,, dental hygienists are required to complete 75 hours of continuing competencies within a three-year cycle, to pass a British Columbia Dental Hygiene Practice Examination or to successfully complete a refresher course approved by the CHBC Registration Committee.[1] Non-practising dental hygienists are not required to maintain continuing competency credits but must show evidence of completing 75 continuing competency credits when reverting to practising registration.[1]

Critics of mandatory continuing education argue that registrants simply attend courses to fulfill requirements.

Although CDHBC uses mandatory continuing education for quality assurance purposes, the literature shows that this type of education does not promote behavioural changes in health professionals.[3-6] Critics of mandatory continuing education argue that registrants simply attend courses to fulfill requirements and that there are usually no measurable endpoints or evaluations to determine if the new knowledge finds it way into practice.[3,6,7]

For example, a study by Bullock et al. in 1999 evaluated the effect of continuing education courses on dentists' practice.[8] Questionnaires were sent to dentists six weeks after they had attended a professional dental course or seminar to determine if there was any measurable impact on their practice.[8] It was determined that the most effective continuing education courses in dentistry were hands-on in nature and discussed common clinical topics.[8] This study, however, did not determine if the *quality* of dental care improved after the dentists had attended the continu-

ing education courses. Bullock et al. also noted that large lecture-style formats tended to have the least amount of impact on dentists' practice.[8] Although this style of presentation is cost-effective and disseminates information to a large group, there is low participant involvement.[9] Passive learning does not result in behavioural changes because there is no self-reflection, identification of deficiency, or motivation to improve the identified deficiency.[9]

Although the CDHBC *Registrants' Handbook* states that it is the registrant's responsibility to choose specific learning activities that are relevant to his or her practice to maintain his or her competency,[1] there is no formal process for the registrant to assess his or her strengths and limitations. Quality assurance mechanisms only require confirmation that a registrant attended or performed a continuing competency activity; there is no assessment of the learning activity's outcome or its relevance to the registrant's practice. The limitations of quality assurance can be addressed, however, by the continuous quality improvement philosophy.

Quality assurance versus continuous quality improvement

There has been a shift in health care from quality assurance (QA) to continuous quality improvement (CQI), which uses specific approaches through people to improve practices that go beyond QA.[10] Table 1 highlights the key differences between QA and CQI.

Fundamental difference between QA and CQI is the focus.

The fundamental difference between QA and CQI is the focus. Quality assurance focuses on the individual and his or her performance; CQI focuses on the system or process of providing health care.[11] It is "a common myth that most quality problems can be blamed on individuals. Over 80% of quality problems are related to system problems, such as inefficiencies in work flow, information breakdowns, poorly designed or inefficient work processes, inadequate resources or a combination of these factors."[10] Only a small minority of health care providers are incompetent.[10] Therefore, a CQI approach aimed at enhancing systems through people seems reasonable for improving health care quality.[10]

This paper explores the nursing profession for CQI tools that can be used by dental hygienists. The nursing profession is similar to the dental hygiene profession in that both professions are self-regulating,[1,2] are predominately female,[12,13] and work in collaboration with other health professions in providing care to the public. Although nurses tend to work in large, government-run organizations[13]

Table 1. Key differences between quality assurance and continuous quality improvement (CQI)[11]

	Quality assurance (QA)	Continuous quality improvement (CQI)
Definition	The establishment of practice standards by a regulatory body, by which the professional services provided by the health care professional are assessed and corrected, if the services do not meet the established standards.	"A structured system for creating organization-wide participation in planning and implementing a continuous improvement process to meet and exceed the consumers' needs."[11]
Focus	The individual health care professional's performance, i.e., what does the professional do or not do? What mistakes did he or she make?	The performance of the system or process, i.e., how can one make the system or process better to meet or exceed the consumers' needs?
Purpose	To correct the outliers or "the bad apples."	To use the expertise of the health care professionals, who are the experts in the practice setting, to identify systems that work or don't work.
Outcomes	Punitive actions against the "deficient" health care professionals.	Acknowledgment of the health care professional as the organization's best asset for improving the process of delivering health care and encouragement of professional growth.
Impact on the individual health care practitioner	The individual must follow the by-laws and regulations set out by the regulatory body. Whether one chooses appropriate learning activities to enhance one's practice is not as important as fulfilling the requirements of the regulatory body.	Health care practitioners are encouraged to think critically and analytically to improve their practice. Only they are aware of their weak areas and are therefore the best ones to decide on a realistic action plan to improve these areas. It is more important to choose learning activities that are relevant rather than fulfilling an arbitrary number of activities.

RÉSUMÉ

L'assurance qualité est une préoccupation constante au sein des professions de la santé auto-réglementées qui veulent s'assurer que le public reçoit des soins de santé satisfaisants et de qualité de la part de leurs membres.[1,2] En Colombie-britannique, les mécanismes d'assurance qualité pour les hygiénistes dentaires se composent de programmes obligatoires d'unités de compétences continues ou de formation continue.[1] Cependant, il a été démontré dans la littérature que la formation continue obligatoire ne favorise pas les modifications du comportement chez les professionnels de la santé.[3-6] La récente tendance en soins de santé est de passer de l'assurance qualité, qui vise avant tout à assurer le respect individuel des normes clairement établies, à l'amélioration continue de la qualité, qui utilise des approches spécifiques auprès des personnes pour améliorer les pratiques.[11] Ce document analyse des activités spécifiques d'amélioration continue de la qualité pour la profession infirmière, comme les portfolios professionnels, les curriculum vitae et les inspections professionnelles; il examine également l'applicabilité de ces outils à la profession d'hygiéniste dentaire. Si la philosophie d'une profession auto-réglementée est d'amener ses membres à être responsables et imputables de leurs pratiques, alors l'amélioration continue de la qualité est bénéfique pour les hygiénistes dentaires, la profession d'hygiéniste dentaire et le public desservi.

while dental hygienists tend to work in small, private sector businesses,[14] the CQI tools used by nurses can also be used by dental hygienists. Nurses use such tools as the professional portfolio, personal profile, and peer review.[2] The definition, purpose, benefits, and limitations of these mechanisms are examined, followed by a discussion about the need for change in dental hygiene.

CONTINUOUS QUALITY IMPROVEMENT TOOLS

Professional portfolios

Definition

A professional portfolio is a written account of an individual's process of learning and the outcomes of that learning. Brown defines the professional portfolio as follows:[15]

> A [professional portfolio] is a private collection of evidence which demonstrates the continuing acquisition of skills, knowledge, attitudes, understanding, and achievements. It is both retrospective and prospective, as well as reflecting the current stage of development and activity of the individual.

A portfolio is not a résumé or curriculum vitae.[16] A résumé or curriculum vitae lists the educational institutions attended, positions held, and other personal background information about the individual.[16] Although a portfolio may contain this information, the portfolio also contains evidence-based documentation of the individual's competencies and expertise, which has developed from these experiences.[16]

Rationale for using the professional portfolio

The portfolio is based on Knowles' four adult learning principles:[17] the adult learner is assumed to (1) be self-directed; (2) have a rich resource for learning based on his or her past experiences; (3) be open to learning in response to life's tasks and problems; and (4) be curious and self-motivated to grow and achieve.[17,18] Motivation alone, however, is not sufficient for producing behavioural changes.[9]

Although an individual may be successful in retaining new knowledge or skills, he or she may not apply that knowledge or skill to his or her practice. This sentiment is shared by Broad and Newstrom who believe the knowledge and skills gained by workers (well over 80% by some estimates) are not fully applied on the job.[9,19] Caffarella further states that the learning transfer of knowledge into practice needs to be encouraged by assisting people to reflect and plan for those changes.[9] The transfer of learning is also more likely to occur when people choose activities that will satisfy individual needs or particular environments.[6,9] The professional portfolio assists in the learning transfer by engaging the learner in critical thinking and self-reflection. Box 1 contains an example of a self-reflection worksheet.[20]

Purpose

The professional portfolio provides a method for health care practitioners to monitor their progress in meeting personal and professional goals.[16,20,21] The portfolio records significant elements in the practitioner's career and is therefore useful for career planning and personal profiles.

Imagine that you are applying for a new job. In the interview, the prospective employer asks you, "Why are you the best person for this job?" To answer this question confidently, you need to know your strengths as well as your weaknesses.

Summarize your strengths	Summarize your weaknesses
Knowledge for practice	Knowledge for practice
Practice skills	Practice skills
Personal qualities	Personal qualities
Values	Values
Other	Other

What do you do well? *I have excellent clinical, communication, and organizational skills.* In your opinion, what do you need to do to improve your weak areas to make you a better candidate for the job? *I need to improve the success rate of my inferior alveolar blocks and will be attending a hands-on workshop to achieve this.*

Box 1. Self-reflection worksheet[20]

Contents

The actual contents of a professional portfolio will vary among health care practitioners because of variations in specialties, practice settings, job responsibilities, and personal and professional goals.[16] In general, portfolios should contain materials that demonstrate the practitioner's competencies and highlight his or her achievements. O'Halloran suggests the following four categories to include in the professional portfolio:[22]

1. *Education*: In this category, health care practitioners would include their resume or curriculum vitae, formal education credentials, licence or registration number, specialty certifications and titles, and any organizational awards received.
2. *Performance*: Job position descriptions, performance appraisals, reference letters, recommendations, and other evidence of meeting or exceeding job performance standards would be included in this category.
3. *Community service and professional activities*: In this section, membership in professional associations or organizations, involvement with committee work or professional boards, and volunteer services would be recorded.
4. *Continuing education*: Documentation of programs attended, professional journals read, and other learning activities are included in this category. The outcomes of the learning activities and their impact on the health care practitioner's practice are of special interest in this section. For the purposes of CQI, this section of the professional portfolio is the most important. Learning activities should be relevant to the practitioner's practice and should have an impact on the provision of care being provided to the clients.[20] A clear relationship between the learning activities and the claimed competencies needs to be established to provide evidence of the health care practitioner's knowledge and expertise.[16] An example of a professional portfolio entry is found in Box 2.[20]

Benefits

The professional portfolio provides the health care practitioner with many benefits, such as guiding the practitioner through the processes of critical thinking and self-reflection.[23] The reflective process of the portfolio encourages the health care practitioner to identify weak areas in his or her knowledge and skills; it also documents his or her strengths.[23,24] The professional portfolio encourages lifelong learning and professional development by emphasizing the importance of monitoring one's own learning needs. Portfolios are also beneficial to the profession because practitioners who are accountable and responsible for their own learning are the driving force behind professions that are seeking to grow through accountability, responsibility, and autonomy.[20,23]

Portfolios are also useful for supporting a health care practitioners' claims of competency.[20] Competency refers to the necessary knowledge and skills health care practitioners must have to perform a specific activity safely and

Workplace

Where were you working when the learning activity took place?
Name of organization: *Dr. Smith, private dental practice*
Brief description of your work/role: *clinical dental hygienist*

Nature of my learning activity

Date: *January 7, 2006*
Briefly describe the learning activity; for example, attending a course: *Attended a hands-on workshop for local anesthetic techniques*
State how many hours this took: *6*

Description of the learning activity

For example, why did you do choose this learning activity? When and where did you do the learning activity? What type of learning activity was it? What did you expected to gain from it?

I was only 50% successful with the mandibular inferior alveolar block. Therefore, I attended a hands-on workshop at the UBC dental clinic for local anesthetic techniques. The instructors demonstrated the landmarks, penetration site, and depth and angle of penetration. I then had the opportunity to try the block on a colleague under the supervision of an instructor.
I hoped to learn why I have been unsuccessful and how to correct my technique.

Outcome of the learning activity

Give a personal view of how the learning informed and influenced your work.
What effect has this learning had on the way you work or intend to work in the future? Do you have any plans or ideas for follow-up learning?

I know what I was doing wrong and how to correct it. I'm more confident when I see patients who require local anesthetic in the mandible and am able to successfully anesthetize them. I will no longer hesitate to take hands-on workshops because I know it will be beneficial to me in a practical sense. I also realize that I am not the only one who has problems with administering local anesthetic and I don't have to feel ashamed. I also realize that avoiding or denying a weakness hampers my ability to provide quality dental hygiene care for my clients.

The way in which this learning activity has influenced my work is by…

I can successfully anesthetize clients and provide better dental hygiene care for these clients than in the past.

Box 2. An example of a professional portfolio entry[20]

according to the profession's Practice Standards.[1,2] To obtain the necessary knowledge or skills or both, health care practitioners may participate in workshops or other educational programs. This information is then documented in their portfolios as evidence in support of their claims of competency. In this regard, the portfolio is useful for professionals who are preparing for job interviews, annual job performance appraisals, job promotions, and career planning.[20]

The professional portfolio encourages lifelong learning and professional development.

The portfolio is a valuable tool for nurses applying to universities or colleges for post-RN formal education because these institutions' admission committees may grant credits for a nurse's prior learning and work experiences based on the information provided by the professional portfolio.[20] For dental hygienists seeking post-diploma education, the University of British Columbia will consider prior learning experiences for admission into the Bachelor of Dental Science in Dental Hygiene Program.[25] Although it is advantageous for applicants to know and offer relevant information in an interview, it can be difficult for some applicants to remember important information when they are under stress. A professional portfolio can assist the applicant by providing the interviewers with relevant, evidence-based information about the applicant's professional life.

Limitations

There are potential limitations associated with professional portfolios. One is that new practitioners may lack confidence when using a portfolio for the first time.[23,26] Scholes et al. in 2004 suggest that practitioners be given clear guidelines, a template with examples, support from more experienced practitioners, and feedback from the assessor to alleviate the practitioners' concerns.[26] Scholes et al. also state that the depth of reflection in the portfolio will change according to the stage in the health practitioner's professional career.[26] New practitioners should therefore think of their professional portfolios as works of art in progress.

Second, there is the limitation imposed by subjectivity. A portfolio may not represent a true picture of a practitioner's practice.[23] There is the possibility that practitioners believe that they are competent to do a task when they are not.[24] Practitioners may also believe they are competent because of the perception of others, but this is not sufficient evidence of competency.[24] True self-assessment is less likely to occur in those who are inexperienced because they are often unaware that they do not know.[27] The College of Registered Nurses and Nurse Practitioners of British Columbia (CRNBC) recognizes that portfolios are subjective and encourages registrants to seek peer feedback as a means of clarifying their limitations and identifying specific goals.[2]

Third, the use of a portfolio for assessing learning and competence is controversial because its reliability and validity are often difficult to measure objectively.[23,27] A measurement is said to be valid if it measures what it claims to measure and is reliable when the measurement is consistent.[28] But since portfolios are subjective and highly individualized, it is difficult to devise evaluation criteria that are valid and reliable.[28,29] Attempts have been made, however, to devise grading criteria for assessing portfolios in nursing education.[28] For example, Jasper in 1995 devised 10 criteria for grading a portfolio.[30] Each criterion was given a score from 0 to 10, ranging from "no or little evidence" to "evidence" of the criterion "being met in all its aspects."[30] These scores, however, were essentially subjective and their validity and reliability could only be judged if operational definitions of "little, etc." were provided.[28]

In another example, Hull and Redfern in 1996 used the following criteria for assessing portfolios for accreditation of prior or experiential learning for university credits:[31]

1. Depth and breadth: Are the learning activities isolated or do they encompass many different aspects of practice?
2. Authenticity: Can the person do or has done what is claimed?
3. Quality: Was the learning activity at the appropriate level to be considered for program exemption?
4. Currency: Does the person show evidence of keeping up-to-date with recent developments?
5. Acceptability: Does the evidence in the portfolio support the learning that is being claimed?
6. Sufficiency: Is there enough evidence to show sufficient proof of confidence?

Although these criteria give the assessors guidelines for assessing a portfolio, the assessment continues to be plagued by subjectivity. Webb et al. in 2003 explored the possibility of monitoring the rigour of student portfolio use on two levels, using a qualitative approach.[28] On the student level, they found that tripartite meetings between student, personal teacher, and mentor were effective.[28] In the meetings, students had an opportunity to demonstrate their communication, reflective, and analytical skills while discussing the contents of their portfolio. The mentor had an opportunity to provide the student with feedback and guidance on future learning needs, and the teacher could verify that the events took place.[28] In this situation, the assessors were able to gain more information about the student than what the portfolio alone provided.[28] This additional information was useful when the portfolio was graded.[28] On the overall monitoring level, Webb et al. suggested two calibrated examiners using detailed, objective criteria to grade the portfolios and audit trails, which are records of transactions that occurred, such that another person is able to reconstruct and examine the sequence of events.[28,32]

In spite of the controversies surrounding the validity and reliability of portfolios for assessing learning and com-

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petency, one must keep in mind the purpose of the portfolio. According to Jasper, the portfolio is a process, not an end product. It merely supplies the documents of the process rather than any measure of quality.[30] Snadden in 1999 continues by questioning whether we are trying to "measure the unmeasurable" and concludes by stating that "a mental shift is needed" to find a more holistic approach to assessment when dealing with portfolios.[33] According to Webb et al., this suggests that assessments of clinical skills and performance in practice settings should be assessed separately from the reflective aspects of the portfolio.[28] For professional regulatory bodies, a clear distinction will have to be made as to what is important in the vision and mission of that particular College. Is it QA or CQI? If it is QA, professional portfolios will not provide valid and reliable measures of a registrant's competency in clinical skills and performance in the practice setting. If it is CQI, then portfolios provide an important self-assessment component in the lifelong learning process and professional development of the registrant. According to the Health Regulatory Organizations of British Columbia, "quality care is more likely when quality improvement and control are emphasized over quality measurement."[10]

The portfolio is a process, not an end product.

A fourth potential limitation is that practitioners may censor entries in the portfolio if there is lack of confidentiality. In a punitive environment, registrants may be afraid that the contents of a portfolio could be used against them during inquiry or disciplinary action.[23] According to a 2005 article by Asadoorian and Locker about dental hygienists in Ontario who use the professional portfolio system, only 11.6% of the respondents selected learning activities to "address a professional weakness."[6] Most of the respondents chose learning activities based on "personal interest" and "convenience."[6] Although Asadoorian and Locker speculate that the respondents chose learning activities with which they were comfortable, there is also the possibility that the respondents were afraid to identify any true professional weakness. In Ontario, dental hygienists are required to submit their entire portfolio for auditing purposes.[34] Although it is important for regulatory bodies to enforce the use of professional portfolios (if this is one of their registration requirements) by randomly auditing its registrants to check for compliance,[2,24] it is equally important that regulatory bodies establish confidentiality guidelines and a supportive environment to gain registrants' trust. The College of Dental Hygienists of Ontario (CDHO) has attempted to protect the registrants' confidentiality by having a firewall between the quality assurance and inquiry departments, but this does not appear to be enough to gain the registrants' trust.[34]

A better way for regulatory bodies to protect the public and encourage honest self-appraisals and pro-active, relevant learning of its registrants is to require the submission of a personal profile. This idea was taken from CRNBC, which uses the personal profile for auditing its registrants to assess the quality of their practices.[2]

Personal profiles

Definition

According to Brown, a profile differs from a portfolio in that it is a collection of evidence selected by the owner from his or her portfolio for a particular purpose and audience.[15] A profile is a "snapshot" of what a health care practitioner has accomplished and his or her present situation.[20] A profile is a public document; a portfolio is not.[20]

Purpose

Personal profiles are useful in situations where information is needed about the competencies and expertise of a practitioner and this information will be viewed by others.[16] For example, if a nurse was applying for a job promotion or job interview, he or she could select documentation from the portfolio to put into the personal profile, which would demonstrate his or her competencies and expertise for that job.[16] Personal profiles are especially useful for auditing purposes by regulatory bodies. For example, the CRNBC respects the confidentiality of its registrants by requesting registrants to submit a practice review,[2] which is a *profile* of the registrants' learning activities.

Benefits

The key benefit of the personal profile is that it maintains the privacy of the professional portfolio.[16,20] Any limitations or deficiencies identified by the practitioner of the portfolio are never publicized. Therefore the practitioner does not have to fear retribution from the professional regulatory body, his or her employers, or feel embarrassed among his or her colleagues. The profile liberates the practitioner to do honest self-appraisals and contributes to a safe and supportive learning environment.

The other benefit of the profile is that a practitioner can select the best and most appropriate information from the portfolio to show to others.[16,20] It is a great marketing tool for the health care professional as it provides the evidence needed to corroborate his or her claims of competency and expertise.[16,20]

Limitations

The only limitation of personal profiles is that new or inexperienced nurses may not have as much information or the same type of experience as more experienced nurses. However, the target audience generally takes this into consideration when viewing their profiles.

As with any self-assessment tool, the personal profile is only as effective as the person using it.[9] To obtain optimum benefits from the professional portfolio and the personal profile, the health care practitioner must be honest in his or her self-reflection process. Yet, as described earlier, some practitioners may be unaware of their weak areas.[24] Peer review is a valuable tool for helping practi-

tioners to identify their strengths and weaknesses and is a necessary component of the professional portfolio.[2]

Peer review

Definition

"Peer review is a process for checking the work performed by one's equals (peers) to ensure it meets specific criteria."[35] A peer is defined as someone who is similar to you in terms of education, experience, and occupational status.[36] As peers are acquainted with the requirements and demands of particular positions, they are able to quickly identify each other's errors, speeding up the time it takes for mistakes to be identified and corrected.[35,36]

Purpose

Peer review may be a formal or informal process, depending on its purpose. Organizations use formal peer reviews for job performance appraisals.[36] A formal peer review is a written evaluation that follows the established guidelines and criteria of an organization to assess the health professional's standard of care.[36]

In contrast, informal peer reviews are discussions between colleagues on a specific subject to gain additional insight into one's practice.[2,36] The willingness of the participants to be open and frank in their discussion results in an enriching learning experience for both parties.[37,38] Since the informal peer review is more applicable to dental hygienists as a learning tool, it will be discussed in further detail.

Benefits of informal peer review

Peer review is a valuable component of the professional portfolio because it enhances the self-reflective process by providing different perspectives of the learning experience.[2]

In Europe, peer review is widely accepted as a suitable method for quality improvement in medical practice.[39,40] Studies have shown that health care practitioners experienced changes in their performance by being involved in peer reviews with colleagues.[37,40,41] Although there were reservations and fears initially, these were quickly dispelled and the health care practitioners embraced the peer review method.[37,41]

In dental hygiene, peer review can occur in study clubs. Although most dental hygienists work in private dental practice and are frequently the only dental hygienist in the office,[14] they can voluntarily join a study club. Study clubs consist of a minimum of five dental hygienists who come together for clinical or non-clinical educational study for the purpose of maintaining or increasing their competence.[1] Peer review is possible in a study club because there is often an opportunity to share experiences with one or two members of the group on an informal basis. Only another dental hygienist can understand what a dental hygienist is experiencing; this understanding facilitates a genuine rapport between the dental hygienists. Since the study club provides a safe, supportive environment, it facilitates open communication and enhances personal growth for each member of the group. CDHBC believes that study clubs are valuable venues for continuing dental hygiene competence and professional development.[1]

Limitations of peer review

Occasionally, peers may deliberately give generous assessments in anticipation of receiving reciprocal treatment[24] or give harsher reviews than management.[42] The reluctance to provide honest feedback is a critical problem in peer review.[36] Honest feedback is more likely to occur when there are established standards for quality of care. Peers are encouraged to use their professional practice standards to assess a colleague's job performance rather than their own personal standards or feelings.[36]

The professional portfolio, personal profile, and peer review are effective CQI tools that dental hygienists can use to improve the quality of their practices. CQI is effective for encouraging professional growth and higher standards of care, but does this mean that it is necessary for dental hygiene to adopt CQI?

QA TO CQI: WHY IS CHANGE NECESSARY?

The ability to change and adapt is key to growth. Dental hygiene is a growing profession;[43] maintaining the status quo, such as the passive quality assurance system, places the profession at risk for stagnation.[44] Although change is uncomfortable, it is both possible and necessary. Health care is rapidly changing and so must the provision of health care.[6,44] Not only are there rapid advances in science and technology, consumers learn about and are demanding these innovative health care services. Dental hygienists have a responsibility to meet this need by continuing to learn and improve their practices to provide the best possible care to clients.[1] Under the current QA philosophy, dental hygienists could maintain competency (and their right to registration) simply by attending courses.[1] Yet this philosophy does not necessarily improve the practitioner's practice. Dental hygiene needs to shift from QA to CQI to meet the health care demands of the public it serves. CQI is effective in improving dental hygiene practice because it empowers and supports health care practitioners to make wise choices about their learning activities, selecting activities that will have the greatest impact on their professional practice and careers. Dental hygienists have individual characteristics, experiences, attitudes, and values that will influence their learning choices as well as the impact those learning choices will have on their practices.[9] CQI allows dental hygienists to select their personal path to improvement; QA dictates what must be done to meet the requirements of the regulatory body.[11] By empowering and supporting dental hygienists, the CQI philosophy allows the dental hygiene profession to grow through its most valuable asset, its people.

CONCLUSION

To meet the growing needs of the public and the dental hygiene profession, dental hygienists must change their current passive role in quality assurance to the more accountable and responsible role in continuous quality

improvement. Continuous quality improvement tools such as professional portfolios, personal profiles, and peer reviews are useful for dental hygienists who want to improve their dental hygiene practice. The CQI philosophy mirrors the goal of self-regulating professions by empowering its members to be responsible and accountable for their professional careers. Not only will this protect the public today, it will enhance the quality of health care for the future.

If you want one year of prosperity, grow grain.
If you want ten years of prosperity, grow trees.
If you want one hundred years of prosperity, grow people.[45]

– Ancient Chinese Proverb

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Past, Present, and Future *(continued from page 107)*

This is further interpreted to include, in priority order:

1. Members are unified in their identity as a unique profession.
2. Members have a strong national voice.
3. Members can acquire, maintain, share, and use a growing body of professional knowledge and educational opportunities.
4. Members' value is credibly demonstrated to, and understood by, Canadians.
5. Members have resources for safeguarding their fair treatment and well-being in the workplace.
6. Members have resources to support business success.

These changes in our goals are in keeping with the survey results submitted by you, the owners of CDHA. As you all know, the foremost objective of CDHA is to create the optimum working environment for the members of our profession. It is therefore in this spirit that I ask you to look at the changes we have made to our goals. I trust that you will accept these changes as a positive step toward supporting each of you in your profession, whether you choose to stay in your working environment, to become an entrepreneur, to extend your dental hygiene services to disenfranchised groups such as residents of long term care facilities, or to work with other health professionals in helping the overall health of all Canadians.

The Board of Directors of CDHA believes that these new "ends" will help create and make accessible unbounded opportunities for all dental hygienists in Canada. It is with this in mind that I bring up the theme of this year's national conference, "Endless Opportunities…Create Yours." I invite all of you to attend CDHA's 17th national conference in Edmonton from June 16 to 18, 2006. It is a great opportunity to join your colleagues from across Canada to discuss important issues facing our profession. Members of the CDHA Board of Directors will be there for the whole conference to hear and discuss any issues that are important to you. I look forward to seeing you in Edmonton.

You can contact Diane Thériault at <president@cdha.ca>.

New Ways of Thinking in the World *(continued from page 111)*

group advocacy. Dr. O'Keefe states that there is a need for global coordination to present new arguments. For what reason, he does not specify. However, one would understand it would be to safeguard the status quo.

The timing of the journal editorial was prompted by the Irish Competition Bureau's recommendations for independent dental hygiene practice and coincided with several letters that have emerged from Canada's Competition Bureau in support of independent dental hygiene practice. (Links to these documents are on our website at www.cdha.ca/content/newsroom/reports.asp.) George Weber, Executive Director of the Canadian Dental Association, in response to a competition bureau letter states "It is true that not all Canadians access dental care on a regular basis, however, their reasons for not attending are varied and complex – including cultural, financial, mobility and attitudinal influences. Removal of the dentist participation is not a magic bullet that will increase access to oral health services." The comments of both of these respected men led me to select the quotation from two centuries ago that I used to set the tone of this message. Is there a parallel between the "underlying motives" for antifeminism and racism mentioned above and the CDA's reaction to the advancement of the dental hygiene profession?

I have never seen any policy or position statements that recommend removing dentists' participation in oral health care delivery. What I have seen is recommendations for removing barriers that restrict the ability for dental hygienists to practise the full scope of dental hygiene practice. There are many different types of collaboration and many types of teams. I would suggest to Dr. O'Keefe that, rather than investing negative energy in developing new arguments to thwart what he refers to as "emerging occupations," positive energy be invested in developing new perspectives on how teams of collaborating professionals can work together to help improve the health of Canadians when dentists are not necessarily the boss.

ABSTRACTS

The International Association for Dental Research (IADR), in association with the American Association for Dental Research (AADR), Canadian Association for Dental Research (CADR), and American Dental Educators Association (ADEA) held a combined meeting and exhibition March 8–11, 2006, in Orlando, Florida. Scientists and researchers from around the world present their research findings for discussion. The IADR has given us permission to publish a selection of abstracts presented at that meeting.

CARIES

0153 DENTAL CARIES AND FLUOROSIS IN RELATION TO WATER FLUORIDE LEVELS

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Objectives: This study assessed the relationship between dental caries and fluorosis at varying fluoride levels in drinking water. **Methods:** Subjects were followed from birth with questionnaires every 3-4 months to gather information on fluoride intake. 420 study subjects received dental examinations at age 5 on primary teeth and at age 9 on early-erupting permanent teeth. Composite fluoride levels in drinking water at home and childcare were determined from public, private well, and/or bottled water sources at 24 months of age for individual participants. Permanent tooth fluorosis cases were defined as subjects having definitive/severe fluorosis on 2+ teeth. Caries prevalence rates were calculated at age ~5 and ~9 on primary teeth. The linear trends between fluorosis or caries and fluoride levels in drinking water were assessed by Cochran-Armitage tests. **Results:** Fluorosis prevalence rates on early-erupting permanent teeth were 21.0%, 41.1% and 46.3% for composite water fluoride levels of <0.7, 0.7-1.2, and >1.2 ppm (P<0.001). Caries prevalence rates on all primary teeth at ~age 5 were 23.8%, 22.9%, and 24.4% for water levels of <0.7, 0.7-1.2, and >1.2 ppm (p=0.970). Specifically on primary second molars, the corresponding caries prevalence rates were 18.2%, 15.3%, and 17.0% at ~age 5 (p=0.631) and 37.1%, 34.3%, and 34.1% at ~age 9 (p=0.612), respectively. Similar relationships were found between fluorosis/caries and water fluoride levels at 12 months and 36 months. **Conclusions:** Fluorosis prevalence increased significantly with higher water fluoride levels; however, caries prevalence did not decline significantly. Supported in part by R01-DE09551, R01-DE12101, and M01-RR00059.

1532 SITE-SPECIFICITY OF ACID PRODUCTION IN DENTAL PLAQUE

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Objectives: We have been studying the site-specificity of dental plaque cariogenecity that would be related to the caries status of associated tooth surfaces. Our previous study of plaque buffer capacity showed that the highest was the lower-anterior- lingual (LAL) and the lowest was the upper-anterior-buccal (UAB) when we compared the 8 different sites. The aim of this study was to clarify the two different sites of acid production in dental plaque by determining the plaque pH curves following sucrose exposure. **Methods:** Two-day plaque samples were collected from UAB and LAL in each of 9 adult subjects. Wet plaque samples were transferred to plastic sticks and immediately put into pre-weighed plastic tubes. The samples were weighed and 0.85% KCl solution (1mg wet plaque/100µl) was added. A stir bar was then added to the plastic tubes. A micro pH electrode was then inserted and the pH was determined. After 5 minutes, 10% sucrose (1mg wet plaque/30µl) was added, plaque pH was then measured at 60 different time points (1-60 min), and the plaque pH curves were recorded. After plotting the curves, the area under each curve (AUC) was calculated. Mean pH values are reported as the log of the mean hydrogen ion activity (i.e., 10^{-pH}), and all statistical comparisons were made based on the hydrogen ion activities. Statistical analyses between 2 different sites were carried out using the Mann-Whitney U test. **Results:** Initial pH (without acid) of plaque in the LAL (mean±S.D.: 7.18±0.36) was significantly higher than in the UAB (6.12±0.36) (p<0.01). As for the AUC, the UAB (mean±S.D.: 8.02±7.06 (mmol/L•min)) was significantly larger than the LAL (0.52±0.64 (mmol/L•min)) (p<0.01). **Conclusion:** Plaque in the UAB is more cariogenic than in the LAL.

1613 ASSOCIATION BETWEEN BMI AND CARIES FREQUENCY IN ELEMENTARY SCHOOL CHILDREN

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Objectives: Within the last 10 years an enormous increase in overweight adults as well as adolescents and children could be observed. Besides well-known risk factors, it may be postulated that a higher frequency of caries can also occur in overweight or obese people as eating habit may contribute to both. **Methods:** A total of 1290 elementary school children (50% boys, 49.8% girls; age 6 to 11 years) were examined. The dental examination included the determination of caries frequency (DF-T-/ df-t-values). The medical evaluation assessed the pupils' general health and the body mass index (BMI). **Results:** The study showed that 3.6% of the children were underweight, 74.8% had a normal weight, 11.9% were overweight and 9.7% obese. Naturally healthy teeth were found in 38.8 % of all children. Children with underweight showed healthy teeth in 44.7%, those with normal weight showed natural teeth in 40.7%, while children with high weight and obese children showed healthy teeth in 30.5% resp. 31.7 %. A significant correlation between high weight and caries frequency in the first dentition (p= 0.0067 for df-t distribution) and in the permanent dentition (p= 0.0002 for DF-T distribution) could be observed. The association remains statistically significant after adjusting for age. The number of healthy teeth decreased with the age (p=0.001), BMI (p=0.0061) and was different between girls and boys (p=0.0334. **Conclusions:** This study demonstrated a significant association between dental caries and weight in children of elementary schools. In future preventive programs the importance of nutrition should not only be emphasized with respect to general diseases but also with regard to carious lesions

1997 USE OF TELEDENTISTRY FOR DETECTION OF CARIES IN PRESCHOOL CHILDREN

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Objectives: To assess caries prevalence in 12-60 month old children enrolled in six Early Head Start inner-city childcare centers by means of Teledentistry and to evaluate the use of Teledentistry as an oral examination screening tool. **Methods:** Images of the deciduous dentition were obtained by trained Telehealth Assistants using an intraoral camera. Images were entered into a web-based storage and retrieval program maintained by Health-e-Access, University of Rochester, Department of Pediatrics and the sponsor of the Teledentistry initiative. Images were transmitted to a secure remote-site computer and evaluated by a calibrated pediatric dentist. **Results:** Of 121 children screened, 55 (approximately 45%) were caries active. The mean dfs score was 2.34 (SD= 4.73) with a range of 0 to 32 carious surfaces. African-American children (n=78) had the highest mean dfs score of

3.05, followed by Caucasian children (n=3, dfs= 1.67) and Hispanic children (n=39, dfs= 1.03). Males had a higher mean dfs score (dfs=2.35, SD= 5.76) than females (dfs= 2.33, SD=4.10). 2.48% of children had diagnostically unacceptable images. These children were re-imaged until diagnostically acceptable images were obtained. Referrals for preventive or restorative care were provided for all children participating in the study. **Conclusion:** The results of this study suggest that (1) an intraoral camera can be used successfully for diagnostic purposes; (2) may reduce costs and enhance oral health screening programs; (3) images can be obtained as often as necessary to achieve an acceptable diagnostic standard or to follow-up on children referred for treatment and (4) very young children who often are not seen by a dentist can be screened and referred for care. Supported by NIH/NIDCR R21 DE08946 and the Aetna Foundation.

1998 ELECTRICAL CONDUCTANCE MEASUREMENT IN HIDDEN OCCLUSAL CARIES DETECTION

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Introduction and Objective: Intact enamel of occlusal surfaces of posterior teeth is non-conducting electrically. With enamel mineral loss especially in caries vulnerable sites (e.g. pits and fissures), electrical conductivity (EC) rises. However, EC for detecting caries has met limited success. Here we re-examined this question in vitro using a newly developed EC device developed in our laboratory. **Method:** In 20 extracted third molars with no restorations, non-cavitated caries lesions or visible defects, 6-8 occlusal sites were tested for EC before crowns were sectioned horizontally using an Isomet 11-1180 low-speed saw. Sections were 630µm thick and spaced at 150µm (thickness of diamond blade). Our EC instrument is comprised of a current source with a 3µA current output to which reference and indicator electrodes are connected. To simulate oral cavity conditions, a special apparatus was constructed to enable tooth and electrode positioning. Three measurements were made in triplicate at each site. Before each measurement, each tooth site was dried with air-blowing for 10 sec. **Results:** A total of 81 potential caries and 69 potential non-caries sites were identified from the conductance data. The former sites showed EC values ranging from 1.0 to 3.0µA, except for one site which was 0.3µA. EC for the potential non-caries sites were all 0.0µA. Visual examination of the first group sections overwhelmingly showed demineralization. Scoring them on a 0 to 4 scale and determining their degree of agreement with EC showed a correlation coefficient of 0.895. In contrast, the non-conducting tooth sites showed no mineral loss visually and scores of 0. **Conclusion:** Results of this evaluation suggest that the detection of dental caries in occlusal pits and fissures by EC with the new EC device is highly reliable and reproducible. If proven in vivo, it could be a valuable instrument for early hidden caries detection.

1008 INEVITABILITY OF DENTAL DISEASE: BELIEFS OF YOUNG MOTHERS

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The dental beliefs of parents may impact on the resultant oral health of their children. If it is believed that the development of dental caries or tooth loss are inevitable, parents may be less receptive to the initiation of preventive care. As a result, the caries experience of their children may be increased. **Objective:** These data were derived from a larger study designed to determine associations between caries risk behaviors, dental knowledge and perceptions of health of primary caregivers (PCG) and their toddlers, with their level of caries incidence. These data summarize the dental health beliefs of the PCGs based on self-reported race/ethnicity related to caries development and tooth loss. **Methods:** 375 white, black and Hispanic PCGs of 396 young children (26.4±5.6 months-of-age) were interviewed. Six questions were formulated to measure their dental health beliefs; two to gauge perceptions concerning the development of dental disease as related to dental caries and tooth loss. The first question was "Most young children will get cavities". The second was "Most adults will lose all their teeth as they get older". Answers of True, False or Do Not Know were recorded. **Results:** For the first question, 66% of Hispanic mothers answered affirmatively followed by 51% and 45% of black and white mothers, respectively. Hispanic mothers were most likely to answer "True" to the second question (49%) followed by black (37%) and finally white mothers (22%). Analyses of the data indicated significant differences between groups for both questions. **Conclusion:** Preliminary analyses indicated that the belief in the inevitability of the development of dental disease and resultant tooth loss was found to differ significantly based on race/ethnicity. Comparative analyses of these data to the collected caries examination data of the children are being performed. This study was supported by NIH R21 48-745-00

0152 ASSESSING THE CARIES PREVENTIVE EFFECT OF PREVENTIVE PUBLIC SCHOOL PROGRAM

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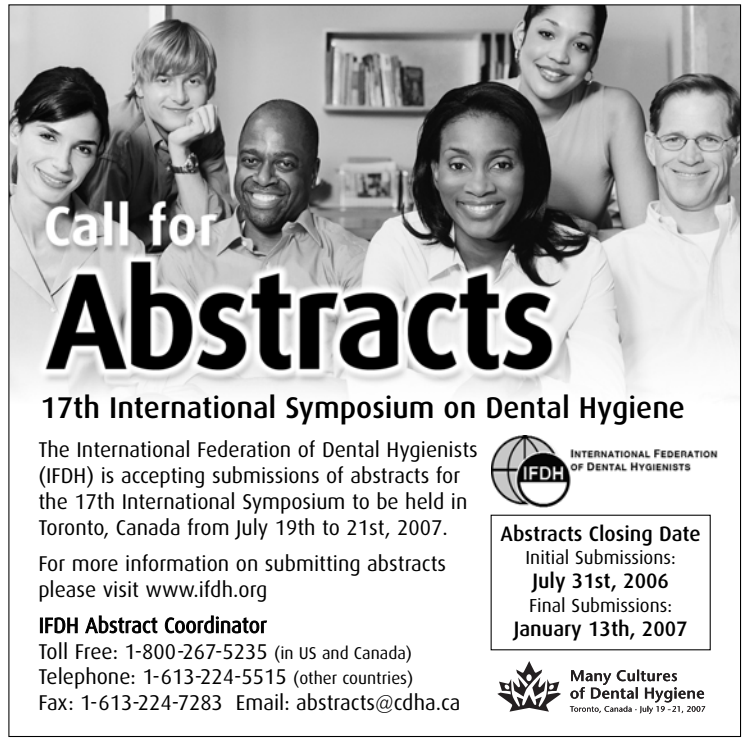
The Quebec Preventive Dental Services Public Program (PDSPP) has a recurring annual budget of $12 M. Its main component is a school program (PDHPSP) having as its major objective the prevention of dental caries in primary school children. **Objective:** Evaluate the association between exposure to the PDHPSP and dental caries prevalence among Quebec children aged nine years. The hypothesis tested was that nine year old children found at risk for dental caries at age five years and who did not benefit from any preventive intervention (the control group) had an average d3efs + D3EFS greater by three units or more than children of the same age and caries risk but who received preventive interventions (the intervention group). **Method:** A retrospective cohort design with cross-sectional data collection was used. A convenience and non-representative sample of 1185 nine year-old children was used. Of these 142 were at high risk of caries and received the PDHPSP, 103 were at high risk and did not receive the PDHPSP and 940 were at low risk for caries and did not receive the PDHPSP. Data were collected directly from the children in a school environment by three dental hygienists, and by mail from their parents and their private dentist. Questionnaires were used to collect data concerning knowledge and behavior associated with dental caries incidence. The study primary dependent variable was the average d3efs + D3EFS. **Results:** The mean d3efs + D3EFS of children in the control group was 17.03, while that of children from the intervention group was 17.02. There was no difference in these mean caries experiences between the two groups. **Conclusion:** The results suggest that there is no evidence of association between dental caries prevalence and PDHPSP exposure after four years (i.e. at nine years old).



0456 FACTORS ASSOCIATED WITH SEVERE EARLY CHILDHOOD CARIES AMONG ABORIGINAL CHILDREN

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Objectives: To identify the factors associated with Severe Early Childhood Caries (S-ECC) among three and five year-old Aboriginal children residing in seven Aboriginal communities in the District of Manitoulin, Ontario, Canada. **Methods:** Using a case-control study design factors were identified using a standardized interview questionnaire given to 68 primary caregivers. A S-ECC case was defined as a child with caries on two or more deciduous maxillary incisors or canines presenting as active or filled lesions or teeth missing due to caries, or they had a total decayed, missing (because of caries), filled primary teeth score (dmft) greater than 3. Data were analyzed using manual, forward, stepwise multiple logistic regression. **Results:** The following familial, infant/child feeding and oral hygiene factors were statistically associated with the development of S-ECC (P<0.1): father's education level OR 14.2 90% CI (4.1,49.2); child using a bedtime bottle containing sweet liquids after the child began walking (approximately 12 months of age) OR 6.6 90% CI (1.2, 36.4); mother's education level OR 0.2 90% CI (0.03, 0.4); primary caregiver initiating child's brushing of teeth after the age of 24 months OR 6.1 90% CI (1.5, 25.7); and the child eating four or more between-meal snacks per day OR 4.9 90% CI (1.4, 17.1). **Conclusion:** These results will assist community health care workers in identifying those children at greatest risk for S-ECC. It may also help in the redirection of limited resources to plan and implement effective preventive oral health interventions.

DEMINERALIZATION / REMINERALIZATION

0497 INFLUENCE OF FLUORIDATED CARBAMIDE PEROXIDE BLEACHING GEL ON ENAMEL DEMINERALIZATION

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Objective: Some brands of 10% carbamide peroxide bleaching (CP) gels are now fluoridated to limit bleaching-induced tooth sensitivity experienced by some individuals. Fluoride application on tooth surface induces increase resistant of the surface to demineralization. The aim of this study was to determine the effect of fluoridated CP gel application to tooth surface on enamel demineralization, comparing it with non-fluoridated CP gel and fluoridated toothpaste. **Method:** 4 enamel blocks were cut from each of twenty extracted human molars. The 4 blocks from each tooth were randomly assigned to four experimental groups: A (control), B (treated with non-fluoridated CP gel), C and D (treated respectively with CP gel and toothpaste both containing 0.11% fluoride). The blocks were subjected to 8-hour treatment each day with their respective agent for 14 days to simulate manufacturer's bleaching instruction. Following treatment, a tooth section was cut from each block. Sections were microradiographed and the images were analyzed for quantification of lesion parameters (mineral loss (Δz) and lesion depth (LD)) using transverse microradiography. Data was analyzed statistically using paired t-test (n=20, α=0.05) to test for differences in degree of demineralization (as measured by the lesion parameters) among the four groups. **Result:** Significantly greater Δz was observed in group A when compared with B($p<0.05$), C($p<0.001$) and D($p<0.01$), and in B when compared with C($p<0.05$). No significant difference in Δz between B and D, and between C and D. LD was significantly greater in group A when compared with C($p<0.001$) and D($p<0.01$), and in B when compared with C($p<0.001$) and D($p<0.05$). No significant difference in LD between A and B, and between C and D. **Conclusion:** Application of fluoridated 10% carbamide peroxide gel resulted in enamel demineralization inhibition comparable to toothpaste of similar fluoride concentration. Supported in parts by NIDCR, Grant #DE14318 for COSTAR Program and Ultradent Products.

2070 TOPICAL FLUORIDE TREATMENT AND ENAMEL DISSOLUTION IN CITRUS-CONTAINING BEVERAGES

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Objectives: Previous studies have demonstrated that exposure of dental enamel to soft drinks, particularly those containing citrus flavoring, causes dissolution. It is well-known that topical fluoride treatment reduces the rate of carious lesion development. No data is available, however, on the effect of topical fluoride on enamel erosion by citric acid-containing beverages. **Methods:** Enamel was sectioned in thin slices from extracted human molars and premolars with care being taken to yield enamel-only slices. The dimensions and weights were recorded for each enamel slice. Three sets of enamel slices (N=6) were then immersed in Mountain Dew, Fresca, Red Bull and lemon juice for a total of 8 days, with solutions being changed daily. The solutions were stored in an incubator at 37°C. One set of slices were left untreated prior to immersion. A second set of slices was treated with APF and the 3rd set was treated with neutral pH Nupro fluoride treatment. **Results:** It was noted that enamel dissolution was low for up to 5 days but thereafter the rate of enamel dissolution increased. Topical fluoride treatment markedly reduced enamel dissolution in the beverages compared to that for untreated enamel, and while a second topical F- treatment initially reduced the rate of attack, eventually both treated and untreated enamel exhibited similar rates of dissolution. It was found that successive F- treatments reduced enamel dissolution until there was marked enamel loss; thereafter, the rate of attack increased regardless of F treatment. **Conclusions:** Citrus-containing beverages are very aggressive towards dental enamel and while topical fluoride treatment delays the onset and rate of enamel dissolution, it does not prevent attack.

0474 ENAMEL AND ROOT SURFACE EROSION DUE TO POPULAR U.S. BEVERAGES

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Our earlier work has demonstrated the effect of acidic beverages on dental enamel but the susceptibility of root surfaces to a similar acidic insult has not been investigated. **Objective:** This study measured erosion depths in root surfaces following beverage exposure, and compared erosion depths between enamel and root surfaces. **Methods:** Representative beverages were chosen from regular sodas, diet sodas, 100% juices, and sports drinks categories. Extracted teeth were painted with fingernail polish exposing a small window (1x4 mm) of enamel or root surface. Teeth (n=4/per group) were randomly assigned and submerged in the beverages for 25 hours; beverages were changed every 5 hours. Teeth were sectioned into thin slices using a microtome, erosion depths were viewed using a polarized light microscope and measured with Image Pro Plus. Data were analyzed using one-way ANOVA and two-sample t-test ($p<0.05$). **Results:** Mean enamel erosion depths following exposure to Gatorade® (131±8µm) were greater ($p<0.05$) than Red Bull® (100±5µm) and Coke® (92±6µm); these three depths were greater ($p < 0.05$) than Diet Coke® (61±4µm) and apple juice (57±µm). Mean root surface erosion depths differed between each possible pair of beverage comparisons ($p<0.05$) following exposure; Gatorade® (118±5µm), Red Bull® (111±4µm), Coke® (101±3µm), apple juice (77±3µm) and Diet Coke® (66±2µm). Erosion depths were greater in root than in enamel surfaces following exposure to Red Bull®, Coke®, and apple juice ($p<0.05$ in all instances). Erosion depths were greater in enamel than in root surfaces following exposure to Gatorade® ($p<0.05$). Enamel and root surface erosion depths did not differ following exposure to Diet Coke®. **Conclusion:** Exposure of root surfaces to acidic beverages resulted in significant erosion. The susceptibility of enamel and root surfaces to erosion was not consistent between beverages and warrants further investigation.

PERIODONTOLOGY

2152 THE ASSOCIATION BETWEEN METABOLIC SYNDROME AND PERIODONTAL DISEASE

O.M. ANDRIANKAJA, R. DUNFORD, and E. DENARDIN, State University of New York - Buffalo, USA

Objectives: Obesity, hypertension, hyperglycemia and dyslipidemia, collectively referred to as "metabolic syndrome", have been associated with cardiovascular disease and have been suggested as potential independent risk factors for periodontal disease (PD). To confirm the latter, using data from the NHANES III that included 7431 subjects aged 20 years or older, we analyzed the association between metabolic syndrome and PD, and identified which components of metabolic syn-

drome may play a role in this association. We also examined the possibility that subjects with PD may be at higher risk to develop metabolic syndrome. **Methods:** Clinical criteria for metabolic syndrome included: 1. Abdominal obesity; 2. High triglyceride levels; 3. Low HDL cholesterol levels; 4. High blood pressure or current use of blood pressure medication; and 5. High fasting plasma glucose concentration. PD was evaluated by probing pocket depth (PPD) at four sites per tooth on the two randomly selected quadrants, one upper and one lower. Periodontal disease was defined as mean PPD ≥ 2.5mm. **Results:** There was a 39% increase (OR= 1.39 95%CI; 1.20- 1.62) in the odds of having PD in women having indicators of metabolic syndrome; no difference was seen for men [OR=0.98 (0.84-1.14)]. Using a minimum of 3 out of 5 criteria for metabolic syndrome, the adjusted OR were 1.02 (0.65-1.61) for men and 1.88 (1.05-3.35) for women. Abdominal obesity [OR= 1.50 (0.98-2.29) for men, 3.38 (1.81-6.32) for women] was the largest contributory factor. In addition, there was a significant increase in the odds of having metabolic syndrome in periodontal patients [OR = 1.33 (1.17-1.51)].**Conclusions:** The present study suggested that individuals with metabolic syndrome were more likely to develop periodontal disease. The association was statistically significant for women. Further studies are needed to determine the nature of the association between metabolic syndrome and PD. Supported by USPHS-NIH T32 DE07034.

0209 CONTROLLING PERIODONTAL INFECTION REDUCES SEVERITY OF ACTIVE RHEUMATOID ARTHRITIS

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Objective: To determine if eliminating periodontal infection and gingival inflammation has an effect on the severity of active rheumatoid arthritis (ARA) in patients with chronic inflammatory periodontal disease (CPD). **Methods:** 29 patients with a confirmed diagnosis of ARA as well as mild-to-moderate CPD for at least three years participated in the study. Activity of RA was assessed using the disease activity score test (DAS28) and the erythrocyte sedimentation rate (ESR). CPD is defined by 30% or more of the present teeth having 1 to 4 mm of clinical attachment loss. 17 out of the 29 patients were randomly selected to receive periodontal treatment consisting of scaling/root planing and oral hygiene instructions, whereas the other 12 received no treatment. All participants continued with their usual medications for RA during the study period. DAS28, ESR, and periodontal evaluations including plaque index, gingival index, probing depth, and bleeding on probing were recorded at base line and at 8 weeks thereafter for all the participants. Mann-Whitney U and chi-square tests were used to test if there is a significant difference in ARA severity in the periodontally-treated group than in the untreated group. **Results:** 10 out of the 17 subjects (58.8%) in the treated group showed improvement in the RA score indices whereas only 2 out of 12 (16.7%) in the untreated group showed slight improvement. There was a statistically significant difference ($p>.05$) in DAS28 and ESR between the treated and the control groups (40.1±20.4 vs. 43.7±16.1) and 30.5±20.4 vs. 39.4±22) respectively. **Conclusion:** Control of periodontal infection and gingival inflammation by scaling/root planing and plaque control in subjects with periodontal disease may lessen the severity of ARA. This finding supports the notion that there is an association between these two chronic inflammatory disease conditions.

GERIATRIC ORAL RESEARCH

0184 ORAL HEALTH CARE PERCEPTIONS IN U.S. NURSING FACILITIES

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A variety of factors may substantially influence the oral health status of nursing home residents. **Objectives:** Explore perceptions of Directors of Nursing (DoNs) regarding access to dental care and related issues. **Methods:** Questionnaires sent to random sample of DoNs in 9 regionally representative U.S. states (n=1333). **Results:** Response rate was 50% (n=664); mean facility 109 residents; 82% were of "white" ethnicity; and less than 25% were private pay; 51% were located in rural areas; and 59% of facilities were proprietary. DoNs and social workers most likely to coordinate dental care; nearly 30% of facilities did not have a written plan of care for oral health; 8% had on-site dental equipment; nearly half of residents were reported to be examined annually by dental professional; only 28% were likely to have received dental care beyond an exam and 25% of these visits were related to dental emergencies. Only 15% of respondents were dissatisfied with their facilities capacity to adequately address dental emergencies. Barriers to care with the highest mean level of significance were DDS willingness to treat residents and financial concerns of the resident/family. A 5 point "access" indicator scale was created and logistic regression model constructed to assess key variables; significant factors (p<.05) in decreasing strength of association were availability of dental equipment, having a written dental care plan, and having the dental care plan coordinated by the unit charge nurse. A variety of state-based study differences were evident; when compared to those in NY facilities residents in AZ and TX faced much greater barriers due to financial constraints (OR 19.6, 18.3), transportation of resident for care (OR 10.6, 11.6), and willingness of DDS to treat at facility (OR 7.7, 7.9). **Conclusions:** Findings confirm that there are substantial barriers to care and they appear to vary considerably by region.

2071 AGING CONTRIBUTES TO THE FATIGUE CRACK GROWTH RESISTANCE OF DENTIN

D. BAJAJ, N. SUNDARAM, A. NAZARI, and D.D. AROLA, University of Maryland at Baltimore County, USA

With rise in the number of seniors that are fully dentate, it is becoming increasingly important to understand the changes in structure of tooth tissues with age and the corresponding influence on their mechanical behavior. **Objectives:** To quantify the influence of patient age on the fatigue crack growth properties of human dentin. **Methods:** Compact Tension (CT) fatigue specimens were sectioned from the coronal dentin of extracted molars and subjected to high cycle fatigue loading (105<N<106) while fully hydrated (HBSS) at 22°C. The specimens were categorized young (18″ Age ″ 35; N=9) or old (50″ Age; N=8). All specimens were prepared to achieve crack growth perpendicular to the dentin tubules and then were subjected to Mode I loads with stress ratio (R) and frequency of 0.1 and 5Hz, respectively. Fatigue crack growth rates corresponding to steady-state growth were quantified according to the Paris Law in terms of the crack growth exponent (m) and coefficient (C). In addition, Electron Dispersive X-ray Analysis (EDXA) was performed to study the changes in chemistry and structure of dentin with age. **Results:** Overall, the fatigue crack growth rates ranged from 4E-7 to 5E-2 mm/cycle over a stress intensity range from 0.5 to 1.2 MPa•m^0.5. The average fatigue crack growth exponent for the young dentin (m= 13.3±1.1) was significantly lower than that of the old dentin (m = 21.6±5.2; p<0.003). Fatigue cracks in the old dentin underwent initiation and propagation at a much lower stress intensity range than that for the young dentin. Results from the EDXA showed that the Ca:P ratio in young dentin was 3.14 ± 0.053 whereas in old dentin was 2.55 ± 0.072. **Conclusion:** The fatigue crack growth resistance of dentin decreases with patient age. (Supported by an individual investigator grant, Whitaker Foundation)

ORAL HEALTH

2049 ADVANTAGES OF BRUSHING TWICE-PER-DAY COMPARED TO ONCE-PER-DAY

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Objectives: To compare the effects of brushing once-per-day (morning) with brushing twice-per-day (morning and evening) on fluoride levels in saliva and total viable bacteria (TVC) in plaque. **Methods:** 32 healthy adult volunteers completed a single-blind, randomised cross-over design study. Before Test Day 1, subjects had all visible plaque removed and used non-fluoride toothpaste for 1-week. Having refrained from brushing for 12hours, subjects provided a baseline saliva sample on the morning of Test Day 1 then brushed with 1.5g of silica toothpaste containing 0.32% NaF (Close-Up, Unilever). Saliva samples were collected 1 and 2hours after brushing. Subjects allocated to twice-per-day brushing were given the test toothpaste to use on the evening of Test Day 1, while those allocated to once-per-day regime did not brush. The following morning (Test Day 2) all subjects provided a saliva sample on waking then returned to the test site where a plaque sample was collected. The subjects completed a further week on non-fluoride toothpaste prior to repeating the procedures for the second brushing regime. Saliva samples were analysed for total fluoride by ion selective electrode. Aerobic and anaerobic TVCs were determined in the plaque samples. **Results:** Overall Mean (s.e.) Salivary fluoride concentrations (ppm):

Brushing regime	Baseline	1 hour post-use	2 hours post-use	Morning
Once-per-day (morning only)	0.035 (0.009)	0.556 (0.067)	0.195 (0.024)	0.046 (0.006)
Twice-per-day (morning & evening)	0.027 (0.002)	0.537 (0.077)	0.213 (0.034)	0.292 (0.057)
Significance				p>0.0001

When brushing twice-per-day the fluoride levels in the morning saliva samples were similar to the levels found 2hours after brushing. When brushing once-per-day the fluoride levels in the morning saliva samples had returned to baseline. Significantly fewer aerobic(p<0.0001) and anaerobic(p=0.0003) bacteria were found in plaque for twice-per-day brushing compared to once-per-day. **Conclusion:** Brushing twice-per-day with the test product gave significant increases in overnight salivary fluoride levels and reductions in total viable bacteria compared to once-per-day brushing.

RESEARCH METHODOLOGY

0920 EVALUATION OF DENTAL SYSTEMATIC REVIEW SEARCH AND SELECTION METHODS

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Objectives: Despite the large increase in evidence-based knowledge in dentistry, there has been little done to evaluate the quality of dental systematic reviews and meta-analyses. The aim was to evaluate search and selection of studies in these systematic reviews. **Methods:** Dental systematic reviews published between January 1, 2000 and July 14, 2005 were searched for systematically utilizing multiple electronic databases and secondary searches. Search and selection methods of identified reviews meeting the definition of a "systematic" were evaluated against the guidelines in Cochrane Handbook for Systematic Reviews of Interventions. Systematic reviews were evaluated for 1) documentation of database name and date range of search, 2) electronic searches preformed in at least two databases, 3) electronic searches followed-up with secondary searches, 4) search terms were clearly presented 5) Boolean operators for combining terms were presented, 6) clear and reproducible inclusion-exclusion criteria were presented, 7) included articles were selected by a team of two or more researchers, and 8) all languages were included. **Results:** 220 unique dental systematic reviews were identified. All aspects of search and selection methodology have improved. In 2005, most systematic reviews documented database names and search dates (90%), electronic search terms (95%), inclusion-exclusion criteria (95%), and employed secondary searching (100%). However, any still fail to search more than MEDLINE (20%), document the search strategy (20%), use multiple reviewers for selecting studies (25%), and include all languages (39%). **Conclusions:** Readers of systematic reviews can become increasingly confident of the reviews conclusions. But though systematic review methodology is improving, key components are still frequently absent. Each component identified as frequently missing

has been quantitatively tied to the validity of systematic review conclusions. Therefore researchers, clinicians, and all other interested parties should always read systematic reviews critically constantly considering the potential for bias from methodological flaws.

0876 VALIDATION OF THE CHILD PERCEPTIONS QUESTIONNAIRE IN CHILDREN WITH MALOCCLUSION

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The Child Perceptions Questionnaire for 11-14-year-olds (CPQ11-14) is an oral-health-related quality of life measure encompassing the domains of oral symptoms, functional limitations, emotional well-being and social well-being. The Child Health Questionnaire (CHQ-87) is an established measure of self-perceived physical and psychosocial child well being. Objective: To test the cross-sectional convergent validity of the CPQ11-14 against the CHQ-87 in orthodontic patients. Methods: The CPQ11-14 and the CHQ-87 were completed by orthodontic patients at the Faculty of Dentistry, University of Toronto prior to the commencement of their treatment. CPQ11-14 total scores were calculated by summing the domain subscale scores. Two domains of the CHQ-87 were tested against CPQ11-14 total score and socio-emotional domains scores: self esteem (SE) and general mental health (GMH) domains. Convergent validity was tested by means of Spearman's correlation. Results: Data were collected from 211 children. Mean age of the sample was 12.5 (SD = 1.2). Mean SE and MH scores for children with malocclusion were 0.85, 0.79 respectively, compared to school based population norms of 0.89 and 0.82. There were significant negative correlations between the CPQ11-14 scores and the CHQ-87 domain scores. High CPQ11-14 total scores indicating poor oral health quality of life were associated with low self esteem CHQ scores ($rs = -0.46$; $p<0.01$) and low general mental well being ($rs = -0.47$; $p<0.01$). A similar pattern was observed for the subscale scores, with the most pronounced gradient in the emotional well-being domain. Conclusions: The study provided evidence of the cross-sectional convergent validity of the CPQ11-14, supporting its application in clinical orthodontics settings.

0878 THE MEANING OF SELF-RATINGS OF ORAL HEALTH

D. LOCKER, J. MAGGIRIAS, and E. WEXLER, University of Toronto, Canada

Objectives: To assess variations in the frames of reference underlying self-ratings of oral health. **Method:** Interviews were undertaken with a convenience sample of adults. Subjects were asked to rate their oral health on a scale ranging from excellent to poor and then to give the reasons for their ratings. The interviews were tape-recorded, transcribed and content analyzed. Up to four numerical codes were allocated to reflect the reasons given in support of the self-ratings. Quantitative analysis was undertaken to determine if there were systematic differences in the frames of reference used according to gender, age and education. **Results:** Data were obtained from 80 subjects, ranging in age from 22 to 97 years. 55% were female. 13.8% rated their oral health as excellent, 36.3% as very good, 30.0% as good, 15.0% as fair and 5.0% as poor. Sixty-two codes were needed in order to characterize the frames of reference underlying these ratings. Some rationales were simple, others complex and multi-layered. There were variations in the biophysical and behavioural characteristics invoked and whether those characteristics were present or absent. Some were based on the present and some on the past. For quantitative purposes these codes were reduced to six major groups. Current and past dental problems, treatment needs and histories were referred to by 59% and health behaviours by 51%; 25% referred to tooth loss and 16.2% to pain and other outcomes. For 6%, ratings were based on temporal or social comparisons. There were some differences by gender, age and education in the referents invoked to account for self-ratings in predictable ways. This may be because quantification of the qualitative data reduced and misrepresented its complexity. **Conclusions:** There are considerable variations in the frames of reference underlying self-ratings of oral health that are masked by the requirements of quantitative analysis.

1505 SCHOOL PERFORMANCE INDICATORS AS PROXY MEASURES OF SCHOOL DENTAL NEEDS

V. MUIRHEAD, D. LOCKER, and C. QUINONEZ, University of Toronto, Canada

Concerns about the cost-effectiveness of universal school dental screening programs have spurred the hunt for alternative approaches to identify individuals or schools at oral health risk. This pilot study assessed the feasibility of using readily available educational and social determinants as proxy measures of school-based dental treatment need. **Objective:** To test the ability of school performance indicators to predict school dental treatment needs in York Region elementary schools, Ontario, Canada. **Methods:** An ecological study using school aggregated data. Data sources included York Region Dental Health Unit dental screening data (2003-2004); area-based income data from Statistics Canada (2001) based on school address postcodes and grade three and grade six school performance results in reading, writing mathematics and English as a second language (ESL) data (2003-2004) obtained from publicly accessible educational websites. **Results:** Data were extracted for 219 elementary schools. Simple linear regression analyses showed that the percentage of children requiring urgent dental treatment was positively associated with all six school performance variables representing the percentage of grade three and six children scoring below the provincial standard in reading, writing and mathematics ($P<0.001$). Hierarchical stepwise multiple linear regression analysis showed that two school performance variables remained in the model after controlling for area-based median family income and ESL variables: the percentage of grade 6 pupils scoring below the provincial average in writing ($P<0.001$) and the percentage of grade 3 pupils scoring below the provincial average in reading ($P=0.02$). **Conclusions:** Grade three and six school performance results are good predictors of urgent school dental treatment in York Region elementary schools. Further studies need to be carried out using age corresponding data sources and data from other Ontario health regions.

CANCER

0748 ALVEOLAR RIDGE KERATOSIS: A CLINICOPATHOLOGIC STUDY

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Alveolar ridge keratosis (ARK) is a white lesion of the retromolar pad (RP) or edentulous alveolar ridge (EAR) believed to represent a response to chronic frictional trauma. ARK is not widely recognized and often is included in studies of oral leukoplakia (OL), thereby implying premalignant potential. **Objectives:** 1)To characterize the clinicopathologic features of ARK. 2)To determine whether removal of ARK from the OL category could have a significant impact on prevalence of dysplasia or carcinoma in OL. **Methods:** We conducted a retrospective study of all ARK cases submitted to our biopsy service from 1995-2004. We defined ARK as a white patch or plaque without erythema and limited to RP or EAR. **Results:** 421 ARK cases were identified, comprising 17% of all OL specimens. The mean age was 54years (range 16-87years). The male:female ratio was 1.8:1. Microscopically, ARK cases exhibited hyperkeratosis and the following features: 95.25%(n=401) without dysplasia, 2.85%(n=12) mild reactive atypia, 1.43%(n=6) mild-to-moderate dysplasia, 0.48%(n=2) severe dysplasia, 0%(n=0) carcinoma. All dysplastic cases were associated with one or more of the following: verrucous appearance, tobacco use, history of multiple OL lesions (not involving RP or EAR), previous oral carcinoma. Removing ARK from the OL group increased the percentage of OL cases exhibiting dysplasia or carcinoma from 19 to 23%. Including versus excluding ARK from OL resulted in a marked difference regarding the OL microscopic diagnostic profile (kappa=0.18). **Conclusions:** The majority of ARK cases represent benign hyperkeratoses, although prospective studies are needed to confirm a lack of premalignant potential. Certain features of the patient history and clinical examination might suggest true OL mimicking ARK and may provide guidelines regarding indications for biopsy. Excluding ARK from OL yielded a small but significant increase in the proportion of OL cases with dysplasia or carcinoma. Investigators should consider not classifying ARK as OL.

Le passé, le présent et le futur *(suite de la page 107)*

Voici les nouveaux objectifs ou « fins » qui ont été élaborés et révisés par votre conseil d'administration en mars. Ces nouveaux objectifs prendront effet en octobre.

L'ACHD existe afin que ses membres soient en mesure d'offrir des soins de santé buccodentaire préventifs et thérapeutiques de qualité à tous les Canadiens et Canadiennes.

L'interprétation extensive de cet énoncé inclut, en ordre de priorités :

1. Les membres sont liés par une identification professionnelle unique.
2. Les membres ont une forte voix nationale.
3. Les membres peuvent acquérir, maintenir, partager et utiliser un ensemble croissant de connaissances professionnelles et de possibilités de formation.
4. La valeur des membres est démontrée de façon crédible aux Canadiens et Canadiennes et comprise par eux.
5. Les membres ont des ressources pour assurer leur traitement équitable et leur bien-être en milieu de travail.
6. Les membres ont des ressources pour favoriser la réussite commerciale.

Ces changements sont en harmonie avec les réponses au sondage soumises par vous, les propriétaires de l'ACDH. Comme vous le savez tous et toutes, le tout premier objectif de l'ACHD est de créer un environnement de travail optimal pour les membres de notre profession. C'est donc dans cet esprit que je vous demande de penser aux changements que nous avons apportés à nos objectifs. J'ose espérer que vous accepterez ces changements comme une mesure positive pour appuyer chacun et chacune de vous dans votre profession, peu importe que vous choisissiez de rester dans votre milieu de travail, de devenir entrepreneur, d'offrir vos services d'hygiène dentaire à des groupes privés de leurs droits de représentation, comme les résidents d'établissements de soins de longue durée, ou de travailler avec d'autres professionnels de la santé en aidant à améliorer la santé générale de tous les Canadiens et Canadiennes.

Le conseil d'administration de l'ACHD croit que ces nouvelles « fins » aideront à créer et à rendre accessibles des possibilités illimitées pour toutes et tous les hygiénistes dentaires au Canada. C'est avec ceci en tête que je dévoile le thème de la conférence nationale de cette année : « Des possibilités sans fin… Créez les vôtres ». Je vous invite tous et toutes à assister à la 17e conférence nationale de l'ACHD qui se tiendra à Edmonton du 16 au 18 juin 2006. C'est une excellente occasion de vous joindre à vos collègues, venant de toutes les régions du Canada, pour discuter des importants enjeux auxquels est confrontée votre profession. Les membres du conseil d'administration de l'ACHD seront présents pour toute la durée de la conférence afin d'entendre et de discuter plusieurs questions importantes pour vous. J'espère vous voir à Edmonton.

On peut communiquer avec Diane à l'adresse <president@cdha.ca>.

Nouvelles façons de penser dans le monde *(suite de la page 111)*

décideurs écoutent ceux qui s'expriment avec assurance et ceux qui sont privés de leurs droits de représentations ne sont habituellement entendus qu'à la suite d'initiatives de groupes de défense d'intérêt. Le Dr Okeefe déclare qu'il faut qu'il y ait coordination au niveau mondial pour présenter de nouveaux arguments. Pour quelle raison ? Il ne le spécifie pas. Cependant, l'on pourrait comprendre que cela permettrait de maintenir le statu quo.

La parution de l'éditorial du journal est survenue à la suite des recommandations du Bureau de la concurrence de l'Irlande en faveur de la pratique indépendante de l'hygiène dentaire et coïncidait avec l'envoi de plusieurs lettres du Bureau de la concurrence du Canada appuyant la pratique indépendante de l'hygiène dentaire. (Vous pouvez accéder à ces documents sur notre site Web : www.cdha.ca/content/newsroom/reports.asp.) En réponse à une lettre du Bureau de la concurrence, George Weber, directeur général de l'Association dentaire canadienne, déclare : « Il est vrai que tous les Canadiens n'ont pas accès au soins dentaires sur une base régulière ; cependant, leurs raisons pour ne pas y accéder sont variées et complexes – incluant les influences culturelles, la situation financière, la mobilité et les barrières psychologiques. Le retrait de la participation des dentistes n'est pas une solution miracle qui augmentera l'accès aux services de santé buccodentaire. » [Traduction] Les commentaires de ces deux hommes respectés m'ont amené à choisir la citation que j'ai utilisé pour donner le ton à ce message et qui a été écrite il y a deux siècles. Y a-t-il un parallèle entre les « motifs sous-jacents » de l'antiféminisme et du racisme mentionnés plus haut et la réaction de l'ACD concernant l'avancement de la profession d'hygiéniste dentaire ?

Je n'ai jamais vu de politiques ni de déclarations qui recommandent le retrait de la participation des dentistes dans la prestation de soins de santé buccodentaire. Ce que j'ai vu, ce sont des recommandations pour le retrait des barrières qui restreignent la capacité des hygiénistes dentaires à exercer leur profession dans toute son ampleur. Il y a plusieurs types différents de collaboration et plusieurs types d'équipes. J'aimerais suggérer au Dr O'Keefe que plutôt que de dépenser de l'énergie négative à développer de nouveaux arguments de frustration concernant ce qu'il appelle des « professions nouvelles », il serait préférable de dépenser de l'énergie positive dans le développement de nouvelles approches sur la façon dont des équipes de professionnels collaborateurs peuvent travailler ensemble pour aider à améliorer la santé des Canadiens, lorsque les dentistes ne sont pas nécessairement les patrons.

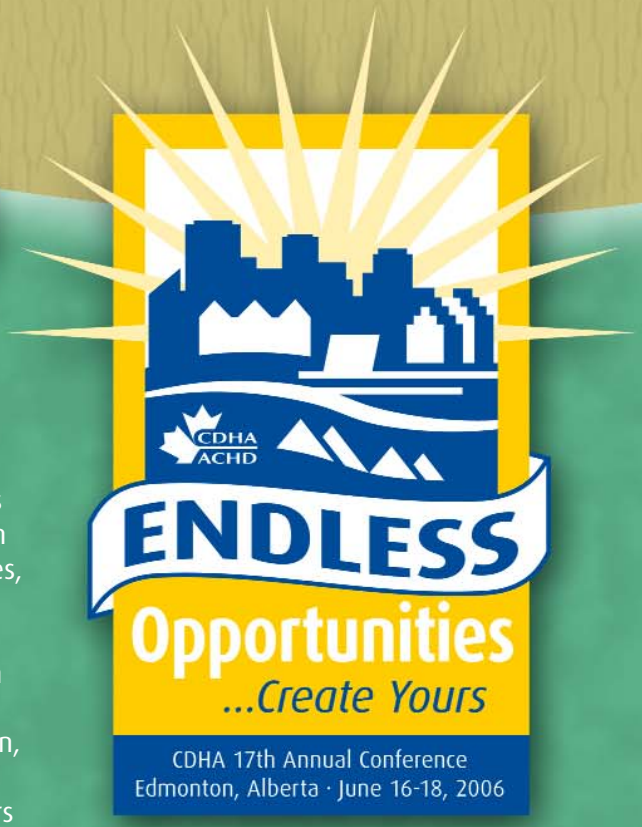
E_____n

Q. What starts with "E," ends with "N," is a place where you can learn, grow, mingle with colleagues, make new friends, and have loads of fun to boot...?

A. Edmonton

Join us in Edmonton, Alberta, June 16-18, 2006, for three value-packed days during CDHA's 17th Annual Professional Conference

There is still time to register on-line! Visit www.cdha.ca to register now!



Here's why YOU should attend:

- An exceptional continuing education opportunity that covers the latest topics, issues, and trends affecting your profession
- A chance to share your experiences, network with colleagues, and make new contacts
- An exciting exhibit hall where you can meet with industry leaders to learn about the newest innovations in oral health care products and services
- An opportunity to take a break, connect with your profession, and be inspired
- A substantial discount on conference fees for CDHA members
- Plus, we have lots of fun and some great surprises in store for you!

Win Some Fabulous Prizes, including a special grand prize package in our first-ever **Conference Trivia Contest!**

Attendees will receive a list of 10 Edmonton trivia questions in the conference delegate bags. The answers to the trivia questions have been appearing over the past months leading up to the conference in regularly scheduled broadcast e-mails to CDHA members, *Conference Connections* and in the *Canadian Journal of Dental Hygiene*. And no need to worry if you don't collect all of the answers prior to attending the conference. You will still have a chance to get the answers during the conference by visiting the exhibit hall. Ten exhibitors (we won't tell you which ones) will each have the answer to 1 of the 10 questions. If you answer all 10 questions correctly, your name will be placed in a draw for some great prizes including a special grand prize package. Here is your answer to another Edmonton trivia question:

The Muttart Conservatory with its four distinct pyramids located in Edmonton's lush river valley area features horticultural gardens with tropical, show, temperate, and arid displays.

CDHA ACHD
THE CANADIAN DENTAL HYGIENISTS ASSOCIATION
L'ASSOCIATION CANADIENNE DES HYGIÉNISTES DENTAIRES

CDHA Board – Highlights of Meeting

March 3–4, 2006, Ottawa

1. **Monitoring reports:** The board accepted the monitoring reports that reviewed CDHA policies.
2. **Review of governing policies:** The current policies were reviewed for clarity, succinctness, and duplication. GP #3 was evaluated. Governance policies (GP #8, 9, 11, 12, 13) will be reviewed at the October 2006 meeting.
3. **Information sessions:** Two presentations were made to the board at this meeting. Robert Shantz spoke on the audit process and its goals. The procedure of the audit was discussed as was the future development of the audit committee. Jeff Chapleau of MarketLink Solutions gave the second talk, presenting the results of the last five years' strategic plan, showing the changes that have occurred since he first visited CDHA. He also reviewed the CDHA processes and infrastructure. This information will be shared with CDHA members at the conference in June in Edmonton so they can see the changes that have occurred at the national office.
4. **Environmental scan:** To prepare for the review of the "ends" by the board, an environmental scan was carried out by MarketLink, which looked at a variety of documents, reports, and statistics. The company's report demonstrated the method by which ends are identified and action taken and showed the results realized in many areas.
5. **Review of "Ends":** The board discussed End E1 at great length, concentrating especially on the wording of E1, Level 1. The current two-page document was reduced to half a page. The executive director will develop a new strategic plan for CDHA with the assistance of staff.
6. **Online survey:** The executive director will arrange for the analysis of the data from this survey.
7. **Linkage with ownership:** The provincial reports were accepted and reviewed. A version of the MarketLink presentation on Ends will be presented to the members at the conference in June.
8. **National conference:** A policy was developed regarding board members' presence at the conference. The board will wear a distinctive item to identify them as board members. They will be attending the CDHA booth.
9. **Life membership award:** A recipient was identified at this meeting and the award will be presented at the conference in June.
10. **Future meetings:** Four members of the board will be finishing their term this year. The new members will attend the board meeting in October 2006.

The Health Action Lobby

The Health Action Lobby (HEAL) is a coalition of national health and consumer associations and organizations dedicated to protecting and strengthening Canada's health care system. CDHA is an active member. HEAL was formed in 1991 out of concern over the erosion of the federal government's role in supporting a national health care system and represents more than half a million providers and consumers of health care.

HEAL's mission is to protect and strengthen Canada's health care system, and health human resources have been identified as its key priority. HEAL believes that achieving a strategic, coordinated human resource plan for Canada's health workforce can be successful only if it is integrated across all provinces, territories, and the various health professions. To this end, it sponsored a multi-stakeholder health human resources summit in October 2005. The report of this summit, *Core Principles and Strategic Directions for a Pan-Canadian Health Human Resource Plan,* has just been released. It contains a list of core principles and strategic directions and can be accessed at www.physiotherapy.ca/HEAL/english/index.htm.

Dental Hygiene Educator's Canada (DHEC/EHDC)

DHEC/EHDC is in its sixth year as the national organization for Canadian dental hygiene educators. We have been a completely volunteer group since the inception but are exploring the opportunity to affiliate with CDHA so that some administrative responsibilities (e.g., example: membership, financial tracking, and meeting planning) can be supported by contract.

Dental hygiene education is one of the foundations of our profession. The objectives for DHEC/EHDC are to

- foster excellence in teaching and learning;
- promote evidence-based dental hygiene education;
- facilitate the exchange of information and expertise to develop dental hygiene education in Canada;
- promote inter-professional alliances with national and international education and health organizations.

Dental hygiene education is facing many challenges. Some of these challenges include establishing baccalaureate education; strengthening accreditation standards and processes; updating diploma and implementing baccalaureate learning outcomes for dental hygiene education; and improving research capacity. In order to address these challenges, dental hygiene educators require a common forum such as with DHEC/EHDC where educators can come together to plan and develop the future of dental hygiene education.

In April 2005, the Board planned for the future of the organization in a strategic planning meeting held in Edmonton, Alberta. The Board reviewed DHEC/EHDC's purpose; completed an assessment of external challenges and opportunities; and considered the organization's strengths and weaknesses. The outcomes from the workshop included amendments to the DHEC/EHDC objects, clarification of the administrative structure and process and identification of a number of priorities, which the Board continues to work toward. Some of these projects include:

- developing continuing education standards;
- developing a research agenda for DH education;
- promoting inter-professional education in the DH curriculum;
- developing admissions guidelines for selecting socially conscious and diverse candidates;
- developing Residencies in Dental Hygiene;
- preparing a DHEC calendar for members; and
- establishing an Endowment Fund.

In February, a member survey was completed and the results will be considered in the annual planning session in June. Another annual activity is the Educators' Workshop, preceding the annual CDHA conference. On June 15, 2006, the annual workshop in Edmonton will focus on using rubrics to assess student learning.

DHEC/EHDC is a growing, developing organization and if you are not a member, we encourage you to join. Individual memberships support the activities of the association and give the member the privilege of an individual vote. Please check the website (www.dhec.ca) for more information. We, the Board members, look forward to meeting you.

MDHA Celebrates the Passage of the *Dental Hygienists Act*

Celebration night at the Manitoba Dental Hygienists Association for the passage of the *Dental Hygienists Act* in December 2005.

(L to R) Natasha Kravtsov, Mickey Emmons Wener, Signe Jewett, Laura MacDonald, Salme Lavigne, Carol-Ann Yakiwchuk, Joanna Asadoorian, Gayle Halas, and Harriet Rosenbaum

Grey Literature

by CDHA staff

GREY LITERATURE IS DEFINED AS "THAT WHICH IS PRODUCED on all levels of government, academics, business and industry in print and electronic formats, but which is not controlled by commercial publishers."[1]

This category of material lies between the "white" or published material and indexed works such as journals and texts, and the ephemeral or short-lived materials such as flyers and timetables. Grey literature is characterized by non-standard formats, limited quantities, and the difficulty involved in identifying and accessing it.

Searching and locating grey literature is often thought of as finding the proverbial needle in the haystack. As this literature is not published commercially, there is limited availability and indexing. According to one study,[2] lack of cataloguing and "visibility" were the two major reasons why grey literature is not used as much as it should be.

But things may be improving slowly. There are frequent references to grey literature in scholarly journals and more and more organizations are providing online access to their publications. We will look at a number of these sites and the search tools that will help you understand and obtain grey literature. You may think you are in the "Probing the Net" section but online access to this literature is one of the most efficient ways to locate it.

University of Calgary Library: HSL – Grey literature. This site provides an extensive listing of sources for grey literature, both Canadian and international. Databases and registries is included, along with some "tips&tricks"for using a Google search on the internet. *http://library.ucalgary.ca/branches/hsl-greyliterature/index.php*

University of British Columbia Library. This site provides "uniquely Canadian" subject resources for accessing grey literature. There is an extensive index of Canadian private and government agencies, covering a broad range of topics. A link, "Searching for health statistics and related publications," could be particularly rewarding. *http://toby.library.ubc.ca/subjects/subjpage2.cfm?id=879*

Canadian Health Services Research Foundation. This site lists national and provincial agencies involved in health research and provides information for both researchers and policy makers. *www.chsrf.ca/other_documents/newsletter/qnv1n4p4_e.php*

Canadian Evaluation Society. This society maintains a database of unpublished reports and papers. *www.evaluationcanada.ca/site.cgi?s=6&ss=8&_lang=a n*

Role of Grey Literature in the Sciences. This site explores the impact of grey literature on scientific endeavours, looking at how they can provide research summaries, statistics, and other data that contribute to a more comprehensive view of a topic. *http://library.brooklyn.cuny.edu/access/greyliter.htm*

GrayLIT Network. This U.S. site provides information on technical reports that are generated through government-funded research and development projects. It allows users to retrieve information without knowing the funding agency. *http://graylit.osti.gov/*

NY Academy of Medicine: Grey Literature Page. This site focuses on grey literature resources from the medical field, and includes an extensive listing of agencies that produce health-related materials. The site also features a quarterly "Grey Literature Report" that is available by subscription. *www.nyam.org/library/grey.shtml*

EDUCATION-LINE. This site, run by the Brotherton Library in England, provides full-text access to reports, working papers, and conference proceedings that support educational research, policy and practice. Users may browse by thesaurus subject terms or via indexed author/title fields. *www.leeds.ac.uk/educol/*

Grey Net Listserv. This is an internationally moderated list that seeks to facilitate communication between organizations involved in the field of grey literature. It also provides an extensive listing of resources by category. *www.greynet.org*

Other ways to access grey literature include checking bibliographies and reference lists, hand-searching relevant journals, and personal contact with researchers. Try consulting websites of organizations involved in your area of interest and keep list of "Favorites" where you have found grey literature.

Grey literature is a type of informal communication. A formal publication may follow later but in many cases, these papers are never made available to the public. Nevertheless, grey publications may contain comprehensive, concrete, and up-to-date information on research. Grey literature can also help individuals in making decisions about their lives and communities via reports and documents issued by governments and international agencies. In today's electronic environment, grey literature will continue to grow in importance as an information resource.

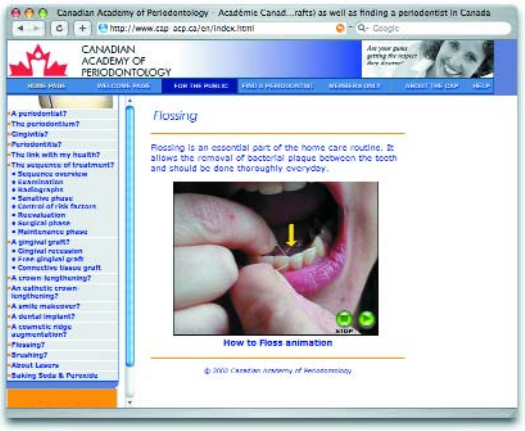
1. New frontiers in grey literature. Proceedings of the Fourth International Conference on Grey Literature: GL'99; 1999 Oct 4-5; Washington, DC. Washington (DC): GreyNet; 1999.
2. Ranger SL. Grey literature in special libraries: access in use. Publ Res Quarterly. 2005;21(1):53-63.

Sites for Clients + Second-hand Smoke

by CDHA Staff

THIS MONTH STARTS WITH TWO SITES THAT WILL BE OF interest to your clients. The first by the Canadian Academy of Periodontology would be valuable for clients to look at on their home computers while the second is the Vancouver Coastal Health's publication on flossing and brushing. The focus then shifts to second-hand smoke with numerous sites that will give you the information to persuade and encourage your clients to stop smoking. Making clients understand the extent of the harm smoking causes to children could be a powerful tool in the tobacco cessation program.

Questions & Answers for the Public (Canadian Academy of Periodontology)
www.cap-acp.ca/en/index.html – Click on "For the Public"
This section of the CAP website has a list of different terms and conditions such as gingivitis, periodontitis, tooth and gum anatomy, flossing, brushing, implants, periodontal pocket measurement, etc. on the left side of the screen. These short and easy-to-read clear explanations—with animation—could be helpful for clients who find it difficult to visualize these diseases and the correct techniques for flossing and brushing. The graphics of various conditions could certainly motivate a person to improve his or her oral hygiene regimen! An attractive and informative site to recommend to your clients.



Flossing and Brushing – Brochure (Vancouver Coastal Health)
www.vch.ca/dentalhealth/docs/HED.700.pdf
This brochure was produced by the Dental Health Services section (www.vch.ca/dentalhealth/) of Vancouver Coastal Health, a very large health authority that serves much of the lower B.C. mainland. The brochure is well-written, clear, easy to understand, and has excellent graphics. It can be ordered online from Vancouver Coastal Health at **http://vch.eduhealth.ca/**.

Second-hand Smoke – Canadian Cancer Society
www.cancer.ca/ccs/internet/standard/0,3182,3172_13127__langId-en,00.html
The Canadian Cancer Society's site has many pages on tobacco. This one on second-hand smoke deals with such topics as "Second-hand smoke is dangerous," "Health risks of second-hand smoke," "Who is at risk?" and "The costs of second-hand smoke." The printer-friendly version of the page can be printed and can provide a good starting point in a tobacco cessation scheme. Other sections of the "tobacco" area of the website are "Smoking," "Quit Smoking," "Smokers' Helplines," and "Canadian Stats."

Health Effects of Exposure to Secondhand Smoke (Indoor Air – Smoke-free Homes Program of the U.S. Environmental Protection Agency)
www.epa.gov/smokefree/healtheffects.html
This site provides information about second-hand smoke, the serious health risks to children (and to children with asthma), and a very good listing of the "science behind the risks" with key findings for two major studies by the EPA and links for all papers to either the full report or summaries.

Medline Plus: Secondhand Smoke
www.nlm.nih.gov/medlineplus/secondhandsmoke.html
This portal site contains valuable links: Latest News, From the NIH, Overviews, Specific Conditions, Related Issues, Newsletters/Print Publications, Organizations, Law and Policy, Statistics, Children, Women. Here you can access facts, fact sheets, and articles on a wide variety of topics—children and second-hand smoke; effects of second-hand smoke on pregnant women; second-hand smoke's impact on health, respiratory system, asthma, cancer, diabetes.

Cigarette Smoke & Kids' Health (Physicians for a Smoke-Free Canada)
www.smoke-free.ca/Second-Hand-Smoke/health_kids.htm
This site will provide much ammunition in your tobacco cessation efforts with your clients. It provides facts in clearly written prose about how second-hand smoke affects children (for example, how many of your clients know that it can cause ear infections?). The site deals not only with children but with many other aspects of smoking: research, health information, fact sheets, publications, information about the tobacco industry.

Second-hand Smoke (Health Canada)
www.hc-sc.gc.ca/hl-vs/tobac-tabac/second/index_e.html
A good portal site for facts and links to organizations, media campaigns, tobacco use surveys.

Secondhand Smoke (Mayo Clinic)
www.mayoclinic.com/health/secondhand-smoke/CC00023
This reputable site provides a good discussion of the dangers associated with second-hand smoke with links to various articles such as "Stop Smoking: Strategies to Help You Quit," "Teens and Smoking: What Parents Can Do," and to other Mayo Clinic sites on ear infections and childhood asthma.

CLASSIFIED ADVERTISING

CDHA and *CJDH* take no responsibility for ads or their compliance with any federal or provincial/territorial legislation.

BRITISH COLUMBIA

BURNABY Dental hygienist required. Periodontist office in North Burnaby requires part-time dental hygienist. The office is conveniently located near SkyTrain station and has convenient underground parking. If you are interested, please contact our office. Telephone: **604-733-4867** or fax résumé to **604-294-9707**.

BURNABY Full-time dental hygienist for a progressive Burnaby office that performs comprehensive dentistry and has an established perio program. Excellent benefit package and great support of staff. Please fax résumé to **604-524-4986**. Qualifications: completion of Certified Dental Hygienist program.

DUNCAN DENTAL HYGIENISTS WANTED! Wonderful patients, staff, and office would like a second dental hygienist to work with our team. Hours and days are flexible. Full time is available. Alderlea Dental Health Centre is located in Duncan on beautiful Vancouver Island, midway between Victoria and Nanaimo. We think this is a marvelous area in which to work and live. Please contact us at **raedae@shaw.ca** or fax your résumé to **250-748-9868**. Office telephone: **250-748-1842**; evenings: **250-748-2086** or **250-715-1837**.

INVERMERE Are you fun, energetic and love working with people? Enjoy being part of a great team in an easy-going, stress-free setting? This dental office in Invermere may be for you. No weekends! Flexible time off and best of all, live an active outdoors lifestyle. New grads welcome. To inquire, e-mail us at: **rskanan@telus.net** or call Dalphine at **250-342-3811**.

PITT MEADOWS RDH needed to join our busy hygiene team. Enjoy a friendly work atmosphere with input/contol over your patient scheduling needs. Please contact Dr. Michael A. Chow Inc., 111–19150 Lougheed Hwy, Pitt Meadows, BC V3Y 2H6. Tel: **604-465-8011**; fax: **604-465-8078**; e-mail: **macinc@telus.net**.

SURREY Busy family practice with the staff and employers working as a friendly team. We would like another friendly member to join us. Looking for a caring, gentle, patient-oriented dental hygienist who would be a team player. Permanent position; could work out P/T or F/T. Fax: **604-542-0127**; telephone: **604-597-8808**.

VERNON Foster Dental Clinic – Brand new state-of-the-art office in Vernon, BC, requires a full-time dental hygienist. Our fully computerized operatories are equipped with digital x-rays, Cerec 3D, unltrasonics, and TVs. We provide high-quality family and cosmetic dentistry in a caring and professional environment. Salary and scheduling are flexible. Please contact Krista or Shawn at the office at **250-542-1404** or at **sbfl14@telus.net**. We look forward to hearing from you.

VICTORIA Full-time dental hygienist position available to join our busy, bilingual, multi-cultural family practice. Our periodontal program is designed for continued motivation of the patient. The dental hygienist works closely with the dentist to evaluate which patients will require surgical intervention, most of which are performed in the office. Please contact Dr. Adrian Luckhurst at fax: **250-386-3064**; tel: **250-386-3044**; e-mail: **crluck2@shaw.ca**.

ALBERTA

HINTON Established family practice requires a full-time dental hygienist. Clinic offers general dentistry, implants, and esthetics as well as orthodontic and denturist clinics. State-of-the-art equipment and technology. Excellent dental hygiene re-care program. Six operatories; a well-established, friendly, professional dental team of two dentists and a part-time dental hygienist. Office hours: Mon to Wed, 8–5; Thurs, 10–7 (8–5 in summer); Fri, 8–3. A small town, Hinton is in the foothills of the Rockies just 15 minutes from Jasper National Park and 2-1/2 hours from Edmonton. Many opportunities for outdoor recreation. Please submit your résumé to: AuCoin Dental Practice, Cheryl Frantz, 123 Jasper ST, Hinton, AB T7V 2A8. Telephone: **780-865-7673**; fax: **780-865-4866**; e-mail: **cherylfra@shawbiz.ca**.

ONTARIO

ETOBICOKE Part-time hygienist needed with good communication skills and professionalism. Some evenings and Saturdays. Minimum 1 or 2 years' experience required. South Etobicoke area. Please fax your résumé to **416-255-6373**.

TORONTO Instructors required to teach in theory and practice courses. Candidates must demonstrate commitment to teaching, learning, and student success. Send résumé with cover letter by e-mail to **dental@cbstraining.ca** or by fax to **416-925-9220**. Qualifications: Registered Dental Hygienist with two years of recent clinical experience. Please contact Paul Sharma, Canadian Business College, 2 Bloor Street West, 22nd Floor, Toronto, ON M4W 3E2. Tel: **416-925-9929**.

PRINCE EDWARD ISLAND

CHARLOTTETOWN Two dental hygienist positions starting September 2006. Duties includes: planning, coordinating and providing preventive and oral health promotion services in extensive oral health programs, using a team approach. Good salary, excellent benefits, 3 weeks' paid vacation, pension plan, life and accident insurance, medical/dental plan, etc. Must be pleasant, a self-starter, and able to be licensed to practise dental hygiene in P.E.I. For more information, visit our website at **www.peidental.ca**, PEI government website at **www.gov.pe.ca/jobs**, or contact Dr. Barry Maze at **902-368-4915** or **dbmaze@ihis.org**.

SUMMERSIDE A great working environment, a beautiful place to live, and the perfect opportunity for you. Work and play surrounded by water on the Island. A recently expanded general practice now requires another dental hygienist. Permanent position, 28 hours/four days a week, no evenings or weekends (potentially more hours if desired). Competitive salary, cont ed, uniform, license fee allowances, three weeks' paid vacation, and a signing bonus. If you are fun-loving and team-oriented, please contact us at **902-436-4444** (work); **902-887-3258** (home); **902-436-1365** (fax); or by e-mail, **scott.mollins@pei.sympatico.ca**.

AGENCIES

JOBTRAK CLASSIFIEDS Dental hygienists required immediately. Several locations are available at this time. To submit a résumé and application form, please visit our website at **www.jobtrak.ca**.

CDHA CLASSIFIED ADS

Classified job ads appear primarily on the CDHA's website (www.cdha.ca) in the Career Centre (*Members' Only* section). On-line advertisers may also have their ad (maximum of 70 words) listed in the journal *CJDH* for an additional $50. If an advertiser wishes to advertise only in the print journal, the cost will be the same as an on-line ad. These classified ads reach over 11,000 CDHA members across Canada, ensuring that your message gets to the target audience promptly. Contact CDHA at **info@cdha.ca** or **613-224-5515** for more information.

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