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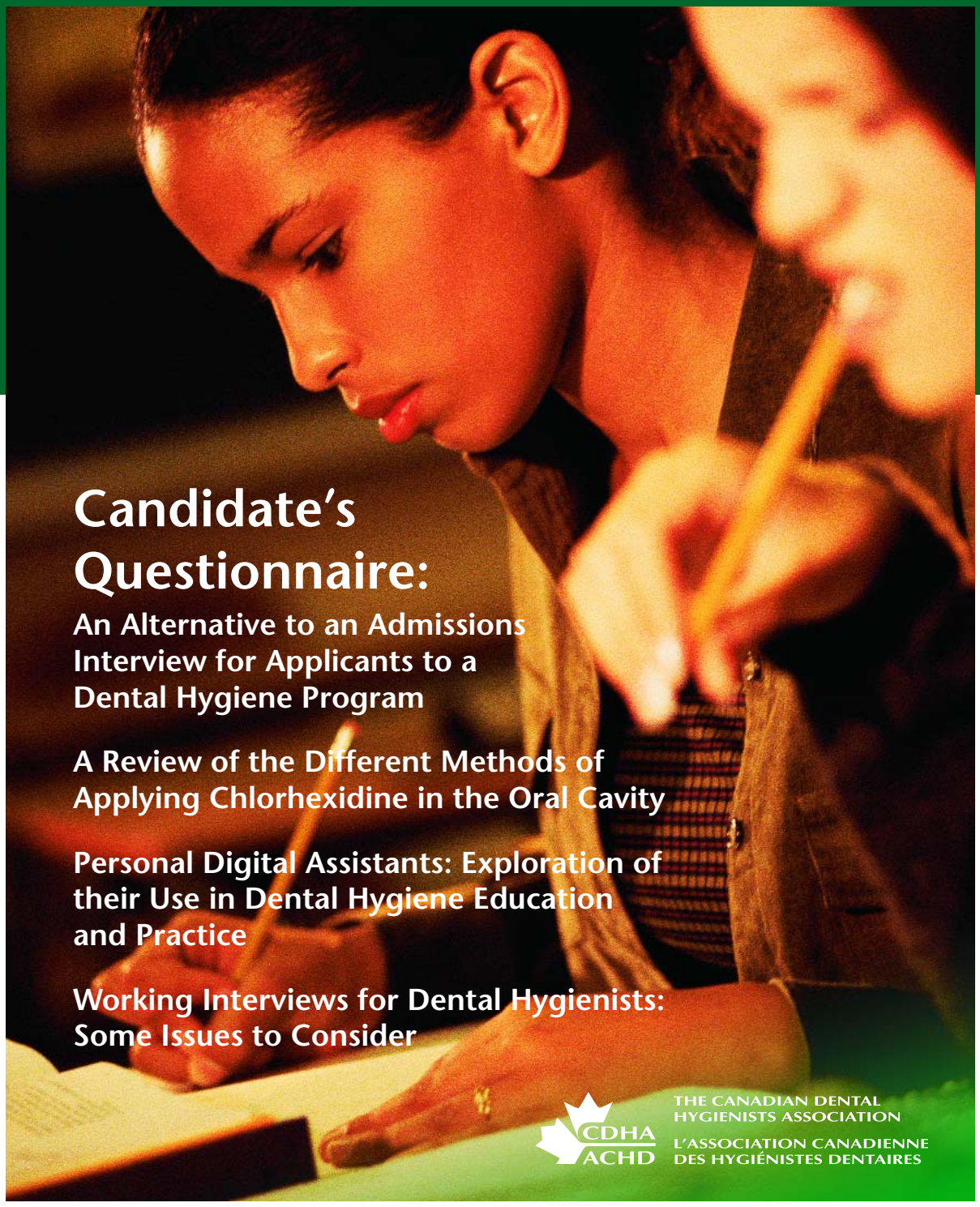

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THE CANADIAN DENTAL HYGIENISTS ASSOCIATION
L'ASSOCIATION CANADIENNE DES HYGIÉNISTES DENTAIRES

THE OFFICIAL JOURNAL OF THE CANADIAN DENTAL HYGIENISTS ASSOCIATION

Working Together

by Diane Thériault, RDH

LAST JULY WHILE READING THE *NATIONAL Post*, I came across an article, "Fat Nation," that opened my eyes to the alarming increase in the level of obesity throughout Canada. More importantly, it renewed my interest and desire to work with other health professionals to help prevent chronic diseases.

As you all know, obesity is a contributing factor in an increase in cardiovascular diseases, type 2 diabetes, hypertension, stroke, to name just a few. Furthermore, our research linking oral health to systemic diseases such as cardiovascular disease, diabetes, etc. leads us to believe that we will undoubtedly see an increase in oral health diseases. This is troubling news, given that the aging Canadian population and the increasing level of obesity throughout our nation will add a considerable strain to our health system. And our health system cannot currently provide adequate access to oral health and medical treatment for our citizens. Therefore, it is crucial that we employ various approaches to improve the oral health and total wellness of our patients.

Dental hygienists have been working with other health professionals in multidisciplinary team efforts.

I strongly believe that an interdisciplinary approach focusing on prevention is the best and logical course of action. Our profession is well versed in the subject of chronic diseases and many dental hygienists have been working with other health professionals in multidisciplinary team efforts to promote illness prevention among the general public. They are attempting to meet one of CDHA's goals: to foster awareness among Canadians of the relationship between oral health and total wellness.

John Wicker once said, "Opportunities multiply as they are seized; they die when neglected. Life is a long line of opportunities." We must continue to promote the prevention aspect of our profession to increase its image in the eyes of the public, other health professions, as well as various levels of government. CDHA certainly has been working hard to elevate the profession's profile with these groups and I believe that dental hygienists' current direct participation in fostering awareness of the relationship between oral health and total wellness demonstrates how

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Travailler ensemble

par Diane Thériault, RDH

EN JUILLET DERNIER, EN LISANT LE *NATIONAL Post,* je suis tombée sur un article intitulé « Fat Nation », qui m'a ouvert les yeux sur l'accroissement alarmant de l'obésité au Canada. Fait plus important, cet article a renouvelé mon intérêt à travailler avec d'autres professionnels de la santé et mon désir de le faire pour contribuer à prévenir les maladies chroniques.

Comme vous le savez tous, l'obésité est un facteur qui contribue à l'augmentation des maladies cardiovasculaires, du diabète de type 2, de l'hypertension et des accidents vasculaires cérébraux, pour ne nommer que quelques problèmes de santé. De plus, nos recherches établissant un rapport entre la santé buccodentaire et des maladies systémiques telles que les maladies cardiovasculaires et le diabète nous amènent à croire que nous assisterons sans aucun doute à un accroissement des maladies liées à la santé buccodentaire. Il s'agit là d'une nouvelle troublante, étant donné que le vieillissement de la population canadienne et l'augmentation de l'obésité dans tout le pays ajouteront une pression considérable sur notre système de santé. Or celui-ci n'est pas actuellement en mesure de fournir un accès adéquat à la santé buccodentaire et au traitement médical de nos concitoyens. Par conséquent, il est crucial que nous utilisions diverses façons de procéder pour améliorer la santé buccodentaire et le bien-être total de nos patients.

Hygiénistes dentaires ont en effet travaillé avec d'autres professionnels de la santé au sein d'équipes multidisciplinaires.

Je crois fermement qu'une approche interdisciplinaire centrée sur la prévention constitue la meilleure ligne de conduite, la solution logique. Notre profession s'y connaît bien dans le domaine des maladies chroniques. Beaucoup d'hygiénistes dentaires ont en effet travaillé avec d'autres professionnels de la santé au sein d'équipes multidisciplinaires qui cherchent à promouvoir la prévention de la maladie parmi la population en général. Ces hygiénistes tentent d'atteindre l'un des buts de l'ACHD, soit d'encourager la population canadienne à prendre conscience des relations entre la santé buccodentaire et le bien-être total.

Travailler ensemble *…suite page 87*

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by Susan Ziebarth, BSc, MHA, CHE

"Change the way you look at things and the things you look at will change."

– Wayne Dyer

I RECENTLY RECEIVED AN E-MAIL VOICING A CONCERN about the future of dental hygiene due to the increasing number of private educational programs offering dental hygiene education. This uncommon concern, expressed by practising dental hygienists and educators alike, usually involves three issues: (1) admission requirements are not stringent enough; (2) schools will not want their graduates to fail because they will not attract new students and therefore their standards will be lower; and (3) the employment market will be flooded with dental hygienists, resulting in a shortage of work and lower salaries. CDHA and provincial associations are being challenged by some members to protect the needs of existing members

If we choose to see the changes as negative and scary, we will see negative and scary things.

and stop the proliferation of additional educational programs. Some people suggest that we as an association will benefit from increasing the numbers of dental hygienists and therefore this biases our protection of existing members. While the adage "strength in numbers" is very true in associations, I would like to offer the following thoughts to perhaps broaden consideration of this sensitive issue.

The free market dictates the fate of for-profit education. But philosophically speaking should CDHA adopt a position against private schools? What does this changing face of dental hygiene education mean for the culture of dental hygiene? CDHA stands behind its recommendation in 2000 that supported baccalaureate education for dental hygienists and encourages articulation agreements with degree-granting institutions. We applaud the efforts of many dental hygiene educators who have worked tirelessly in developing options for accessible degree completion. That said, is there any reason why private institutions could not work with degree-granting institutions? Is maintaining a quality education standard of paramount impor-

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La transformation de l'enseignement

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

« Changez votre façon de voir les choses, et les choses que vous voyez vont changer. »

– Wayne Dyer

J'AI REÇU DERNIÈREMENT UN COURRIEL D'UNE PERSONNE qui disait s'inquiéter de l'avenir de l'hygiène dentaire compte tenu du nombre grandissant de programmes d'enseignement privé offrant une formation en hygiène dentaire. Cette préoccupation, maintes fois exprimée par des hygiénistes dentaires et des enseignants, englobe habituellement trois aspects : 1) les exigences d'admission de ces écoles ne sont pas suffisamment rigoureuses; 2) ces écoles ne voudront pas que leurs finissants échouent de crainte d'avoir de la difficulté à attirer de nouvelles recrues, ce qui les incitera à abaisser leurs normes de qualité; et 3) le marché du travail sera inondé d'hygiénistes dentaires, ce qui entraînera une pénurie de travail et une baisse des salaires. L'Association canadienne des hygiénistes dentaires (ACHD) et les associations provinciales sont pressées par certains de leurs membres de protéger les besoins des membres existants et de freiner la prolifération des programmes d'enseignement supplémentaires. D'aucuns sont d'avis que notre association tirera avantage d'une augmentation du nombre d'hygiénistes dentaires, ce qui risque de nous faire dévier

Si nous considérons que les changements sont négatifs et menaçants, nous y trouverons des aspects négatifs et menaçants.

de notre mission de protéger les membres actuels. La « force du nombre » est certes une réalité incontournable dans les associations, mais j'aimerais vous soumettre quelques réflexions susceptibles d'élargir le débat sur cette question délicate.

L'avenir de l'enseignement à but lucratif repose sur l'existence d'un marché libre. Mais d'un point de vue philosophique, l'ACHD devrait-elle s'opposer aux écoles privées? Quel sera l'effet de cette transformation de l'enseignement de l'hygiène dentaire sur la culture du milieu? L'ACHD maintient sa recommandation de 2000,

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Candidate's Questionnaire: An Alternative to an Admissions Interview for Applicants to a Dental Hygiene Program

by Terry L. Mitchell, BSc, DDH, MEd, CGN; D. Wayne Dunham, MA;** and H. Joseph Murphy, EdD†*

ABSTRACT

Admissions committees are challenged to select the best applicants from a pool of qualified candidates. Requirements for admission to a Canadian dental hygiene program have included required university subjects average (RSA), average of the last five credits taken at a university level, a structured interview, and a candidate's questionnaire. In 1996, the School of Dental Hygiene at Dalhousie University made a decision to use a candidate's questionnaire (CQ), designed to assess the applicant's knowledge of the program and the profession, instead of an interview because the latter was labour intensive and logistically difficult. To investigate how applicants with low academic prerequisites and high CQ scores performed in the program, the questionnaire scores were collected and compared with performance as indicated by overall grade point average (GPA) at the end of the first year in the program. In their first year, among students with high RSA, those with medium or high CQ perform significantly better than those with low CQ ($p<0.01$). Among students with low RSA ($\leq 72.5\%$), those with high or low CQ perform significantly better than those with medium CQ ($p<0.01$, $p<0.05$).

These results suggest that prior knowledge of the profession and the program influences students' performance levels in the first year of the program. Students who have a better understanding of the profession and the program for which they are applying overcome any disadvantage presented by low academic ability, as suggested by a low RSA. This study suggests that a candidate's questionnaire may be a reasonable tool to use when deciding which applicants with low academic requirements to admit to the program.

BACKGROUND

ADMISSIONS PROCEDURES ARE DESIGNED TO SELECT from a pool of candidates those who are thought to be best suited for the educational program and profession. Primarily, admissions committees review the applicants' prior academic performance.[1,2,3] University-based professional programs such as dentistry, occupational therapy, nursing, medicine, and physiotherapy have also identified characteristics such as communication skills, ethical sensitivity, decision-making skills, and problem-solving ability as important attributes.[1,2,4-8] Until 1996, at the School of Dental Hygiene, Dalhousie University, applicants were selected by considering scores derived from prior university academic performance and a structured interview. Many health professional programs are attempting to broaden the scope of admissions criteria and are investigating alternatives to prior academic performance and an interview. Pereira describes the evolution of admissions criteria for selecting applicants to the problem-based learning (PBL) dental program at University of Southern California.[4] She notes that high academic achievement worked against the success of applicants in the PBL program and that the traditional admissions criteria did not identify candidates with strong interpersonal, communication or decision-making skills, the ability to integrate information, or independent learning skills—all attributes that contribute to a successful problem-based learner. Hoad-Reddick and MacFarlane suggest that suitable candidates for a PBL dental program possess a number of positive attributes such as dexterity, empathy, and communication skills that are not assessed using academic performance or a structured interview.[5] A study conducted by Cunnington and Norman indicates that MCAT (Medical College Admissions Test) scores and GPAs (grade point averages) bear no relationship to clerkship performance and are "insensitive to the kinds of qualities and skills necessary for being a competent and perhaps compassionate physician."[6] Isenburg and Heater provide a list of admissions criteria for entry-level applicants to a master's degree in occupational therapy that includes a high score on a written essay as an effective indicator of the applicant's potential for successfully completing the program.[7] Wilson describes the process for graduate student selection for a master's in nursing program at the University of Missouri-Kansas City. There, the admissions criteria no longer include an interview but require two written essays, one describing the applicant's career development over the past 10 years and the other describing involvement in professional organizations, attendance at conferences, and volunteer efforts.[8] Although the specific tool differs, the consistent trend for admissions committees considering

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RÉSUMÉ

Les comités d'admission ont une difficulté à surmonter : celle de choisir les meilleurs parmi un groupe de candidats qualifiés. Auparavant, pour admettre une personne dans un programme d'hygiène dentaire au Canada, on se basait sur la moyenne requise dans les matières universitaires (MRMU), la moyenne des cinq derniers crédits de niveau universitaire, une entrevue structurée et un questionnaire administré aux candidats. Pour évaluer la connaissance que les postulants pouvaient avoir du programme et de la profession, l'École d'hygiène dentaire de l'Université Dalhousie a pris la décision, en 1996, de soumettre les candidats à une épreuve écrite – un questionnaire – plutôt qu'à une entrevue, parce que cette dernière exigeait beaucoup de main-d'œuvre et posait des difficultés d'ordre logistique. Pour chercher à savoir comment les postulants ayant obtenu de faibles résultats dans leurs cours préalables mais un pointage élevé à l'épreuve écrite s'en sont tirés dans leur programme, nous avons compilé les résultats à l'épreuve écrite pour les comparer au rendement indiqué par la moyenne pondérée cumulative globale obtenue à la fin de la première année du programme. Au cours de leur première année, parmi les étudiants ayant une MRMU élevée, ceux et celles qui avaient eu des résultats moyens ou élevés à l'épreuve écrite ont obtenu des rendements sensiblement meilleurs que ceux et celles qui avaient obtenu de faibles notes à l'épreuve écrite ($p<0,01$). Et parmi les étudiants ayant obtenu une faible MRMU (#72,5 %), ceux et celles qui avaient obtenu des résultats élevés ou faibles à l'épreuve écrite ont eu un rendement sensiblement meilleur que ceux et celles qui avaient un résultat moyen à l'épreuve écrite ($p<0,01$, $p<0,05$).

Ces résultats donnent à penser que la connaissance préalable de la profession et du programme influe sur le niveau de rendement des étudiants au cours de la première année du programme. Les étudiants qui ont une bonne compréhension de la profession et du programme surmontent tout désavantage causé par de faibles aptitudes aux études, comme porte à le croire une MRMU peu élevée. L'épreuve écrite semble être un outil satisfaisant qui aide à choisir les postulants à admettre malgré leur faible MRMU et semble constituer aussi une solution de rechange viable à l'entrevue structurée.

The consistent trend for admissions committees appears to be the investigation of admissions criteria that will highlight those attributes, other than academic performance, deemed to be positive characteristics for the student and graduate of the program.

applicants to health profession programs appears to be the investigation of admissions criteria that will highlight those attributes, other than academic performance, deemed to be positive characteristics for the student and graduate of the program.

The purpose of this paper is to describe the development and implementation of the candidate's questionnaire and to explore relationships between CQ scores and performance as indicated by overall grade point averages at the end of the first year of a two-year university-based dental hygiene program. The pass/fail curriculum design in the second year of the program limits the ability to compare admissions criteria to performance at the end of the program. As the candidate's questionnaire score can influence whether or not a candidate with low academic requirements is accepted, the investigators were most interested in the performance of successful candidates with high CQ scores and low required subjects average (RSA).

DEVELOPMENT AND IMPLEMENTATION OF A CANDIDATE'S QUESTIONNAIRE

Traditionally at Dalhousie University's School of Dental Hygiene, a structured interview and prior academic performance were used to select candidates. The structured interview was developed by the Canadian Dental Association and modified for use with dental hygiene applicants. It was intended to explore the applicant's knowledge of the program and of the profession as well as their values. Approximately 80 of the most competitive candidates were invited to a 45-minute interview conducted by teams of two to three persons composed of dental hygiene faculty and senior dental hygiene students. Since the School has only five full-time faculty members, including the Director, it was difficult to staff the interviews and interviewers found the task to be very labour intensive and time consuming.

Other health professions at Dalhousie University including occupational therapy, physiotherapy, and nursing employ a scored questionnaire as a component of their admissions processes. Applicants are typically asked questions designed to explore their knowledge of the profession to which they are applying. In 1996, the Dental Hygiene faculty chose to develop such a "candidate's questionnaire." This was developed from the questions used by the Canadian Dental Association's structured interview form as adapted for the School of Dental Hygiene and from a questionnaire used by the Schools of Physiotherapy and Occupational Therapy at Dalhousie University. It consists of five questions that faculty consider explore the applicant's knowledge of the program and of the profession as well as the applicant's values and beliefs (see table 1).

1a. What do you know about the **profession** of dental hygiene, and why did you choose to apply?

1b. What are some of the **concerns** or **challenges** you have about **working** as a dental hygienist?

2. Imagine that you are a **graduate dental hygienist**. What do you feel your patient has a right to expect from the dental hygiene care that you provide?

3. What characteristics and behaviors can be expected of you as a **student** in a professional program?

4. Describe how your work activities, volunteer work, community service, and hobbies have **prepared you** for a **career in dental hygiene**.

5. The following is a hypothetical question. Read carefully. There is no right or wrong answer.

   Suppose you are in a lab course and a close friend is your lab partner. You know that your friend is having serious personal problems and as a result is having trouble in university. Your friend has not done any lab work and you have completed the required work. What would you do if your friend asks to copy your assignments? Explain your reasoning.

Table 1. The candidate's questionnaire

The essay-style responses are scored, according to the quality of the answer, into one of three categories:

A: above average, awarded 5 points

B: average, awarded 3 points

C: below average, awarded 1 point

A total score for all five questions is calculated, and used in the admissions procedure.

All full- and part-time faculty of the School of Dental Hygiene were asked to provide the answers they would expect from the applicants and these answers were used to develop a scoring key.

Candidate's responses were scored by the five full-time faculty, each scoring the same question on all papers. This scoring method means that the faculty must be calibrated only with themselves, rather than with their colleagues, as would be required if many faculty members were scoring the same question. For the initial use of the questionnaire, each faculty member self-calibrated by reading samples of answers to evaluate the overall quality of the responses before deciding the standard for each category of A, B, or C. In subsequent years, faculty has scored the same question.

With the addition of the CQ score to the admissions criteria, the rank order of applicants changes from that obtained by using academic components alone. Those applicants with high academic requirements are not substantially impacted by this shift. However, applicants with low academic requirements (and therefore closer to the cut-off point for applicants to be admitted) are the most affected by the CQ score. When the academic qualifications are very similar, a high CQ score may shift the applicant's rank into the range of accepted positions.

METHOD

In compliance with department policy, confidential files such as admissions information and academic performance records were drawn from secure (locked) file cabinets and stored in the Dean's Office, Faculty of Dentistry, Dalhousie University, during the data extraction phase of the study. The data collected for this study included applicants' required subjects average (RSA), the candidate's questionnaire scores (CQ) obtained from admissions information, and the corresponding grade point average (GPA) at the end of the first year of the program from academic records of applicants admitted between 1996 and 2002. All data were coded and processed blind so that no individual in the study could be identified individually. Every effort was taken to guarantee the confidentiality of the student records reviewed. The scope of the study is limited to those applicants who were offered and accepted a position in the program and completed at least the first year of study. The study cohort included a sample size of 250 students. The CQ and RSA scores were categorized into three groups, respectively, using the following criteria: A student scoring 14 or lower out of 25 on the CQ scale was classified as "low." Those students with a CQ score of 18 or higher out of 25 or more were classed as "high" on the CQ index. Students with a score between 15 and 17 fell into the "medium" category. Likewise, students were relegated to the "low" RSA group if their RSA was 72.5% or less while students with a score of 80.5% or better were deemed to be "high" RSA. The mid-range category for RSA rested between 72.5% and 83.5% without including these limit. (See table 2.)

CQ Groups		RSA Groups	
High	(≥18/25)	High	(≥80.5%)
Mid	(15–17/25)	Mid	(72.6–80.4%)
Low	(≤14/25)	Low	(≤72.5%)

Table 2. Required subjects average groups

All nine of the CQ by RSA crossed-combinations resulted in mutually exclusive groups or complex categories (i.e., one CQ level combined with one RSA level). Thus, nine groups of successful candidates were analyzed in the study. The mean GPAs were calculated for successful candidates who had (1) a low RSA and a low, medium, or high CQ score; or (2) a medium RSA and a low, medium, and high CQ score; or (3) a high RSA and a low, medium, or high CQ score. Table 3 lists the average grade point averages of the nine complex categories of successful candidates.

A two-way fixed effects, analysis of variance (ANOVA) was performed on the data in an effort to evaluate differences on the GPA for (1) the three CQ groups, alone (main effect of CQ); (2) the three RSA groups, alone (main effect of RSA); and (3) most importantly, the interaction between these two factors. In accordance with the simple

RSA group	CQ group	Mean	Std. deviation	N
Low	Low	3.291	.369	21
	Medium	3.030	.494	23
	High	3.341	.387	19
	Total	3.211	.440	63
Medium	Low	3.306	.383	51
	Medium	3.263	.429	55
	High	3.317	.368	24
	Total	3.290	.398	130
High	Low	3.130	.242	14
	Medium	3.489	.336	30
	High	3.538	.305	13
	Total	3.412	.345	57
Total	Low	3.273	.362	86
	Medium	3.276	.447	108
	High	3.376	.366	56
	Total	3.298	.403	250

Note: Dependent variable: year-1 grade point average

Table 3. Mean year-1 grade point averages (GPA) of admitted students by admissions standings on candidate's questionnaire (CQ) and required subjects average (RSA)

effects strategy described by Kirk,[9] an ANOVA source table was derived with the intention that significant omnibus F-tests would be followed by appropriate post-hoc analytics (e.g., simple main effects tests and pairwise contrasts, suitably corrected for inherent type I errors). (See table 4.)

RESULTS

Table 3 summarizes the sample sizes (n), means (M), and standard deviations (SD) of the grade point averages for the levels or groups of the two primary factors and the complete set of nine complex interactive subgroups representing the interaction. The mean GPA for all students (n = 250) was 3.30 (SD = 0.40). The 86 successful candidates occupying the "low" CQ category had a mean GPA of 3.27 (SD = 0.36) while the 56 candidates in the "high" CQ group had a mean GPA of 3.38 (SD = 0.37). The remaining candidates (n = 108), comprising the "medium" interval, revealed an average GPA of 3.28 (SD = 0.45). Among the RSA groupings, 63 candidates in the "low"category obtained a mean GPA of 3.21 (SD = 0.44). The 130 students falling into the "medium" RSA group returned an average GPA of 3.29 (SD = 0.40), and the "high" RSA group (n = 57) had a mean GPA of 3.41 (SD = 0.35).

Averaged GPA scores among the nine dual-factor subgroups representing the interaction were varied as well. However, they followed a more involved and less-linear pattern of relative scores than that which was evident in the two main factors of CQ or RSA alone. For instance, the low CQ/high RSA subgroup (n = 14, M = 3.13, SD = 0.24) represented one of the lowest GPA averages; the 19 students occupying the high CQ/low RSA subcategory (n = 19, M = 3.34, SD = 0.39) show one of the higher mean GPAs in the study. The group with the lowest average GPA was the medium CQ/low RSA subgroup (n = 23, M = 3.03, SD = 0.49) while the highest mean score was, not unexpectedly, achieved in the high CQ/high RSA category (n = 13, M = 3.54, SD = 0.31).

As shown in Table 4, the two-way ANOVA source table revealed no significant main effects for either the RSA or CQ groups. However, a significant interaction between the RSA and CQ groups was evident [F (4, 241) = 3.71, $p \leq 0.01$].

Figure 1 illustrates the "RSA by CQ Groups" interaction. A post-hoc simple main effects strategy was used to localize the origins of the significant omnibus test of the interaction reported in table 4. The only one-way simple main effects ANOVA within this triad of tests that proved significant was that of the medium CQ scorers between the three RSA subgroups [F (2, 241) = 8.91, $p \leq 0.001$]. Within this subcategory of RSA levels, a further examination of the pairwise-differences between groups was conducted using simple effects-contrasts analysis. This enabled the investigators to determine the level of statistical significance for the mean differences between an exhaustive set of six pairings of the three RSA subgroups.

Among students with a medium CQ score, those with high or medium RSA standing, performed significantly better in the program than students with a low RSA score (low RSA M = 3.03 < medium RSA M = 3.26, $p \leq 0.05$; low RSA M = 3.03 < high RSA M = 3.49, $p \leq 0.001$). In keeping with the observed linear trend for an increase in GPA commensurate with low to high RSA standing, students performing in the high RSA subgroup scored significantly better than students occupying the corresponding medium RSA subgroup (medium RSA M = 3.26 < high RSA M = 3.49, $p \leq 0.05$).

Figure 2 illustrates the complimentary perspective of the interaction by exploring the CQ by RSA subgroup dynamic. Again, the remaining three possible one-way simple main effects ANOVAs were performed. However, in this set of tests, the RSA categories were held constant while the CQ subgroupings were examined for significance. Two of the three one-way simple main effects tests proved significant at $p \leq 0.05$. Differences among the CQ subgroups were evident for students occupying the low RSA group [F (2, 241) = 4.35, $p \leq 0.05$] and the high RSA

Source of Variation	Sum of squares	df	Mean square	F	Sig.
RSA Group	.754	2	.377	2.501	.084
CQ Group	.849	2	.425	2.815	0.62
RSA Group* CQ Group	2.238	4	.560	3.711	.006
Error	36.343	241	.151		
Total	2759.285	250			

Note: Dependent variable: year-1 grade point average

Table 4. ANOVA source table: tests of between-subjects effects

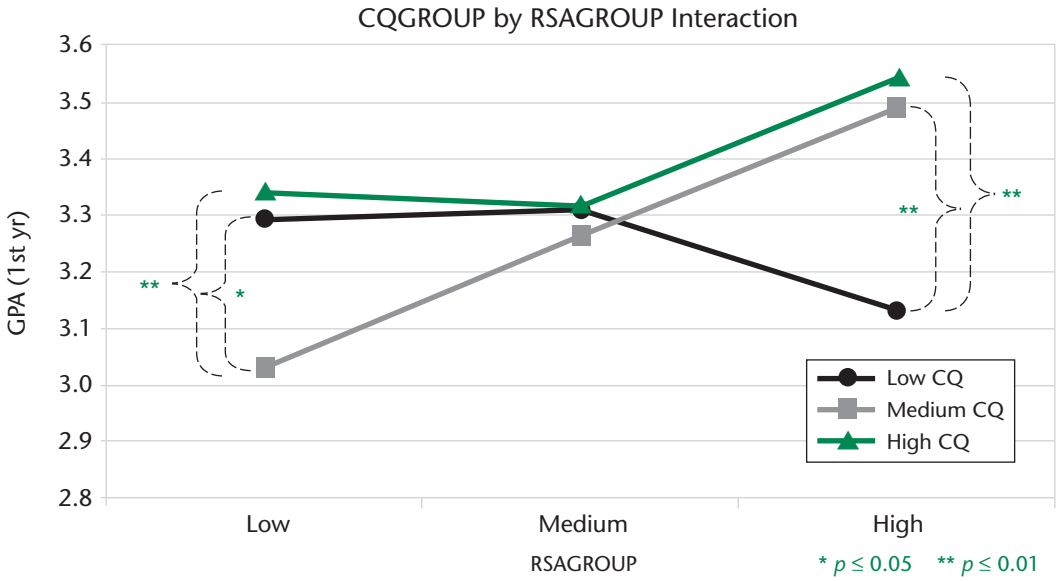

Figure 1. CQ group by RSA group interaction

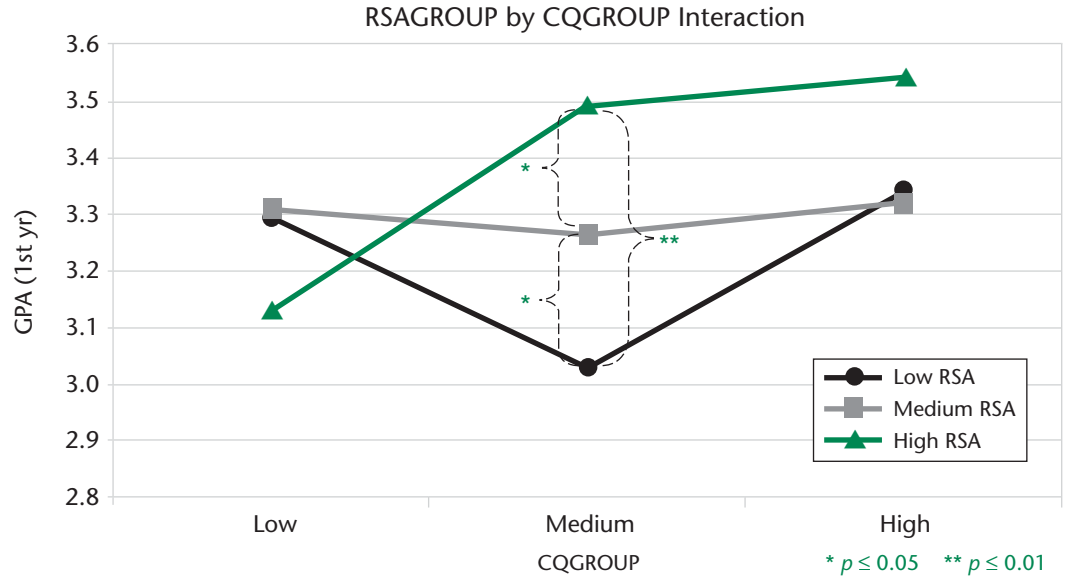

Figure 2. RSA group by CQ group interaction

group [F (2, 241) = 6.24, $p \leq 0.01$]. In keeping with the prescribed analytic strategy,[9] post-hoc simple effects contrasts were performed on the two significant simple effects. With respect to the first-year students in the high RSA category, those with a high or medium CQ score performed significantly better than those with a low CQ score (low CQ M = 3.13 < medium CQ M = 3.49, $p \leq 0.01$; low CQ M = 3.13 < high CQ M = 3.54, $p \leq 0.01$). Interestingly, among students with a low RSA, those with a low or a high CQ score performed significantly better than those with a medium CQ score (medium CQ M = 3.03 < low CQ M = 3.29, $p \leq 0.05$; medium CQ M = 3.03 <high CQ M = 3.34, $p \leq 0.01$). First-year students in the medium RSA group performed similarly regardless of their CQ score.

Students with a better understanding of the profession and the program for which they applied (high CQ) overcome any disadvantage presented by low didactic ability (low RSA).

DISCUSSION

These results suggest the applicant's level of knowledge and understanding of the profession and the program influences the student's performance level in the first year of the program. Students with a better understanding of the profession and the program for which they applied

(high CQ) overcome any disadvantage presented by low didactic ability (low RSA). In addition, students who had a poor understanding of the profession and program (low CQ) but who perform at a high level as evidenced by high RSA appear less prepared to meet the challenges presented in the first year of the program and therefore performed at a lower level. Students with a low CQ and a high RSA may represent applicants who apply to a wide range of programs and thus dental hygiene may not be their preferred program.

Faculty members have identified several advantages to using the CQ as an admissions criterion. For example, the time required to administer and score the questionnaire is considerably less than the time required to interview eligible applicants. Interviews required at least two full days of each faculty member's time. In contrast, the questionnaires can be scored in three to four hours. In addition, while the subjectivity of the interview introduces the possibility of bias, this is significantly reduced in the objective CQ. The faculty member scoring the questionnaire knows nothing about the candidate except that she or he was qualified to write the candidate's questionnaire. Finally, because each faculty member scores one question only, the possibility of influence or potential for bias in the CQ score is minimized and intra-rater reliability is high.

The candidate's questionnaire may be a reasonable alternative to the structured interview in discriminating among applicants with low academic requirements.

Unsuccessful applicants are often counselled regarding actions to take to improve the likelihood of acceptance should they decide to re-apply to the School of Dental Hygiene. In cases where their academic requirements are low, it may be suggested that they take additional university courses to improve their standing. If their academic qualifications are low and they had a low CQ score, it may be suggested that they investigate the profession further as well as improve their academic record.

The potential for re-applicants to complete the questionnaire more than once raised the issue of whether or not the questions on the questionnaire should be different from one year to the next. Faculty reasoned that the re-applicant who answers the questionnaire a second time is likely someone with low academic requirements. An unsuccessful candidate will be aware of the questions asked on the CQ and therefore have the opportunity to become more prepared to answer the questions. Faculty agreed that an improvement in the overall ranking as a result of a better score on the CQ was acceptable because it indicated the applicant was more knowledgeable about their chosen profession.

Because the CQ is intended to identify those applicants who have the best background knowledge of their chosen profession as well as appropriate values and beliefs, faculty raised the question of whether or not there was a CQ score below which the candidate should be denied acceptance regardless of their academic performance. This question is more difficult to answer, but these results seem to suggest that students admitted with low ($\leq$14/25) CQ scores earned on average grade point averages of 3.27 as compared with the 3.38 grade point averages of those with high ($\geq$ 18/25) CQ scores.

SUMMARY

The results suggest that, for admissions committees, the CQ score may be a valuable component of the admissions process. Although the number of students in each subgroup is small, these data indicate that the candidate's questionnaire may be a reasonable alternative to the structured interview in discriminating among applicants with low academic requirements.

Regardless of high, medium, or low RSA or CQ, the applicants selected perform at an acceptable level. Applicants with more knowledge about the profession and program perform better than those applicants who do not have that information. It could be argued that those with high CQ scores are applicants who are more likely to be satisfied with their career choice and remain in the profession. Perhaps admissions committees should consider increasing the emphasis placed on the candidate's questionnaire score when considering those applicants with high required subject averages.

IMPLICATIONS

The School of Dental Hygiene at Dalhousie University found the administration of structured interviews to be logistically difficult and labour intensive. The candidate's questionnaire was designed to explore the same attributes as the structured interview and was favourably received as a part of the admissions process. Anecdotally, the Admissions Committee reported that the accumulated score from the questionnaire provided a discriminating factor to the selection process that the structured interview scores had not. However, as the Committee continues to work with the candidate's questionnaire, several questions have arisen.

The study shows students with high academic requirements are accepted and will perform well even though they may not be prepared for the demands of the program and profession. However, would the student and profession be better served if the admissions committee placed a greater emphasis on the CQ score, thereby selecting candidates who have demonstrated their knowledge of the profession? Further, when considering qualified applicants with low academic requirements, should those with high CQ scores be offered positions before those with high academic requirements and low CQ? Is there a CQ score below which the applicant should be denied a position regardless of their required subjects average?

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Changes in Education *(continued from page 55)*

tance to CDHA? Definitely yes. Does the for-profit or public status of a school indicate whether a quality education standard is achieved? The Commission on Dental Accreditation of Canada (CDAC) is the Canadian body responsible for accrediting educational programs.

The CDAC establishes the accreditation requirements that must be met by Canadian dental hygiene programs before they are granted accreditation. (These requirements are available at www.cda-adc.ca/en/cda/cdac/accreditation/index.asp.) The requirements are the same whether the program has public or private funding. Graduates of an accredited dental hygiene program are eligible to write the National Dental Hygiene Certification Board (NDHCB) examination and apply for registration/licensure with a dental hygiene regulatory authority in Canada. When programs apply for accreditation, they must evaluate the degree to which they have met their stated program outcomes and one way of doing this is to review the success rates of their graduates on the NDHCB exam. Of course, new programs have to graduate the initial intake of students in order to have this data to show to the CDAC but programs are expected to use this data to assist in ongoing program development. The CDAC also requires programs to publish their admissions process to applicants.

Just because there are additional opportunities for dental hygiene education does not mean that the calibre of incoming students has changed. It is not in a program's best interest to accept students who do not have the academic background to be successful in the program. There are different value systems that drive admissions policies; here in Canada we often see the selection of the most qualified or as is the case in some public colleges, a "first qualified, first admitted" policy. In post-secondary education, a more recent trend, quite common in the United States, is the move to an "open admissions" policy where students may enroll without regard to academic qualifications. Under this type of enrolment, students are accepted but they have to perform in order to remain in the program. This trend has been growing because of the increasing number of adult learners.

In Ontario, the province with the most number of private educational programs, before graduates can be registered, they must successfully pass the NDHCB exam. If the graduate is from a non-accredited program, graduates must have their educational credentials evaluated to determine whether they are eligible to write the NDHCB exam. Graduates of non-accredited programs must pass the NDHCB exam and then must also pass a clinical evaluation administered by the College of Dental Hygienists of Ontario (CDHO). Fran Richardson, Registrar of the CDHO, explains: "If dental hygienists have concerns about the quality of a specific dental hygienist, then it is their professional responsibility to lodge a complaint with their regulatory authority. With respect to the perception that there may be an oversupply of dental hygienists, if dental hygienists are willing and able to go to the clients where and when the clients need them, then there probably won't be enough dental hygienists, but if dental hygienists wait for the clients to come to them, there probably will be. It is all about changing practice modalities and that means changing legislation that is in the public interest."

Perhaps it is ironic that in Canadian culture, private schools from kindergarten through high school are viewed as high-quality institutions. But when the dental hygiene culture looks at the private education scenario for dental hygiene schools, this image does not carry through. Do you think this difference in perception reflects our personal biases, given the roots of our own education? Looking at private schools south of the border, some of the most famous schools are private: Harvard, Princeton, Stanford, and Yale, to name only a few.

Change is inevitable and many changes are beyond our control. But how we choose to view those changes *is* within our control. If we choose to see the changes as negative and scary, we will see negative and scary things and we will behave in a manner that reinforces those images. If we choose to see the changes as an evolution that may have us embracing new opportunities and innovative ways of doing things, then those positive thoughts will change our behaviour as well, allowing us to enjoy positive results. Don't get me wrong—we all have little voices that are quick to tell us to fear any changes. When that negative voice whispers in your ear, I challenge you to think of Wayne Dyer's words: "Change the way you look at things and the things you look at will change."

La transformation de l'enseignement *(suite de la page 55)*

celle d'une formation du niveau du baccalauréat pour les hygiénistes dentaires, et favorise la conclusion d'ententes d'articulation des programmes avec les établissements qui délivrent les diplômes. Nous approuvons les efforts des nombreux enseignants en hygiène dentaire qui ont travaillé sans relâche à l'élaboration d'options qui facilitent l'obtention du diplôme. Cela dit, y a-t-il une raison qui empêcherait les établissements d'enseignement privés de travailler en collaboration avec les établissements qui délivrent les diplômes? L'ACHD est-elle très soucieuse de maintenir une norme de qualité de l'enseignement? Oui, bien entendu. Le statut d'école publique ou d'école à but lucratif indique-t-il qu'une norme de qualité de l'enseignement est respectée? La Commission de l'agrément dentaire du Canada (CADC) est l'organisme canadien responsable des normes d'enseignement.

La CADC établit les exigences d'agrément auxquelles doivent satisfaire les programmes canadiens d'hygiène dentaire avant d'être agréés. (Ces exigences se trouvent sur le site de l'Association dentaire canadienne, à l'adresse suivante : www.cda-adc.ca/fr/cda/cdac/accreditation/index.asp.) Que le programme bénéficie d'un financement public ou privé, les exigences sont les mêmes. Les diplômés d'un programme agréé d'hygiène dentaire peuvent se présenter à l'examen du Bureau national de la certification en hygiène dentaire et solliciter une autorisation d'exercer auprès d'un organisme canadien de réglementation en hygiène dentaire. Lors de la présentation d'une demande d'agrément, les responsables de programmes doivent évaluer la mesure dans laquelle ils ont atteint les résultats annoncés, et l'une des façons de le faire consiste à examiner les taux de réussite de leurs diplômés à l'examen du Bureau national de la certification en hygiène dentaire. Évidemment, dans le cas de nouveaux programmes, il faut que la première cohorte d'étudiants soit diplômée pour qu'on soit en mesure de présenter ce renseignement à la CADC, mais l'on s'attend à ce que cette information soit utilisée pour faciliter le travail d'amélioration continue des programmes. La CADC exige également que les processus d'admission aux programmes soient communiqués par écrit aux candidates et candidats.

Le simple ajout de possibilités de formation en hygiène dentaire ne veut pas dire que le calibre des nouvelles étudiantes et des nouveaux étudiants a changé. Il n'est pas dans le meilleur intérêt d'un programme que soient acceptés des étudiants qui ne possèdent pas les acquis scolaires pour réussir. Au Canada et aux États-Unis, de nombreux collèges et universités ont une politique « d'admissions libres », ce qui signifie que les candidats qualifiés qui satisfont aux critères d'admission sont acceptés. Dans certains collèges publics canadiens, cette politique est appelée la politique du « premier arrivé, premier servi », c'est-à-dire du « premier qualifié, premier admis ».

En Ontario, la province qui compte le plus grand nombre de programmes d'enseignement, les diplômés doivent réussir l'examen du Bureau national de la certification en hygiène dentaire avant d'être autorisés à exercer. Si les diplômés ne proviennent pas d'un programme agréé, il faut évaluer leur dossier scolaire afin de déterminer s'ils sont admissibles à l'examen du Bureau national de la certification en hygiène dentaire. Les diplômés des programmes non agréés doivent aussi se soumettre à une évaluation clinique administrée par l'Ordre des hygiénistes dentaires de l'Ontario, après avoir subi l'examen du Bureau. Fran Richardson, la registraire de l'Ordre, explique : « Les hygiénistes dentaires qui doutent des compétences de l'une ou de l'un de leurs collègues ont la responsabilité professionnelle de déposer une plainte auprès de leur organisme de réglementation. En ce qui concerne la perception d'un excédent possible d'hygiénistes dentaires, si les hygiénistes dentaires acceptent de se rendre là où les clients ont besoin de leurs services au moment où ils en ont besoin, leur nombre sera alors probablement insuffisant. Par contre, si les hygiénistes dentaires attendent que les clients viennent vers elles ou vers eux, probablement y aura-t-il un surplus de membres de cette profession. Il s'agit fondamentalement de modifier les modalités de la pratique, et cela signifie modifier la législation. Si les hygiénistes dentaires ont des inquiétudes, je leur suggère de participer au développement de la profession. »

Il est peut-être ironique que, dans la culture canadienne, les écoles privées, de la maternelle à la fin de l'école secondaire, soient perçues comme des établissements d'enseignement de qualité supérieure. Mais dans le milieu des hygiénistes dentaires, l'image de qualité de l'enseignement privé ne s'impose pas. Selon vous, est-ce que cette différence de perception reflète nos préjugés personnels, compte tenu des fondements de notre propre formation? Au sud de la frontière canadienne, certaines des écoles les plus renommées sont pourtant des écoles privées : les universités Harvard, Princeton, Stanford et Yale, pour n'en nommer que quelques-unes.

Les changements sont inévitables et souvent indépendants de notre volonté. Nous pouvons cependant choisir la façon d'envisager ces changements. Si nous considérons que les changements sont négatifs et menaçants, nous y trouverons des aspects négatifs et menaçants, et notre comportement contribuera à renforcer cette vision. Si nous choisissons de voir les changements comme une évolution qui peut nous amener à profiter de possibilités nouvelles et à adopter des façons de faire innovatrices, ces pensées positives modifieront aussi notre comportement, ce qui nous permettra de profiter de résultats favorables. Comprenez-moi bien : nous savons tous que de petites voix intérieures sont promptes à nous mettre en garde contre tout changement. Lorsque vous entendrez leurs chuchotements négatifs, souvenez-vous des paroles de Wayne Dyer : « Changez votre façon de voir les choses, et les choses que vous voyez vont changer ».

A Review of the Different Methods of Applying Chlorhexidine in the Oral Cavity

*by Pauline Imai, CDA, DipDH, BDSc**

ABSTRACT

Chlorhexidine or CHX (chemical name 1.6-bis-4-chloro-phenyldiguanidohexane) is a synthetic cationic detergent, which has broad anti-microbial activity.[1] In numerous studies since the 1970s, chlorhexidine has been shown to be an effective anti-plaque and anti-gingivitis agent and there is extensive literature about chlorhexidine for the treatment of gingivitis. Some studies have demonstrated the efficacy of chlorhexidine using different concentrations and formulations. Others have studied chlorhexidine in various forms, such as mouthwashes, gels, and sprays. Chlorhexidine has also been applied with trays, fingers, toothbrushes, toothpicks, dental floss, foam brushes, and biodegradable chips. The study populations have also been extensive, ranging from children to adults, with and without periodontal disease, as well as with and without mechanical or surgical interventions. This article provides an overview of the anti-plaque and anti-gingivitis properties of chlorhexidine, with an emphasis on the different methods of application in the oral cavity.

Key words: chlorhexidine, dental plaque, gels, gingivitis, mouthwashes, vehicles

INTRODUCTION

CHLORHEXIDINE (CHEMICAL NAME 1.6-BIS-4-chloro-phenyldiguanidohexane) is a synthetic cationic detergent, which has broad anti-microbial activity.[1] Chlorhexidine (CHX) is effective against gram-positive and gram-negative bacteria, yeasts, dermatophytes, and some lipophilic viruses.[1,2] It was first marketed under the trade name "Hibitane" in 1953 as an antiseptic cream[1] but was eventually found to be effective for plaque control in the oral cavity in 1970.[3] In a short-term, experimental gingivitis model study, Löe and Schiøtt in 1970 demonstrated that twice-daily rinsing with a 0.2% concentration of chlorhexidine was effective in completely preventing plaque formation without mechanical interventions.[3]

The anti-bacterial mode of action of chlorhexidine is by damaging the cytoplasmic membrane of the bacteria so that the osmotic equilibrium is no longer maintained.[1,2] Chlorhexidine has two effects on bacteria. At the bacteriostatic level, the cationic chlorhexidine binds to anionic compounds, such as free sulfates, the carboxyl and phosphate groups of the pellicle, and salivary glycoproteins.[1,4] This results in fewer proteins available at the tooth surface for the formation of the dental pellicle, the precursor to dental plaque.[1] Coating the salivary bacteria with chlorhexidine also affects the ability of bacteria to adhere to the tooth surface.[1] The bacteriostatic phase is prolonged so that chlorhexidine, bound to salivary proteins, is released in active form even 8–12 hours later.[4] Substantivity, which is the prolonged bacteriostatic characteristic of chlorhexidine, is an important feature because it provides continuing anti-microbial effects even with reduced frequency of applications. However, during the bacteriostatic stage, the bacteria can still recover if the chlorhexidine is neutralized.[2] Unlike the bacteriostatic phase, the bactericidal stage is non-reversible. At the bactericidal level, "there is coagulation and precipitation of the cytoplasm by the formation of phosphated complexes such as adenosine triphosphate and nucleic acids."[2] Long-term studies show that chlorhexidine does not lose its effectiveness over time nor does it create resistant bacterial strains.[1,5,6]

Long-term studies show that chlorhexidine does not lose its effectiveness over time nor does it create resistant bacterial strains.

Since chlorhexidine is a strong cationic substance, it may be rendered inactive in the presence of anionic substances, such as phosphates, sulfates, and anionic detergents.[7] Although researchers and clinicians suggest that people wait a minimum of 30 minutes between the use of toothpastes and chlorhexidine to prevent a reaction between the sodium lauryl sulphate (the detergent found in toothpastes) and the chlorhexidine, Van Strydonck et al. in 2004 found that this interaction did not occur as long as the person rinsed with water after toothbrushing.[8] Blood, pus, calcium ions, and tannin may also inactivate chlorhexidine.[1] Tannins are found in tea and red wine. Both chlorhexidine and tannins are protein denaturants and hence may compete for the same sites on the enamel pellicle.[9] Denaturing pellicle proteins allows for the formation of iron or tin sulfides to form pigmented products on the teeth.[9] This theory is the most prevalent of the three possible mechanisms, which may explain the characteris-

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RÉSUMÉ

La chlorhexidine (nom chimique : 1,6-bis-4-chloro-phényldiguanidohexane) est un détergent cationique synthétique, dont l'activité antimicrobienne est vaste. Depuis les années 1970, de nombreuses études ont montré que cette substance était un agent anti-plaque et anti-gingivite efficace. La documentation au sujet de la chlorhexidine est abondante. Des études ont démontré l'efficacité de la chlorhexidine en différentes concentrations et selon différentes formules. D'autres ont étudié la chlorhexidine sous diverses formes, tels les rince-bouches, les gels et les aérosols. La chlorhexidine a aussi été utilisée dans la fabrication de plateaux, de doigts, de brosses à dents, de cure-dents, de soie dentaire, de brosses en mousse et de puces biodégradables. Par ailleurs, les populations étudiées sont considérables : elles vont des enfants aux adultes, victimes ou non de maladie parodontale et ayant subi ou non une intervention mécanique ou chirurgicale. Cet article donne un aperçu de la chlorhexidine et met l'accent sur les différentes méthodes d'application dans la cavité buccale.

tic brown stain that appears on teeth and oral tissues after using chlorhexidine.[9]

Tooth stain is a common adverse effect of chlorhexidine use. Three out of four subjects will develop a brown stain on the teeth, tongue, and composite and porcelain restorations within a few days of using chlorhexidine.[1,3,10-13] The intensity and coverage of the tooth stain increases with the intake of tea, red wine, coffee, and tobacco.[9,13]

Other adverse effects of chlorhexidine are a bitter metallic taste (12%), changes in taste sensation (88%), and occasional epithelial desquamation (6%).[10,14,15] Desquamations have been observed in subjects using concentrations of 0.2% or more.[1,2,16,17] Increased calculus formation has also been noted in chlorhexidine studies.[11,18-22] Flemmig et al. in 1990 noted a four-fold increased in calculus formation in subjects using a 0.06% chlorhexidine mouthrinse compared with control subjects.[19]

Chlorhexidine has been shown to effectively inhibit de novo plaque formation or newly forming plaque and to reduce the bleeding and inflammation associated with gingivitis.

Long-term studies have shown that chlorhexidine is safe.[1,5,6] In toxicological evaluations in animal models, chlorhexidine has been found to be non-effective against systemic infections with parenteral dosing.[23] It was therefore concluded that chlorhexidine was only to be used for prophylactic antisepsis by topical or oral applications.[23] Tests that were conducted in animal models for reproductive effects, skin sensitizations, and eye irritations were found to be satisfactory, i.e., no tumours or other toxic manifestations were found.[23] Retrospectively, chlorhexidine has been used orally since the 1950s with no reports of ill-effects following ingestion.[23] Since chlorhexidine is poorly absorbed in the gastrointestinal tract, it has very low toxicity in humans and animals.[1] There are few reported cases of anaphylaxis from chlorhexidine. Krautheim in 2004 reported one subject who had an anaphylactic reaction to chlorhexidine, but it was thought that the reaction was made more severe by applying the chlorhexidine to broken skin, thus introducing chlorhexidine into the blood stream.[24] Generally, the sensitization rate of chlorhexidine is thought to be less than 2%, with prolonged and repeated contact required to develop the contact sensitivity.[24] Overall, the intra-oral use of chlorhexidine is safe.

Chlorhexidine has been used in the oral cavity since the 1970s for the treatment of gingivitis.[1,3] Although gingivitis can be treated by mechanical methods, such as toothbrushing and flossing, [3,25-27] subjects may be unwilling or unable to effectively remove the dental plaque[28-34] that is responsible for the gingival inflammation.[35,36] Many studies have tested the effectiveness of chlorhexidine as a chemical adjunct or replacement for mechanical procedures in the treatment of gingivitis.[3,5-7,11,16-21,29-35,37-66] Chlorhexidine has been shown to effectively inhibit de novo plaque formation or newly forming plaque and to reduce the bleeding and inflammation associated with gingivitis.[3,5-7,11,16-21,29-35,37-66]

In the literature, studies have used various methods of introducing the chlorhexidine into the oral cavity. The most common method of application has been the mouthrinse, followed by gels, sprays, and other novel methods. The purpose of these different methods of application has been two-fold. One aim was to find a method that would enhance subject compliance in using the product. The second was to find a method that would enhance the anti-plaque and anti-gingivitis properties of chlorhexidine while simultaneously minimizing its side effects.

CHLORHEXIDINE MOUTHRINSES

Chlorhexidine has been traditionally dispensed as a 0.2% mouthrinse, a method of application that is easy and accepted by subjects. Long considered the gold standard, the 0.2% chlorhexidine is effective at inhibiting new plaque formation and controlling the clinical signs of gingivitis.[2] The 0.2% concentration was chosen by Löe and Schiøtt in the initial clinical trial because this concentration was used to irrigate the eyes and was therefore felt to be safe.[3,40] Numerous studies have since supported the claim that 0.2% chlorhexidine is an effective anti-plaque and anti-gingivitis agent.[3,12,38,43,46,50,53] In experimental gingivitis studies, 0.2% chlorhexidine has been found to be effective in returning subjects to gingival

health.[3,12,46,53] The 0.2% chlorhexidine mouthrinse was significantly more effective ($p < 0.05$) than manual toothbrushing in resolving the experimental gingivitis within four days.[38] However, subject compliance for the long-term use of the 0.2% chlorhexidine mouthrinse has been poor because of the extrinsic brown stain that forms on the teeth and oral tissue within a few days of use.[9-13] Hence, recent studies have explored the possibility of lower concentrations of chlorhexidine, the use of an oral irrigator, toothbrush, or foam brush to apply the chlorhexidine solution, and different formulations of chlorhexidine solutions to address the staining issue, whilst maintaining chlorhexidine's anti-plaque and anti-gingivitis properties.

Lower concentrations of chlorhexidine rinses

One of the attributes of 0.2% chlorhexidine that makes it the gold standard is substantivity.[2] Substantivity is the ability of chlorhexidine to adsorb from the oral tissues in active form, resulting in a lingering bacteriostatic effect hours after the initial dose.[1,2] Whether a lower concentration of chlorhexidine also had this attribute was explored. A study conducted by Bonesvoll, Lökken, and Rölla in 1974 demonstrated that the retention of chlorhexidine in the oral cavity was proportional to its concentration.[4] For example, "the mean amount of chlorhexidine retained in the oral cavity ranged from 1.8 mg ($\pm$ 0.4) at the 0.05% concentration to 10.5 mg ($\pm$ 3.4) at the 0.4% concentration."[4] Other studies explored the effectiveness of lower concentrations of chlorhexidine on oral bacteria. Sreenivasan et al. in 2004 explored the effect of 0.03%, 0.06%, and 0.12% chlorhexidine rinses on oral bacteria and found that a significant dose-dependent effect occurred.[51] For example, the 0.12% chlorhexidine rinse had significantly stronger effects on oral bacteria than the 0.06%, and the 0.06% concentration had stronger effects than the 0.03% concentration.[51] In another study, 0.05% chlorhexidine was compared with a placebo for microbiological effects.[49] The lower concentration of chlorhexidine was found to be effective in significantly reducing the bacteria in the oral flora ($p < 0.05$), especially for *Porphyromonas gingivalis* ($p = 0.01$), compared with a placebo.[49]

Lower concentrations of chlorhexidine mouthrinses: short-term studies

In short-term studies, 0.12% chlorhexidine has been compared with other agents or placebo for effectiveness in plaque and gingivitis inhibition. In an experimental gingivitis study comparing 0.12% chlorhexidine, triclosan, and placebo, the chlorhexidine had significantly lower plaque scores, but not gingival and gingival crevicular fluid scores.[48] In another study, 0.12% chlorhexidine was compared to an amine and stannous fluoride solution in post-surgical subjects.[16] No differences were found between the two treatment groups in this three-month study. The fact that these subjects had just received periodontal surgery and were probably quite motivated with their oral hygiene may account for the lack of differences between the two treatment groups. A multi-centre, general dental practice study demonstrated that a 0.12% chlorhexidine rinse was effective in reducing plaque and gingival bleeding sites over three months compared with placebo.[41] Although the baseline plaque and gingival scores were already low for these study subjects, it was interesting that the chlorhexidine was still able to exert a noticeable effect.

Comparisons between mechanical plaque removal and lower concentrations of chlorhexidine mouthrinses have also been reported.

Comparisons between mechanical plaque removal and lower concentrations of chlorhexidine mouthrinses have also been reported. Caton et al. in 1993 compared the adjunctive use of 0.12% chlorhexidine and mechanical cleaning to mechanical cleaning alone in the treatment of interdental gingivitis.[39] Interdental cleaning and toothbrushing alone were found to be effective in significantly reducing bleeding sites compared with chlorhexidine and toothbrushing.[39] While this supports previous findings that toothbrushing alone is ineffective in cleaning the interdental area,[26,27] it also highlights the inability of chlorhexidine mouthrinses to penetrate the interdental area,[39] an area where gingivitis is more prevalent.[67,68]

For many short-term studies, the effects of chlorhexidine on plaque formation and gingivitis may appear to be only slightly better or not at all compared with other test solutions, placebos, or mechanical cleaning. Often the Hawthorne effect (i.e., the subjects in the study perform better oral hygiene than usual because they know they are being assessed) and lingering effects from the initial professional prophylaxis play a significant role in the results.[11,43,45,46]

Lower concentrations of chlorhexidine rinses: long-term studies

Studies of six months or longer have several advantages over short-term studies. According to Overholser (1988), the advantages of a long-term study are as follows:[11]

- A period of six months simulates a common recall interval in private practice, something a subject may be familiar with.
- Subjects will likely begin and end the study with a professional prophylaxis. Having all the subjects begin with a plaque score near or at zero facilitates later comparisons between the treatment groups.
- The effects of the initial scaling and root planing will have been mitigated by six months.
- The development of toxic and other adverse effects is more likely to become known.
- Qualitative and quantitative changes in the subject's oral flora can be monitored, especially for the emergence of gram negative, anaerobic, or motile bacteria.

Six months also allows researchers to determine if the treatment produces resistant forms of bacteria.
- The initial Hawthorne effect will gradually lessen over time.

In long-term studies, 0.12% chlorhexidine rinses have been found to be effective in reducing plaque and gingivitis compared with a placebo.[18,19] When compared with a placebo, 0.12% chlorhexidine significantly reduced gingival (18.2%, $p < 0.001$) and plaque (21.6%, $p < 0.001$) scores.[18] However, there was no significant difference in plaque and gingival scores between 0.12% chlorhexidine and an essential oil mouthrinse (Listerine™).[18] Over the six-month period, the chlorhexidine group had significantly more calculus (0.45) and stain (2.08) compared with the essential oil rinse (0.24 and 0.33, respectively) and placebo groups (0.21 and 0.01, respectively).[18] The authors suggest that the 0.12% chlorhexidine mouthrinse be used for short-term use only to reduce the side effects and that the essential oil rinse be used for long-term use since the anti-plaque and anti-gingivitis effects are similar without the side effects of the chlorhexidine.[18]

Research has also been conducted using different formulations of chlorhexidine mouthrinses to minimize or eliminate the adverse effects of tooth staining and poor taste.

In another large study (n = 430), subjects used either a 0.12% chlorhexidine mouthrinse or placebo rinse for six months.[20] Compared with the placebo, the chlorhexidine group had a 37% reduction in gingival occurrence, 39% reduction in gingival severity, 44% reduction in gingival bleeding, and 61% reduction in plaque scores.[20] Although both groups started the study with a professional prophylaxis, the beneficial effect of the prophylaxis slowly diminished, as indicated by gingival severity increasing with time in the placebo group.[20] The authors noted that calculus and stain increased in the chlorhexidine group, but there were no indices included in the study design to indicate that these parameters were actively assessed.[20]

Two other long-term studies used a 0.06% chlorhexidine mouthrinse to test for plaque and gingivitis inhibition.[19,44] The larger study (n = 222) examined the application of 0.06% chlorhexidine as a mouthrinse and by an oral irrigator.[19] The chlorhexidine was compared against two controls, water irrigation and toothbrushing.[19] The six-month results of Flemmig et al.'s 1990 study can be found in table 1. The results for the toothbrushing group remained constant over the six months. At the three- and six-month assessments, the chlorhexidine groups (via mouthrinse or oral irrigator) and the water irrigator group all had significant reductions in the gingival index and bleeding on probing compared with the toothbrushing group ($p \leq 0.05$). The group using the oral irrigator and the 0.06% chlorhexidine had a greater reduction in the gingival index and bleeding on probing scores compared with the other treatment groups at six months.

Interestingly, the water irrigation control was found to have beneficial clinical effects. The authors speculated that specific bacteria may have been reduced or toxic by-products of the plaque washed away, although this is unknown since microbiological tests were not conducted as part of this study. The other speculation was that the mechanical stimulation of the gingiva with the oral irrigator could have played a role in the positive clinical effects seen.[19]

Another six-month study (n = 85) compared 0.06% chlorhexidine mouthrinse with 0.06% chlorhexidine with 250 parts per million sodium fluoride.[44] Both positive (0.1% chlorhexidine) and negative (250 parts per million amine fluoride with stannous fluoride and water) controls were used[44] (see table 2).

As shown in table 2, the researchers noted a strong Hawthorne effect that lasted for three months. This effect was noticeable because the results at three months were better than the results at six months. Longer studies clearly indicate the initial positive effects of the professional prophylaxis and Hawthorne effects and how these confounding effects diminish over time to allow the true treatment effects to be known. Side effects are also more likely to be known in long-term studies, especially when using lower concentrations or dosages of chlorhexidine.

	Gingival index	Bleeding on probing	Plaque index	Calculus index	Staining index	Pocket probing depth
0.06% CHX oral irrigator	↓ 42.5%	↓ 35.4%	↓ 53.2%	↑ 276.4%	↑ 68.9%	↓ 4.6%
0.06% CHX mouthrinse	↓ 24.1%	↓ 15.0%	↓ 43.3%	↑ 273.2%	↑ 74.2%	NSF
Water irrigator	↓ 23.1%	↓ 24.0%	NSF	↑ 7.1%	NSF	NSF

CHX = Chlorhexidine; ↓ = Percentage reduction in scores compared with toothbrushing control; ↑ = Percentage increase in scores compared with toothbrushing control; NSF = No significant findings between treatment group and toothbrushing control

Table 1. Comparing the effects of 0.06% chlorhexidine administered by oral irrigator or mouthrinse to water irrigation and toothbrushing on gingival health using gingival index, bleeding on probing, plaque, calculus, and stain indices, and pocket probing depths after six months of treatment (from Flemmig et al.)[19]

	Plaque index		Gingival index		Discolouration index	
Month	3 M	6 M	3 M	6 M	3 M	6 M
Water control	0.55	0.72	0.28	0.45	0.50	0.38
Amine fluoride + stannous fluoride	0.23 *p = 0.0456	0.29 *p = 0.0150	0.15 *p = 0.287	0.36 NSF	0.66 *p = 0.0109	0.89 *p = 0.0081
0.06% CHX + Sodium fluoride	0.20 *p = 0.0022	0.27 *p = 0.0130	0.21 *p= 0.151	0.34 NSF	0.83 *p = 0.0001	1.06 *p = 0.0011
0.06% CHX	0.14 *p = 0.0007	0.25 *p = 0.0077	0.16 *p = 0.183	0.29 NSF	0.68 *p = 0.0642	1.02 *p = 0.0017
0.10% CHX	0.15 *p = 0.0013	0.13 *p = 0.0007	0.14 *p= 0.045	0.15 *p = 0.003	0.96 *p = 0.0000	1.13 *p = 0.0011

CHX = Chlorhexidine; * = Significant findings, $p \leq 0.05$; NSF = No significant findings

Table 2. Comparing the effects of amine fluoride/stannous fluoride, 0.06% chlorhexidine with sodium fluoride, and 0.06% chlorhexidine to a positive control of 0.10% chlorhexidine and a negative control of water on gingival health using plaque, gingival, and discolouration indices at three and six months (Hoffmann et al.[44]). Median scores and P-values.

Lower concentrations of chlorhexidine mouthrinse applied with different tools

In 1973, Cumming and Löe tested various concentrations of chlorhexidine as mouthrinses and in an oral irrigator to determine if a lower concentration was effective in controlling plaque formation.[40] They discovered that concentrations as low as 0.075% were effective as a mouthrinse, provided that the total volume of solution used was increased.[40] For example, 100 ml of 0.075% chlorhexidine was just as effective in controlling plaque formation as the gold standard of 20 ml of 0.2% chlorhexidine.[40] The use of an oral irrigator was also effective, with 700 ml of 0.05% chlorhexidine producing a plaque score of 0.2.[40] However, since the volumes were so large, it was assumed that most subjects would not comply with this regime over time. The authors suggested 50 ml of 0.075% to 0.1% chlorhexidine by rinsing or 400 ml of 0.025% to 0.05% chlorhexidine by oral irrigator as reasonable alternatives for controlling plaque formation.[40] The lower concentrations minimized the characteristic bitter taste of chlorhexidine and appeared to minimize the amount of staining, although nine days may not have been long enough for the stain to appear on the teeth.[40]

Various lower concentrations of chlorhexidine have also been applied with a toothbrush or foam swab.[60,63,64] Both 0.10% and 0.15% chlorhexidine solutions applied with a toothbrush were effective in reducing plaque scores (66% and 72%, respectively) compared with the placebo.[60] However, the tested concentrations (0.05%, 0.10%, and 0.15%) were unable to completely inhibit plaque formation.[60] Mean gingival index scores were reduced by 58% for the 0.15% concentration and 57% for the 0.10% chlorhexidine concentration compared with the placebo.[60] Stain intensity increased with increasing concentrations and increasing utilization of chlorhexidine.[60] For example, 92% of the 0.15% chlorhexidine group had tooth staining compared with 17% of the subjects in the 0.05% group.[60] Although brushing the chlorhexidine onto the teeth did not eliminate tooth staining, burning sensations and desquamative lesions were absent in this study.[60] The author speculates that using a toothbrush to apply the chlorhexidine resulted in less contact with the mucosal membranes compared with a mouthrinse and thus mucosal adverse effects were absent.[60]

Similarly, chlorhexidine solution has been applied with a foam brush in subjects unable to use a conventional toothbrush.[63,64]Although these studies demonstrated an effect on plaque and gingivitis, there were significant carry-over effects as the subjects were crossed over from one treatment to the next.[63,64]

Different formulations of chlorhexidine mouthrinses

Research has also been conducted using different formulations of chlorhexidine mouthrinses to minimize or eliminate the adverse effects of tooth staining and poor taste. A study by Addy et al. in 1991 compared the efficacy of 0.12% chlorhexidine and a new reformulated 0.1% chlorhexidine rinse (Pierre Fabre, Castres, France).[37] The anti-plaque and anti-gingivitis properties of the 0.1% chlorhexidine rinse appeared to be reduced compared with the 0.12% rinse.[37] Unfortunately, due to the small sample size and significant crossover effects in the study, the effects of the 0.1% formulation on plaque scores is not clear. The authors discuss how 0.1% concentrations of chlorhexidine have been shown *in vivo* and *in vitro* to produce no staining in exchange for limited anti-plaque activity.[37] However, the design of this study did not include any measurements for staining. Therefore, comparisons between the 0.1% and 0.12% chlorhexidine rinses were incomplete.

Another study added 0.5% sodium fluoride to 0.5% chlorhexidine to determine if this formulation would result in less stain, while continuing to have an effect on plaque formation and gingivitis.[45] After eight weeks, the

chlorhexidine and fluoride group had a mean plaque score of 0.4 ± 0.2, $p < 0.001$ and a mean bleeding score of 0.1 ± 0.1, $p< 0.001$ compared with placebo 0.95 ± 0.35 and 0.45 ± 0.30, $p<0.05$, respectively.[45] At eight weeks, the initial professional prophylaxis was continuing to exert a positive influence on gingival health because the control group demonstrated significant reductions in gingival bleeding.[45] A longer study might have demonstrated a difference between the two treatment groups. Another weakness in this study was that the test group had a significantly higher baseline stain score than the control group, even after both groups had received the initial prophylaxis. This complicates the comparison between treatment groups, especially when it is already known that chlorhexidine causes extrinsic tooth staining. Unfortunately, this study does not clearly indicate that a 0.5% chlorhexidine and 0.5% sodium fluoride combination is effective in treating gingival bleeding or reducing the amount of staining usually associated with chlorhexidine.

Regardless of the concentration or method of applying the chlorhexidine solution, tooth staining remains a concern for long-term use in subjects.

Different formulations of chlorhexidine have also been produced to improve the characteristic bitter taste of the 0.2% chlorhexidine mouthrinse. According to Lang et al. in 1988, a subject's taste sensation for "salty" was impaired within one day of using a 0.2% chlorhexidine mouthrinse.[14] This alteration in taste sensation was found to be transient and subjects reported normal taste sensations upon stopping the chlorhexidine.[14]

Therefore, to increase subject compliance with chlorhexidine mouthrinses, other studies were undertaken to improve the taste of the mouthrinse. In particular, 0.5% cetylpyridinium chloride (CPC) was used instead of alcohol.[47,49] In an experimental gingivitis study, 0.12% chlorhexidine rinse with cetylpyridinium chloride was compared with 0.2% chlorhexidine rinse with alcohol (the gold standard and positive control), 0.12% chlorhexidine with alcohol (positive control), and 0.12% chlorhexidine with 0.05% sodium fluoride.[47] Both the 0.12% chlorhexidine rinses with either CPC or alcohol were just as effective clinically and microbiologically as the 0.2% gold standard in retarding new plaque formation.[47] The 0.12% chlorhexidine with 0.05% sodium fluoride did not completely retard plaque inhibition, similar to the results found by Joyston-Bechal et al. in 1993.[45,47] Subjects had the opportunity to rinse with all four rinses in the study by Quirynen et al. in 2001 and were asked to complete a subjective questionnaire regarding the taste of each rinse, loss of taste sensation, sensations on the tongue, staining on the teeth, and any other side effects.[47] The subjects preferred the taste of the new 0.12% chlorhexidine rinse with cetylpyridinium chloride compared with the other rinses ($p < 0.01$).[47] There were no significant differences among the tested chlorhexidine rinses for teeth staining.[47] Other studies support the findings of Quirynen et al., that is, rinsing with 0.12% chlorhexidine with cetylpyridinium chloride is not significantly different than 0.12% chlorhexidine rinse with alcohol on plaque accumulation and bacterial counts.[49,52] The only advantage the 0.12% CPC chlorhexidine had over the other formulations was better taste.

Although chlorhexidine applied as a 0.2% mouthrinse has been clinically and microbiologically proven to be effective as an anti-plaque and anti-gingivitis agent, adverse effects such as tooth staining, changes in taste perception, and poor taste of the solution have limited its long-term use. The lower concentrations of chlorhexidine mouthrinses have been shown to provide similar anti-plaque and anti-gingivitis effects as the 0.2% concentration and in particular, the cetylpyridinium formulation was shown to have a better taste. The method of applying the chlorhexidine solution, such as using an oral irrigator or brushing it on, may also reduce the potential adverse effect of epithelial desquamations by localizing the solution to the teeth. Regardless of the concentration or method of applying the chlorhexidine solution, tooth staining remains a concern for long-term use in subjects.

CHLORHEXIDINE GELS

Over the years, other methods of applying chlorhexidine were devised. The 1% chlorhexidine gel was developed as a means of incorporating the chlorhexidine into a subject's oral hygiene habits by substituting the subject's toothpaste with the gel. This method of application is thought to provide adjunctive benefits to mechanical oral hygiene, such as toothbrushing and flossing, in the prevention and treatment of gingivitis. To determine if a gel formulation of chlorhexidine would be retained intraorally, Bonesvoll in 1978 tested 1% chlorhexidine gel with various concentrations of chlorhexidine mouthrinses.[56] Results from the study indicated that 4 mg of chlorhexidine was retained after toothbrushing with 1 gram of 1% chlorhexidine gel, similar to the results of rinsing with 10 ml of 0.1% chlorhexidine mouthrinse for one minute.[56] The length of brushing time had little influence on the chlorhexidine gel retention, with times as short as 15 seconds having high retention levels.[56] According to Gjermo, Bonesvoll, and Rölla in 1974, the plaque-inhibiting effect of chlorhexidine is related to the amount of chlorhexidine retained.[69]

Chlorhexidine gels: short-term studies

Different study populations were used in the chlorhexidine gel studies, ranging from children to adults, with and without good oral hygiene habits. In an eight-week double-blind trial, children ranging in ages from 9 to 17 years old were instructed in toothbrushing techniques using either the 1% chlorhexidine gel or placebo.[59] There were no significant differences between the chlorhexidine gel and placebo for plaque and gingival scores after eight weeks.[59] The researchers speculate that both groups had

reductions in plaque and gingival scores because of the intensive oral hygiene instruction and professional prophylaxis. However, the study did demonstrate marked tooth staining in the chlorhexidine group compared with the placebo, with 45% of the chlorhexidine subjects exhibiting staining. [59]

A 1975 study by Hansen et al. used young adults to compare the efficacy of 1% chlorhexidine gel with placebo on plaque and gingival scores.[57] The chlorhexidine gel lowered the mean plaque index scores compared with placebo and mechanical oral hygiene, but this was noticeable only for the first four weeks, after which the scores rose to the levels of the controls.[57] The chlorhexidine gel had no effect on gingivitis but did cause more tooth staining than the placebo.[57]

In another study using an adult population, the 1% chlorhexidine gel appeared to have no effect on plaque index scores, gingival crevicular fluid, gingival index scores, and pocket depths compared with placebo over four weeks.[54]

The short-term studies on chlorhexidine gel generally demonstrate negative or inconclusive results. There may be various reasons that explain this lack of results, one of which may have been not to allow enough time for the positive effects of the initial professional prophylaxis to have mitigated. A literature search was therefore conducted for long-term studies using chlorhexidine gel.

Chlorhexidine gels: long-term studies

In a 1977 study by Cutress et al., nursing staff brushed the teeth of mentally challenged children with either a 1% chlorhexidine gel or placebo.[29] No clinical or statistical difference was noted between the chlorhexidine gel and the placebo for plaque or gingival scores over the six-month period.[29] The only significant difference was found for tooth staining, with 79% of the chlorhexidine group exhibiting stain compared with 41% of placebo subjects.[29] The researchers speculated that results were unfavourable due to the nature of the population, which made proper application of the chlorhexidine gel challenging.

It appears that the length of the chlorhexidine gel studies has no effect on the study outcomes. Another possible explanation for the inconclusive or lack of positive results may be the inactivation of the chlorhexidine in the gel vehicle. Yet, in both the 1997 Cutress et al. study and the 1975 Hansen et al. study, the chlorhexidine in the gel was found to be active.[29,57] Although the chlorhexidine gel was active, the studies did not demonstrate the anti-plaque and anti-gingivitis properties found in chlorhexidine mouthrinses. In all of the above studies, the subjects used the chlorhexidine gel only once a day, which may not have been a sufficient dosage. The anti-plaque and anti-gingivitis effect of chlorhexidine is dose-dependent,[51] with the optimal dosage being 40 mg a day.[2]

In comparison, in studies during which subjects have brushed with the chlorhexidine gel twice a day, the gel has been found to be effective in reducing plaque and gingivitis. Bassiouny and Grant in 1975 reported significant differences between a 1% chlorhexidine gel and placebo in plaque reduction and gingival index scores in adults wearing partial dentures.[17] Tooth staining was reported by 37% of the subjects in the chlorhexidine group and this was most visible on approximal surfaces and exposed roots.[17] Lie and Enersen in 1986 also reported significant reductions in plaque and bleeding sites in maintenance care subjects with poor oral hygiene.[30] Tooth staining increased from 0.39 to 1.33 ($p < 0.01$) in the chlorhexidine group and was most evident in non-smokers.[30]

The short-term studies on chlorhexidine gel generally demonstrate negative or inconclusive results.

Different methods of applying chlorhexidine gel

Although applying the chlorhexidine gel by toothbrush has been the most popular method, the gel has also been applied to the teeth by finger, toothpicks, and trays. In one study, 1 gram of the 1% chlorhexidine gel was applied with the subject's index finger to all the teeth.[58] The chlorhexidine gel was compared with placebo gel, 0.2% chlorhexidine mouthrinse, and Neem extract gel (*Azadirachta indica,* a plant found in India and southern Asia, that is commonly used for oral health care).[58] Table 3 shows the six-week results for plaque and gingival scores.

This study was conducted as an open labelled study, which is not ideal because of the potential for researcher bias in the interpretation of the results. Although tooth staining was not assessed in this study, it would have been interesting to see if there was any difference between the chlorhexidine gel and the mouthrinse.

	Mean plaque score	Mean gingival score
Control placebo gel	1.31 ± 0.20	1.140 ± 0.26
0.2% CHX mouthrinse	0.98 ± 0.20 *p< 0.05	0.92 ± 0.21 *p< 0.05
1% CHX gel	0.62 ± 0.29 *p< 0.05	0.52 ± 0.25 *p< 0.05
Neem extract gel	0.63 ± 0.24 *p< 0.05	0.60 ± 0.28 *p< 0.05

CHX = Chlorhexidine

* = Significant result compared with placebo gel, $p \leq 0.05$

Table 3. Comparison of 1% chlorhexidine gel and Neem extract gel with a positive control of 0.2% chlorhexidine mouthrinse and a negative control of placebo gel on mean plaque and gingival scores at six weeks in Pai et al.[58] Mean scores ± standard deviation.

Chlorhexidine gel has also been applied to the teeth with toothpicks. In a pilot study, seven subjects applied 1% chlorhexidine gel or placebo to the interproximal sites for one week.[55] There was no significant difference in plaque scores between the chlorhexidine gel and the placebo. The authors speculated that the mechanical cleaning effect of the toothpick and the motivation of the subjects resulted in the overall reduction in plaque in both groups.[55] There was the additional problem of the chlorhexidine gel accumulating on the buccal surface rather than being carried into the interproximal area, which may have affected the interproximal dental plaque scores.[55]

A 2003 study by Pannuti et al. used 0.5% chlorhexidine gel in trays twice a day and found significant reductions (22.4%, $p < 0.001$) in interdental bleeding after eight weeks compared with placebo.[31] The interdental bleeding increased by 6.1% in the placebo group.[31] In this study, a total daily dose of 120 mg was provided to the subjects.[31] The chlorhexidine group had significantly more tooth staining (81.8% of the subjects) than the placebo group, which had one person present with staining after the placebo gel application.[31]

Francis et al. in 1986 compared 1% chlorhexidine gel in trays to 0.2% chlorhexidine mouthrinse and 0.2% chlorhexidine spray in handicapped children.[70] The chlorhexidine was applied twice a day, regardless of the application method, for four weeks followed by a three-week washout period.[70] In this crossover study, each group received all three methods of chlorhexidine application.[70] Although all three methods were effective in reducing plaque and gingival bleeding scores, the gel was significantly more effective.[70] This difference was attributed to better coverage of the teeth and a higher dosage with the chlorhexidine gel.[70] The tray method has the advantage of providing complete and consistent coverage of the teeth, especially in subjects who are unable to rinse for one minute.[70]

Chlorhexidine gel may provide a convenient mode of application for some subjects but to achieve good anti-plaque and anti-gingivitis effects, the gel must be used twice a day to ensure an optimal dose. Unfortunately, chlorhexidine gel does not eliminate tooth staining.

CHLORHEXIDINE SPRAY

Chlorhexidine has also been applied with a non-aerosol spray. Chlorhexidine spray had originally been used in handicapped populations because of their inability to rinse with chlorhexidine for one minute. Spraying twice a day delivers approximately 1.4 to 2 ml of chlorhexidine, which is one-seventh of the optimal mouthrinse dose of 0.2% chlorhexidine. However, it has the same effect on plaque formation and gingival bleeding as the mouthrinse.[70-72] Twice-a-day spraying of a 0.2% chlorhexidine significantly reduced plaque and gingival bleeding scores compared with placebo in handicapped children and adults.[70,71]

A study comparing the anti-plaque and anti-gingivitis properties of 0.2% stannous fluoride and 0.2% chlorhexidine sprays in handicapped children demonstrated that both sprays were effective in reducing plaque and gingival scores.[33] However, the chlorhexidine spray was significantly better than the stannous fluoride ($p < 0.05$).[33] When a 0.2% chlorhexidine spray is used as an adjunct to mechanical oral hygiene procedures, the chlorhexidine continues to have noticeable clinical and statistically significant reductions in plaque and bleeding scores compared with toothbrushing alone and placebo.[73]

A lower concentration of chlorhexidine spray has also been studied. A 0.12% chlorhexidine spray, in addition to the oral hygiene procedures being provided to the subjects from residential caregivers, significantly reduced plaque ($p = 0.002$) and improved gingival colour ($p = 0.09$), tone ($p = 0.02$), and bleeding ($p = 0.03$) compared with placebo in institutionalized subjects.[32]

For some population groups, twice-a-day spraying of chlorhexidine is not feasible, especially in situations where a caregiver is responsible for the subject's personal hygiene.[34,74] There have been controversial results with a once-a-day spraying of 0.2% chlorhexidine. Although Dever in a 1979 study states that a daily 0.2% chlorhexidine spray produced statistically significant reductions in plaque and gingival inflammation compared with placebo, he discusses the possibility that 5 ml of a 0.2% chlorhexidine spray may not be clinically significant.[34] This may have been due to the initial high plaque and gingival scores, which were not treated with a preliminary professional prophylaxis.[34] Studies have shown that chlorhexidine is more effective on de novo plaque than mature plaque.[2]

Another study, with better controls, was undertaken in 2003 by Clavero et al. to compare the plaque and gingival efficacy of 0.2% chlorhexidine sprays applied once and twice a day in a geriatric population.[74] One group used the 0.2% chlorhexidine spray twice a day and the other group used the chlorhexidine once a day and a placebo spray once a day.[74] Both groups received an initial professional prophylaxis and continued their usual oral hygiene practices.[74] Study results indicated that the once-a-day spraying was just as effective as twice-a-day spraying on plaque accumulation and gingival inflammation.[74]

In most of the studies involving chlorhexidine spraying, there was no tooth staining or less tooth staining than with the chlorhexidine mouthrinse.[32-34,70,72,74] Only Francis et al.'s study in 1987 stated that the tooth staining from chlorhexidine was similar for mouthrinses, sprays, and gels in trays.[70] The reduction in tooth staining may have been the result of the overall lower dosages of chlorhexidine being applied by spray.[10,40]

The advantage of using a spray versus a mouthrinse or gel is the ease of application for a caregiver or parent when administering the chlorhexidine to the subject.[32,34,71-74] Since the spray method localizes the areas of the mouth to be treated by the chlorhexidine, adverse effects may be minimized.[72]

NOVEL METHODS OF APPLYING CHLORHEXIDINE

Most subjects routinely use a toothbrush and toothpaste to remove dental plaque.[28] Therefore, incorporating chlorhexidine into a toothpaste product could provide an easy substitution for subjects to incorporate into their daily oral hygiene regime. A study was conducted comparing toothpastes containing either 0.8% chlorhexidine and inorganic abrasives or 0.6% chlorhexidine and polymer particles with a placebo paste for two months.[7] The active toothpastes had significantly lower mean plaque index scores than the placebo, with a tendency for the differences to increase with time.[7] The chlorhexidine in the toothpaste was stable for up to six months and showed no changes in antibacterial activity in vitro.[7]

Other studies combined chlorhexidine with zinc citrate, sodium fluoride, or triclosan.[22,61,63] Combining 0.4% chlorhexidine with 0.34% zinc in an experimental dentifrice was effective in reducing plaque and gingivitis compared to a gum care dentifrice.[21] The addition of 1000 parts per million of sodium fluoride to a 1% chlorhexidine toothpaste also showed significant reductions in plaque, gingivitis, and gingival bleeding compared with placebo.[22] However, in both studies, increased supragingival calculus formation and tooth staining were reported with the toothpastes containing the chlorhexidine.[21,22] Jenkins et al. in 1990 experimented with 13 combinations of chlorhexidine and other active ingredients and compared these with water (negative control) and 0.2% chlorhexidine mouthrinse (positive control) to determine their antibacterial effects.[61] Although all the toothpaste combinations showed some anti-bacterial effects, the toothpastes were able to reduce the salivary bacterial counts only for a maximum of five hours compared with seven hours in the 0.2% chlorhexidine mouthrinse group.[61] The reduction in bacterial counts was better for the subjects using the 0.2% chlorhexidine mouthrinse (70%) compared with the subjects using the chlorhexidine toothpastes (35%).[61] Jenkins et al. conclude that there is little clinical benefit for subjects to use dentifrices containing chlorhexidine because the anti-microbial effect is reduced.[61] Toothpastes containing chlorhexidine are not commercially produced because tooth staining and increased calculus formation on the teeth are significant concerns for consumers.[22]

Dental floss is another tool that subjects are familiar with in their oral hygiene practices. However, the use of dental floss is considerably lower than toothbrushes. For example, only 22% of the Canadian population used dental floss on a regular basis in 1996.[28] Studies have shown that toothbrushing alone is ineffective in maintaining gingival health in the interproximal areas[26,27] where gingival inflammation is the most prevalent.[67,68] Dental floss has been found to be an effective mechanical method of treating and preventing interproximal gingivitis.[25-27] Kinane et al. in 1992 decided to combine the mechanical effectiveness of dental floss with the chemical effectiveness of chlorhexidine to determine if this device would be better at reducing gingival bleeding than dental floss alone.[62] A floss holder was designed to deliver 25 µl of 0.1% chlorhexidine into each interdental embrasure while the floss was in position interdentally.[62] This was compared with a similar floss holder with placebo solution and conventional dental floss.[62] The percentage bleeding reduction after two weeks was as follows: 38.3% for conventional floss, 51.5% for the flossing device with chlorhexidine, and 51.4% for the flossing device with placebo.[62] The lack of significant inter-group differences was attributed to insufficient daily dose of chlorhexidine: 0.25 to 0.50 mg per day compared with the recommended 4 mg of sprayed chlorhexidine.[70-73] The authors concluded that higher concentrations, volumes, or twice-a-day usage could have improved the results of the study.[62] However, the method itself may have precluded the penetration of the chlorhexidine into the interproximal sites because as it was described in the article, the floss was already placed in the interproximal area then the chlorhexidine was sprayed. This may have resulted in most of the chlorhexidine being applied to the lingual and buccal surfaces of the teeth or at best to the line angles. There is no way to know, for the study only examined the interproximal sites. This may explain why the two flossing devices had similar results because only the mechanical plaque removal would thus be exerting an effect on the gingival bleeding. The better results for the flossing device compared with the conventional floss was attributed to ease of use and novelty of the device.

The future trend is towards professional dental placement of slow-release chlorhexidine chips or other implantable devices for the treatment of periodontal disease.[6,66] This method offers a controlled, localized approach for treating specific sites while virtually eliminating the common adverse effects of chlorhexidine. Soskolone et al. in 1997 placed a biodegradable chip containing 2.5 mg of chlorhexidine into periodontal pockets, which were previously treated with conventional scaling and root planing at baseline and again at three months.[6] These sites were compared with scaling- and root-planing-only sites in each subject. Probing depths were significantly reduced in sites treated with the chlorhexidine chip compared with scaling and root planing alone (1.16 mm $\pm$ 0.058 versus 0.70 mm $\pm$ 0.056, $p < 0.0001$, respectively).[6] Gingival index scores were significantly reduced in treated sites, but plaque and bleeding changes were negligible compared with the control sites. Since the chlorhexidine chips were placed subgingivally, tooth staining was not apparent. It was unfortunate that a scaling and root planing was not performed on the control sites at three months when the second chlorhexidine chip was inserted, to provide a better comparison between the sites at the six-month assessment because scaling and root planing also have positive gingival benefits. The positive effects of scaling and root planing wane after a few weeks and would not exert an influence six months later but could influence a gingival effect at three months.[25,43,46,60]

CONCLUSION

Concentrations of chlorhexidine that are lower than the gold standard of 0.2% has been shown to effectively inhibit plaque formation and reduce the bleeding and

inflammation associated with gingivitis. Numerous modes of delivery have been explored to optimize the anti-plaque and anti-gingivitis properties of chlorhexidine while at the same time controlling or eliminating its unwanted adverse effects. The only mode of delivery successful at achieving this in the past was spraying the chlorhexidine onto the teeth. As the development of implantable, biodegradable systems matures, there is an increased likelihood that chlorhexidine will be delivered by this method because the use of localized techniques ensures optimal dosage of the chlorhexidine at the site, with minimal adverse effects and compliance from the subject. The success of any treatment will depend on an accurate diagnosis, appropriate choice of treatment for the oral condition and the subject's abilities, and subject compliance in following the appointed directions. It is the clinician's responsibility to choose the most appropriate method for his or her client.

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Personal Digital Assistants: Exploration of their Use in Dental Hygiene Education and Practice

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ABSTRACT

Personal Digital Assistant (PDA) is the generic term for various hand-held electronic devices that are increasingly used in education and health care as well as business environments. While several articles have been published on the use of PDAs in medical and nursing education, a MedLine search found no articles on the utilization of PDAs in dental hygiene programs. This article reports on the experimental usage of PDAs by a few students in one dental hygiene program.

In a small northern Canadian college, PDAs were first tried in the nursing program on a limited basis with 11 students. After one year of use, the nursing students reported favourably about the use of PDAs in their educational program. The next year, the PDAs were offered to the dental hygiene students. Five students took this opportunity to utilize the PDAs. Little guidance was given to the students and limited software was available. However, the students were generally positive about their PDA experience.

PDAs may be the wave of the future in health education, allowing better access to meeting standards of care and best practices information.

Keywords: Computers, handheld; dental hygienists; education, professional; personal digital assistants

INTRODUCTION

PERSONAL DATA ASSISTANT (PDA) SIGHTINGS ARE increasing on college and university campuses as PDAs become easier to use, have more available software programs, and become more affordable. A personal digital assistant is the generic term for various hand-held electronic devices used in business and health care fields. While there are a number of mobile technologies available, PDAs are the most frequently used type of these technologies.[1]

PDA technology can connect health care professionals with the most current information and this technology is the wave of the future.[2] Health care professionals are currently using PDAs to help them perform their jobs. Some examples are updating address books, keeping track of appointments, checking drug references, ordering medications, accessing patient records, and viewing lab results.[3] PDAs are also a convenient way to "organize daily schedules, take notes, record voice memos and lectures, write and rehearse PowerPoint presentations, collect and audit data in clinics, compile logbooks in clinics, and view journal articles, clinical photos and movies."[4] The expanding usage of PDAs in practice supports the introduction of PDAs in health education.

LITERATURE REVIEW

The University of Louisville was one of the first universities to make hand-held PDAs an integral part of its educational curricula in 2002.[2] The university's schools of medicine and dentistry purchased and distributed 1,100 Palm PDAs to students.[2] Through technology grants, Palm, Inc. has provided many hand-held computers for students in medicines, dentistry, pharmacology, and veterinary medicine.[5] While PDAs are much more prevalent in medical schools than dentistry, Palm, Inc. has supplied PDAs for the Indiana University School of Dentistry to trace treatments and access curriculum resources. Palm, Inc. has also supplied PDAs to the New York University College of Dentistry where the dental faculty is creating English-to-Spanish and Spanish-to-English translations of dental health history, emergency treatment, diagnosis, and treatment planning procedures.[5]

Several articles have been published on the use of PDAs in medical and nursing education. A 2004 study of 1,331 physicians showed that 73% of young physicians completing their residency used PDAs while only 45% of physicians over 40 used PDAs.[3] Miller et al. reported research on PDAs used as a means to prepare nursing professionals.[1] Miller designed a pre-post and comparative group design to determine how student use of PDAs would affect their information-seeking behaviour.[1] Second-degree students entering an accelerated baccalaureate program were required to purchase PDAs; the second-degree students in the regular baccalaureate program formed the comparison group.[1] Miller et al. found that both groups were active seekers of information. When the experimental group used their PDAs, they decreased their reliance on textbooks and clinical faculty.[1] Another unanticipated result was the increased interest in PDAs by the students in the control group.[1]

Ndiwane's pilot study in 2005 discussed several challenges of clinical teaching to nursing students with ratios of 1 to 8 or even 10. Shifting the delivery of health care

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RÉSUMÉ

Assistant numérique personnel (ANP) est le terme générique qui désigne divers appareils électroniques de poche de plus en plus employés tant en éducation et en santé que dans le domaine commercial. Même si plusieurs articles ont été publiés sur l'emploi de l'ANP dans l'enseignement de la médecine et des techniques infirmières, une recherche dans MedLine n'a pas permis de trouver un seul article sur l'utilisation de l'ANP dans les programmes d'hygiène dentaire. Le présent article rend compte de l'utilisation expérimentale de l'ANP par quelques étudiants inscrits à un programme d'hygiène dentaire.

Dans un petit collège du Nord canadien, on a d'abord fait l'essai de l'ANP dans le programme de techniques infirmières sur une base limitée, auprès de 11 étudiants. Après une année d'utilisation, ces derniers se sont dits satisfaits de l'emploi de l'ANP dans leur programme de formation. L'année suivante, on a offert aux étudiants en hygiène dentaire de se servir de l'ANP. Cinq étudiants ont profité de l'occasion pour utiliser l'appareil. Les étudiants n'ont pas eu beaucoup d'encadrement et n'avaient pas beaucoup de logiciels à leur disposition. Toutefois, leur réaction à la suite de cette expérience a été dans l'ensemble positive.

Il se peut que l'ANP soit l'instrument de l'avenir dans l'enseignement des disciplines reliées à la santé et qu'il facilite l'accès à l'information sur le respect des normes de soins et les pratiques exemplaires.

from hospitals to community settings makes supervision even more challenging.[6] A new strategy in teaching is a more efficient use of technology to meet the clinical needs of nursing students. Nursing students in a community health class were recruited to participate in a pilot test of the use of the Tracker system, a computerized information device that facilitates secure electronic communication between students at clinical sites and clinical faculty at other locations.[6] Overall, the students reported improved learning and communication, improved patient assessment, and efficient data input and transmission despite some minor technical glitches.[6] The system also improved student confidence in an autonomous practice setting.[6]

Stroud, Erkel, and Smith in 2005 surveyed via a questionnaire the prevalence and usage of PDAs by nurse practitioner students and faculty. The prevalence-of-use rate of the 227 respondents was 67%.[7] The students' primary motivation for using the PDAs was clinical decision making[7] while the majority of faculty had obtained a PDA to manage personal information.[7] Almost all respondents had at least one medical software program, two thirds had a medical text reference, and half had practice guidelines installed on their PDAs.[7]

A literature search of MedLine found no articles on the utilization of PDAs in dental hygiene programs. The purpose of this paper is to report on a pilot project on the use of personal digital assistants (PDAs) in a Canadian dental hygiene program. The paper will also discuss the possible uses of PDAs in dental hygiene education and practice.

PROJECT HISTORY AND BACKGROUND

During a leadership campaign in the Health Sciences and Social Services Division at the College of New Caledonia (CNC), a baccalaureate nursing program steering committee (consisting of two nursing faculty, one nursing student, and the dean) developed an initiative to introduce PDAs into the clinical setting by providing them to several educators and students.[8] The purpose of that initiative was to explore how PDAs might impact nursing education and practice.[8] The dean and nursing faculty, who already had been using PDAs, were initially role models for other faculty and students on how PDA usage had enhanced their work and personal lives. The students already using PDAs found that electronic organizers were far superior to other methods of organizing and accessing information sources.[8] The next step was to obtain PDAs that could be lent by the division to interested student participants. A plan outlining the goals and outcomes of the project was presented to the president of the college, who supported the project and provided financial support for the purchase of several PDAs.[8] Following local cost analysis, seven Palm Pilots (model M-130) were purchased. Shortly after, two more units were donated to the project, bringing the total number of PDAs to nine units.[8] The steering committee then identified and obtained appropriate software. Over $2,000 in PDA file programs was eventually donated by various companies for use during the length of the nursing pilot project at CNC.[8] A limited number of second-year nursing students were identified to participate in the year-long project and were taught the basic use of hand-held computers. The nursing student participants could use the Palm Pilots as they saw fit during the next five months of their education.[8]

In a formal survey after this period, over 90% of the nursing students indicated it was beneficial having a PDA and 75% recommended PDAs for all nursing students.[8] Some of the students used the PDAs for accessing drug guide information; the majority used it as a day timer, alarm, word processor, and calculator.[8] The students recommended that the PDA software be purchased in place of textbooks; however, buying both textbooks and PDA software would be cost prohibitive.[8]

The PDAs were returned to the dean's office at the end of the 2003/2004 academic year. The dean then decided to make the hand-held Palms available to another program in the division. The CNC Dental Studies asked that students in either the dental hygiene or dental assisting programs have the opportunity to use the Palms during the academic year of 2004/2005.

The dental hygiene and dental assisting students were informed that PDAs were available for a period of one academic year. Interested students submitted written requests

together with the reasons they would like to use a PDA. Students had different reasons for wanting to try the Palm Pilots. Students were curious about the usefulness of PDAs. One student commented she "had seen many people who seemed to enjoy using them" and therefore wanted to try one out. The dental hygiene students generally hoped that the PDA could enhance their organizational and time management skills.

In November, the five participating dental hygiene students were given the PDAs. The Palm Pilots had limited memory capacity and were without any software other than the most basic electronic organizer program. The entire effort was very informal and there was no direction given on recommended ways to use the Palm Plots or on the basics of operating the devices.

OUTCOMES OF THE PROJECT

At the end of the academic year, the Palm Pilots were returned. The students were asked to report informally via e-mail on their experience and then asked to complete a structured questionnaire. Responses varied regarding the usefulness of the PDAs. Student 1 reported that "I found the Palm Pilots easier to use than the notebook day planner." Student 2 said that she preferred writing in notebooks to using the PDA. Student 3 explained that it was useful as an organizer but "its [the PDA] usefulness could be greatly enhanced by having dental software packages." Most of the students who used the PDAs did not use them every day. The lack of software applicable to dental hygiene education was one of the problems cited. The time it took to figure out how to use the PDAs was another issue raised in the self-reported experience of the students. Student 2 said "I felt like I was wasting valuable time just programming the thing and I found that I preferred to look at information on paper." The one student who did use it daily mentioned that she found using electronic devices easy and that her handwritten notebook was at times illegible. Student 3 reported, "I enjoyed using it (the PDA) so much that I bought a newer version." The variation in responses was not surprising considering the newness of this technology and the fact that neither faculty nor students in the program were previously using a PDA.

An outcome of the Health Sciences Divisional experience is that the CNC nursing program and CNC Institute of Learning and Teaching received a substantive grant from BCCampus (gateway to all on-line courses, programs and services for students in higher education within British Columbia) to put their courses on-line. The unique aspect of this grant work will be the incorporation of PDAs into the curriculum. As a result of the project, the interest of three faculty members in CNC Dental Studies was piqued. They borrowed the Palm Pilots over the summer of 2005 to become familiar with PDAs. The dental hygiene program is considering applying for a similar grant.

SUGGESTIONS FOR USING PDAs

PDAs seem able to help dental hygiene students organize their work and have a better learning experience. Ideally, students should be comfortable using the Palm Pilots before they begin the program or at least within the first week of classes. As well, software specific to dental hygiene would increase the usefulness of PDAs. An example would be a program into which one could enter medications that would determine whether the proposed dental hygiene treatment is contraindicated. In January 2003, the Canadian Pharmacists Association received funding from Health Canada's Primary Health Care Transition Fund to develop a portal that will allow medical practitioners to access current drug and therapeutic information that is downloadable to PDAs.[9]

PDAs can assist students with additional instruction and practice as well as further clarification of difficult concepts. Students could review video clips of clinical procedures outside of regular clinic practice times. For students in the earliest phase of education, videos showing instrumentation techniques or local anesthetic landmarks could be beneficial as numbers of instructors are limited and learning is enhanced by repetition. Students could review instrumentation techniques and classes at home on the PDA, allowing for off-campus access to class and clinically related information. Students can also ensure they understand materials with practice quizzes prior to formal exams.

The PDAs can give the student access to an immense amount of information in the clinical environment that would be challenging and time-consuming to locate otherwise. Students could have—literally at their fingertips—access to information on disease signs, symptoms and oral manifestations, drug interactions, and local anesthetic contraindications. Simple programs could calculate in seconds the maximum amounts of local anesthetic according to age and weight as well as appropriate amounts of epinephrine to administer.

There are several software options of interest that are applicable to dental hygiene:

- ePocrates qRx is a free drug database.
- ePocrates QID is an infectious disease database.
- DocAlert, free from ePocrates, downloads medical news.
- Dental Lexi-Drugs is a database of over 5,000 drugs and gives dental-relevant information including anesthetic and vasoconstrictor precautions.
- Five-Minute clinical consult provides a quick pathology reference.
- Dentalog maintains patient demographics, insurance information, clinical information, medical and dental history, treatment planning, prescriptions, and clinical notes.
- Palm Corporate Dental Application is set to record over 600 procedures and a basic Palm hand-held can store approximately 6,000 patient records.[10]

Dental charting programs could reduce or eliminate some of the problems regarding illegibility and discrepancies amongst symbols. This major weakness in dentistry came to light after the September 11, 2001, tragedy. So that clients receive optimum care when they change dental offices, the clients' charts could be transferred easily via disk or sent electronically. Ultimately, PDAs could be a possible answer to creating a standardized charting sys-

tem. Such a digital system would not only provide long-term records for clients but would make research easier as comparisons could be made from office to office with a higher degree of accuracy. Information for research purposes could be easily shared as well, client/patient permitting. Practitioners could be prompted to ask certain questions, based on a client's health history, periodontal status statements, and charting information. This could therefore reduce the human error that can occur when things are overlooked.

In dental hygiene practice, PDAs could be a more aseptic way to complete dental charting and record client information than the current paper system. PDAs are small and easy to barrier-wrap. At the end of the day, the PDAs could load the information into the office's computer for long-term storage. Retrieval of information is quick and easy because the PDAs connect directly to the computer.

PDAs with a voice-activated charting system could lessen the time it takes to record pertinent information and thus be a cost-efficient way to increase productivity in a market where dental hygienist services are in such demand. The office staff could have their schedules sent from the office computer to their PDAs and eliminate the paper used to print individual schedules. If schedules change, as they so often do, the schedule can be quickly and neatly changed electronically and the client's chart would be readily accessible.

DISCUSSION

This project has been enlightening and has made a difference in how the CNC Dental Hygiene department looks at on-line education and PDAs. However, several significant limitations existed in this project. First, there were a very small number of dental hygiene students who participated. Of the 17 second-year students, only 2 chose to participate; of the 20 first-year students, only 3 chose to participate. Second, student participants received no guidance from the department or faculty. At the beginning of this project, dental hygiene faculty were not using PDAs. In fact, the majority of faculty were unfamiliar with the devices and rather skeptical about their use in dental hygiene education. That attitude has since changed significantly. Third, there was a lack of software programs for the dental hygiene students to use on the Palm Pilots as the agreements regarding software for the nursing students were limited to the time of the nursing project. When the dental hygiene students received the Palm Pilots, there was only basic scheduling software sufficient for organizing schedules, appointments, due dates, and telephone numbers. There will likely be limited opportunity for continued use of Palms in the dental hygiene department at this time. They have been returned to the dean's office and will most likely be lent to students in another program in the division for the academic year 2005/2006.

Research is needed to determine if using PDAs in the dental office is worth implementing. Also, the actual effects of PDAs on the learning process and efficiency in the school and workplace need to be investigated. While PDAs could have many useful applications, one needs to consider the intended use of the PDAs carefully and then purchase the appropriate device. There are many different models and PDAs may be purchased as a singular device or as part of a mobile phone unit. As with all technology, there is a learning curve that requires patience and practice. There is limited applicable software at this time; however, that will change as more dental hygienists and dentists start to use PDAs. The following websites are useful to explore for more information on PDAs:

- www.handheldsfordoctors.com
- www.viewz.com/aol/guides/pda.shtml
- palmtops.about.com/cs/palmessentials/bb/beforeyoubuy.htm
- welcome.hp.com/country/ca/en/prodserv/handheld.html

CONCLUSION

PDAs are increasingly popular in the business, education, and health care fields. Using PDAs will be a challenge for many dental hygiene students, educators, and programs as incorporating new technology can be a daunting task. However, this is a good time for dental hygienists and educators to begin discussions on the value and usage of personal digital assistants in clinical practice.

ACKNOWLEDGEMENTS

The authors would like to acknowledge Dr. June Anonson, the previous Dean of Health Sciences and Social Services, for her vision in this area of education and for her providing all the departments in the division the opportunity to use the Palm Pilots in education. The authors also thank Marion Healey-Odgen and Patricia Noble for editing assistance.

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Working Interviews for Dental Hygienists: Some Issues to Consider

by CDHA Staff

WHETHER YOU ARE A NEW GRADUATE SEEKING YOUR first position as a dental hygienist or you are a currently practising dental hygienist applying for a new position, you may encounter a prospective employer who asks you to participate in a working interview where you work in the employer's operatory for a short period of time. CDHA is not aware of any federal or provincial legislation that prevents employers from making such a request.

Before agreeing to a working interview, it is appropriate and makes good sense to discuss and clarify the following:

- what you both mean by "working interview";
- your and the employer's expectations regarding the working interview;
- expected outcomes of the interview and how they will be measured;
- length of the working interview period (1 day, 2 days, etc.;
- orientation process (provides an opportunity to become familiar with the office policies and procedures for client care prior to the actual day of the interview);
- what assistance that will be available to you during the working interview period;
- how the working interview will impact the offer of employment;
- reimbursement for your travel and/or accommodation expenses incurred in order to participate in the working interview; and
- reimbursement for the services rendered during the working interview.

It is advisable to take notes when you negotiate the terms of the working interview and to obtain explicit written commitment from the employer. You should

- confirm everything about the interview in writing, definitions, expectations, terms, etc.
- ensure that the potential employer will advise clients that you are not an employee or contactor for the employer, but that you are providing services as part of a working interview. The clients should sign a consent form.
- ensure that the potential employer is evaluating your work throughout the day and not simply using the working interview in lieu of a temporary placement service;
- speak to a lawyer specializing in employment law to ensure that your rights are being protected.

Remember, if you are uncomfortable with any aspects of the proposed interview, you can decline to participate. You are not obliged to agree to participate in a working interview. If you do decide to go ahead with the working, it can often be an effective process to assess the possibility of a working relationship and to learn more about the potential employer and the practice setting.

Be aware that neither the payment of expenses related to participating in the working interview nor the remuneration you receive for your services in this interview can be construed as express or implied agreement to employment by either the potential employee or the employer.

If you decide to go ahead with the working interview, it is crucial that you have the appropriate classification of registration/licensure and liability insurance coverage in the jurisdiction where the interview will occur *before* providing care to a client, regardless of when or where this care is given. Dental hygienists who take part in a working interview in a jurisdiction in which they are not registered/licensed would be practising illegally and would be subject to the penalties set out in that jurisdiction. As well, liability insurance is usually dependent on compliance with jurisdictional legislation. Therefore the lack of coverage would therefore leave both the dental hygienist and the potential employer open to liability from any clients they treat.

There are alternatives to the working interview:

- a "regular" interview with a comprehensive résumé and a probationary period;
- references from peers, co-workers or previous employers specific to the dental hygienist's clinical skills, ability to work with others, and time management;
- letters of reference from clients in the dental hygienists' employment documentation;
- a portfolio or record of the continuing education/ competency courses taken or completed;
- specific evidence of feedback from continuing education or refresher courses, such as periodontal root planing courses, dental hygiene refresher courses, and continuing education transcripts.

This is a brief outline of some of the issues you should be looking out for if you go for a working interview. The regulatory body of the jurisdiction where the working interview will occur should be contacted if you have specific concerns.

The provincial and territorial regulatory bodies are listed at the end of the article.

Entrevues de travail

LES NOUVELLES DIPLÔMÉES ET LES NOUVEAUX DIPLÔMÉS en quête de leur premier emploi comme hygiénistes dentaires ou les hygiénistes dentaires à la recherche d'un nouvel emploi sont susceptibles de rencontrer un employeur éventuel qui leur demandera de participer à une entrevue de travail pendant laquelle ils seront appelés à travailler au cabinet dentaire de l'employeur pendant une brève période de temps. L'ACHD ne connaît aucune loi fédérale ou provinciale qui empêche les employeurs de faire une demande de ce genre.

Avant d'accepter de participer à une entrevue de travail, il convient de discuter et de préciser les questions suivantes, ce qui est plein de bon sens :

- le sens que l'employeur et vous donnez à « entrevue de travail »;
- les attentes de l'employeur et les vôtres par rapport à cette entrevue;
- les résultats escomptés de l'entrevue et la façon dont ils seront évalués;
- la durée de la période de l'entrevue de travail (une journée, deux jours, etc.);
- le processus d'orientation (par exemple, avant la journée de l'entrevue, se familiariser avec les politiques du bureau et les procédures relatives aux soins à apporter aux patients);
- l'aide dont vous disposerez au cours de cette entrevue;
- les incidences de l'entrevue de travail sur l'offre d'emploi;
- le remboursement des frais de déplacement et d'hébergement, s'il y a lieu, que vous aurez engagés pour participer à l'entrevue;
- le remboursement pour les services rendus pendant l'entrevue en question.

Il est recommandé de prendre des notes lors de la négociation des modalités de l'entrevue de travail et d'obtenir par écrit un engagement explicite de la part de l'employeur. Il faut :

- confirmer par écrit tout ce qui concerne l'entrevue : définitions, attentes, modalités, etc.;
- vous assurer que l'employeur potentiel avisera les patients que vous ne faites pas partie de son personnel régulier et que vous n'êtes pas non plus agente contractuelle ou agent contractuel auprès de lui, mais que fournissez des services dans le cadre d'une entrevue de travail, ce pour quoi les clients doivent signer un formulaire de consentement;
- vous assurer que l'employeur potentiel évaluera votre travail tout au long de la journée et n'utilisera pas l'entrevue de travail simplement en lieu et place d'un service de placement temporaire;
- parler à une avocate ou un avocat spécialisé en droit du travail pour vous assurer que vos droits sont protégés.

Rappelez-vous que, si certains aspects de l'entrevue proposée vous mettent mal à l'aise, vous avez la possibilité de ne pas y participer. En effet, rien ne vous oblige à accepter de participer à une entrevue de travail. Si vous décidez en fin de compte de vous y soumettre, vous disposerez souvent là d'un bon moyen d'évaluer la possibilité de relations de travail et de vous renseigner davantage au sujet de l'employeur éventuel et du milieu de travail.

Sachez que ni le paiement des dépenses reliées à votre participation à l'entrevue de travail ni la rémunération que vous recevrez pour vos services pendant cette entrevue ne peuvent être considérés comme un accord explicite ou implicite de votre part ou de la part de l'employeur en puissance en ce qui a trait à votre engagement.

Si vous décidez d'accepter l'entrevue de travail, il faut absolument que vous ayez la classification d'inscription ou l'autorisation d'exercer appropriée ainsi que la couverture d'assurance-responsabilité adéquate dans la province ou le territoire où se tiendra l'entrevue *avant* de donner des soins à un patient, peu importent le moment ou l'endroit où ces soins seront fournis. Les hygiénistes dentaires qui participent à une entrevue de travail dans une province ou un territoire où elles ou ils ne sont pas inscrits ou autorisés à exercer pratiquent illégalement et peuvent faire l'objet d'amendes légales dans la province ou le territoire en question. De même, l'assurance-responsabilité est généralement basée sur le respect de la législation provinciale ou territoriale. Par conséquent, s'ils n'ont pas cette assurance, l'hygiéniste dentaire et l'employeur s'exposent à des poursuites en responsabilité par les patients qu'ils traitent.

Il existe des solutions de rechange à l'entrevue de travail :

- une entrevue ordinaire, accompagnée d'un CV détaillé et d'une période de probation;
- des références de la part de pairs, de collègues de travail ou d'employeurs précédents portant spécifiquement sur les habiletés cliniques, la capacité de travailler en équipe et la gestion du temps;
- des lettres de référence de clients dans le dossier d'emploi de l'hygiéniste dentaire;
- la liste des cours de formation professionnelle continue ou de perfectionnement des compétences suivis jusqu'au bout ou non;
- une preuve précise de réactions à la suite de cours de formation professionnelle continue ou de cours de recyclage, tels que des cours de surfaçage radiculaire périodontique, des cours de recyclage en hygiène dentaire et des relevés de notes de cours de formation continue.

REGULATORY BODIES FOR THE PROVINCES AND TERRITORIES

British Columbia
College of Dental Hygienists of British Columbia
219 – 645 Fort Street
Victoria, BC V8W 1G2
Tel: 250-383-4101
Fax: 250-383-4144
Web: www.cdhbc.com

Alberta
Alberta Dental Hygienists' Association
Suite 206, 8657 – 51 Avenue NW
Edmonton, AB T6E 6A8
Tel: 780-465-1756
Fax: 780-440-0544
E-mail: adha@telus.net
Web: www.adha.ca

Saskatchewan
Saskatchewan Dental Hygienists Association
Box 25040, RPO Riverheights
Saskatoon, SK S7K 8B7
Tel: 306-931-7342
Fax: 306-931-7334
E-mail: SDHA@Sasktel.net

Manitoba
Manitoba Dental Association
103 – 698 Corydon Avenue
Winnipeg, MB R3M 0X9
Tel: 204-988-5300
Fax: 204-988-5310
E-mail: office@manitobadentist.ca
Web: www.manitobadentist.ca

[The Manitoba Dental Hygienists Act regarding self-regulation received Royal Assent late in 2005. However, the Act will not be proclaimed until the regulations and by-laws are written and the dental hygiene regulatory body is ready to register dental hygienists. This process usually takes about one year and is under the aegis of Manitoba Health. The Manitoba Dental Association will continue as the regulatory body until the Dental Hygienists Act is proclaimed.]

Ontario
College of Dental Hygienists of Ontario
300 – 69 Bloor Street East
Toronto, ON M4W 1A9
Tel: 416-961-6234 ext. 229
Fax: 416-961-6028 or 1-800-268-2346
E-mail: registrar@cdho.org
Web: www.cdho.org

Quebec
Ordre des hygiénistes dentaires du Québec
1290, St-Denis, 3e étage
Montréal, QC H2X 3J7
Tel: 514-284-7639 or 1-800-361-2996
Fax: 514-284-3147
E-mail: info@ohdq.com
Web: www.ohdq.com

New Brunswick
New Brunswick Dental Society
820 – 520 King Street Carleton Place
P.O. Box 488, Station "A"
Fredericton, NB E3B 4Z9
Tel: 506-452-8575
Fax: 506-452-1872
E-mail: nbds@nb.aibn.com
Web: www.nbds.ca

Nova Scotia
Provincial Dental Board of Nova Scotia
102 – 1559 Brunswick Street
Halifax, NS B3J 2G1
Tel: 902-420-0083
Fax: 902-492-0301
E-mail: pdbns@hfx.eastlink.ca
Web: www.nsdha.ns.ca

Prince Edward Island
Dental Council of Prince Edward Island
184 Belvedere Avenue
Charlottetown, PE C1A 2Z1
Tel: 902-566-5199
Fax: 902-892-4470
E-mail: info@dapei.ca

Newfoundland and Labrador
Newfoundland and Labrador Dental Board
139 Water Street, Fortis Bldg., 6th Floor
St. John's NL A1C 1B2
Tel: 709-579-2391
Fax: 709-579-2392
E-mail: nldb@nf.aibn.com

Yukon
Department of Community Services
Government of Yukon
P.O. Box 2703 C-5
White Horse, YK Y1A 2C6
Tel: 867-667-5940
Fax: 867-667-3609
E-mail: darcie.gignac@gov.yk.ca
Web: www.gov.yk.ca

Northwest Territories
Dept. of Health and Social Services, Government of N.W.T.
Box 1320 8th Floor, Centre Square Tower
Yellowknife NT X1A 2L9
Tel: 867-920-8058
Fax: 867-873-0484
E-mail: jeannette_hall@gov.nt.ca

Nunavut
Department of Health and Social Services
Government of Nunavut
2nd Floor Government Bldg. Box 390
Kugluktuk, NU X0B 0E0
Tel: 867-982-7672
Fax: 867-982-7640
E-mail: bvandenassem@gov.nu.ca

Travailler ensemble *(suite de la page 51)*

John Wicker a dit un jour : « Les occasions se multiplient dès qu'on les saisit; elles tombent à l'eau si on les néglige. Or la vie est une longue suite d'occasions ». Nous devons continuer à promouvoir l'aspect prévention de notre profession afin d'en améliorer l'image aux yeux du public et des autres professions de la santé ainsi qu'auprès des divers ordres de gouvernement. L'ACHD a certes travaillé fort pour rehausser le profil de la profession parmi ces divers groupes. Je crois d'ailleurs que l'actuelle contribution directe des hygiénistes dentaires à la sensibilisation aux liens qui existent entre la santé buccodentaire et le bien-être total montre à quel point les hygiénistes dentaires sont inestimables. Mais plus c'est toujours mieux! J'exhorte donc tous les hygiénistes dentaires qui ne s'investissent pas en ce moment dans la promotion de la santé à entrer en contact avec les organismes locaux ou provinciaux de professionnels de la santé, les associations dans le domaine de la santé et les groupes communautaires, et à se joindre à leurs collègues pour travailler ensemble à l'amélioration du bien-être de tous les Canadiens.

Le gouvernement fédéral reconnaît l'importance de la prévention des maladies chroniques. Il s'est engagé à mettre au point une Stratégie intégrée en matière de modes de vie sains et de maladies chroniques et à fournir 300 millions de dollars sur une période de cinq ans pour favoriser un mode de vie sain et prévenir les maladies chroniques. Compte tenu de l'intérêt du gouvernement fédéral à l'égard de la prévention, la profession d'hygiéniste dentaire est encouragée à continuer son plaidoyer en faveur d'une amélioration de l'accès aux soins de santé buccodentaire et bien placée pour le faire.

La nomination, il y a un an, du Dr Peter Cooney comme dentiste en chef à Santé Canada montre que le gouvernement reconnaît l'importance de la santé buccodentaire. Le Dr Cooney « aura pour principale mission de convaincre les Canadiens de prévenir les maladies buccodentaires et d'améliorer leur santé buccodentaire* ». Cette nomination est un autre signal important dans notre lutte destinée à améliorer l'accès des Canadiens aux soins de santé buccodentaire.

Enfin, et surtout, vous les bénévoles de la Manitoba Dental Hygienists Association qui avez travaillé avec diligence à réaliser votre objectif d'autonomie en 2005, je vous félicite tous et toutes. La mise à exécution de ce projet a été une longue lutte et vous méritez tous et toutes des louanges pour votre travail ardu, votre dévouement et votre persévérance. Réjouissez-vous de votre succès.

Hygiénistes dentaires d'un bout à l'autre du pays, je vous invite à vous engager dans vos associations provinciale et nationale pour faire avancer les intérêts de notre profession. Après tout, l'avenir consiste pour chacune et chacun de nous à créer la profession idéale et à en déterminer le destin.

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

* Santé Canada. Dentiste en chef à Santé Canada. Information. Janvier 2005. [Consulté le 26 janvier 2006]. Accessible sur le Web au : www.hc-sc.gc.ca/ahc-asc/media/nr-cp/2005/2005_dent_f.html.

Many Cultures of Dental Hygiene
Toronto, Canada · July 19 - 21, 2007

Call for Abstracts:
17th International Symposium on Dental Hygiene

The International Federation of Dental Hygiene (IFDH) is now accepting submissions for abstracts from interested parties for the 17th International Symposium on Dental Hygiene to be held in Toronto, Canada July 19–21, 2007. Please go to the CDHA home page at www.cdha.ca and click on the "Call for Abstracts" box for more information.

Brenda Leggett, CDHA's New Information Coordinator

The Canadian Dental Hygienists Association is pleased to announce that Brenda Leggett has assumed the position of the Information Coordinator. Ms. Leggett is a dental hygiene graduate of John Abbott College and holds an Interdisciplinary BA in Labour Studies from Carleton University. Ms. Leggett has over 20 years of experience as a dental hygiene educator at Georgian College and Algonquin College. She has practised in community health and remains active as a clinical dental hygienist in private practice. For 10 years, she has participated as an item writer for the National Dental Hygiene Certification examination. In 2004, Ms. Leggett completed the Library and Information Technician diploma program at Algonquin College and in this capacity looks forward to serving the members of the Association. She can be reached at <library@cdha.ca>.

2006 DHEC/ÉHDC Annual Educators' Workshop

Dental Hygiene Educators Canada/Éducateurs en Hygiène dentaire du Canada is pleased to announce the 7th Annual Educators' Workshop on June 15, 2006, in Edmonton, Alberta, in conjunction with the CDHA Annual Professional Conference.

Topic: Using rubrics to assess student learning

Assessing and evaluating dental hygiene student performance tasks can be a challenge. A rubric articulates the criteria for student activities and assignments along with the quality expected to achieve a specific mark. This session will demonstrate how thoroughly designed rubrics can be used in the evaluation process to benefit students and instructors. Characteristics of an effectively designed rubric will be explored as well as converting the criteria for evaluating a performance task into a rubric. Facilitated by Dr. Sally Brenton-Haden, Department of Educational Psychology, University of Alberta. This workshop is open to members and non-members of DHEC/EHDC.

Time: 2 p.m. – 4:30 p.m.

Fee:	*Before May 31, 2006*	*After May 31, 2006*
Members:	$50	$60
Non-members:	$100	$110

Send registration fee with name and affiliation to: DHEC/EHDC Administrative Office, PO Box 33034, 1363 Woodroffe Ave., Unit B, Ottawa, ON K2C 3Y9

For more information about the workshop, contact **scompton@ualberta.ca**. For information regarding membership, please go to **www.dhec.ca/join.html.**

Working Together *(continued from page 51)*

invaluable dental hygienists are. But more is always better! I urge all dental hygienists who are not involved in health promotion at the moment to get in touch with your local or provincial health professions, health associations, and community groups, and join your colleagues to work together to improve the well-being of all Canadians.

The federal government recognizes the importance of preventing chronic diseases. It has committed to creating an Integrated Strategy on Healthy Living and Chronic Disease and has also committed to provide $300 million over five years to encourage healthy living and to prevent chronic diseases. With the interest the federal government has in prevention, the profession of dental hygiene is encouraged and well situated to continue its advocacy for better access to oral health care.

The government's appointment a year ago of Dr. Peter Cooney as Chief Dental Officer for Health Canada shows that it recognizes the importance of oral health. Dr. Cooney's primary responsibilities are "to increase awareness about preventing oral diseases and to improve the oral health status of Canadians."* This appointment is another strong voice in our struggle to improve access to oral care for Canadians.

Last, but not least, I congratulate all the volunteers in the Manitoba Dental Hygienists Association who have worked diligently toward achieving their goal of self-governance in 2005. This endeavour has been a long struggle and you deserve all the praise for your hard work, dedication, and perseverance. Rejoice in your success.

I invite all dental hygienists across our country to get involved in your provincial and national association to further the interests of our profession. After all, the future is for all of us to shape and create the ideal profession.

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

* Health Canada. Chief Dental Officer for Health Canada. News release. January 2005 [cited 2006 Jan 26]. Available from: www.hc-sc.gc.ca/ahc-asc/media/nr-cp/2005/2005_dent_e.html

The 2005 Oral-B Health Promotion Awards
Spreading the good word about good oral hygiene

Year after year, it just keeps getting better and better. And more inventive. And waaaaaay more public. Every October, dental hygienists fan out across the land to get out the good word: oral health matters!

And every year at this time, we honour the very best ideas by handing out the kudos—and the cheques, $2,000 each to the best school or clinic/society and $1,000 to the best event by an individual. Monies are split between the winners and their respective local dental hygiene chapters.

"It's really quite invigorating," says Michele Christl, the Business Manager for Oral-B's Professional Products Group in Canada, the annual event's sponsor. "Dental hygienists are getting out of the office and into the community to spread the word about good oral hygiene. Kids, teens, adults—everyone is targeted. It's a wonderful way to connect with the community."

While extremely pleased with the level of participation, Canadian Dental Hygienists Association executive director, Susan Ziebarth, says she isn't surprised.

"This is an extremely caring—and fun—group of people who can't just turn it off when the office lights go out. They truly enjoy helping people and it shows," she says. "I've met dental hygienists and dental hygiene students from every province in Canada and I can tell you, Canadians are in good hands."

And the award goes to…

BEST EVENT BY AN INDIVIDUAL

"Celebrity Smiles"

Carol Matusiak, RDH, Glenburnie, ON

Carol Matusiak, a registered dental hygienist who works in a clinic setting in Kingston, Ontario, was instrumental in setting up a "Table Clinic" at a local supermarket. As well as making oral-health information available to passersby, she also handed out an assortment of brochures, coupons and samples, many of them products supplied by Oral-B.

KDDHS Kristen French, RDH *(left)*, Carol Matusiak, RDH *(right)*

What attracted people to the exhibit was a "Celebrity Smiles" contest in which people were invited to try to match celebrities with their smiles. The winner received an electric toothbrush courtesy of Oral-B.

It was also an opportunity for practical demonstrations on how to use both manual and electric toothbrushes and how to floss properly. "It was a successful and rewarding day promoting good oral health," reports Ms. Matusiak. And we're sure the crowds appreciated it, too.

A few of the "Bringing it to the Rink" Team members

BEST EVENT BY A SCHOOL

"Bringing it to the rink"

Saskatchewan Institute of Applied Science and Technology

Gap-toothed smiles? Not at this hockey rink! Year two students at the Saskatchewan Institute of Applied Science and Technology (SIAST) joined forces at a Regina Pats hockey

2005 Tooth Fairy Parade

game to spread the word about oral health in a fun, positive way.

As well as handing out more than 1,300 toothbrushes at the door, the group also staffed an information table that proved very popular, specially with Regina Pats mascot, K9.

While it was a great day for the fans, it was also educational for the students. It allowed them to be exposed to health promotion, marketing, education, collaboration, mass media and community organization.

Perhaps the best indicator of the success of the event was the parting comment of Regina Pats' Director of Game-Day Promotions, Chris Hutchinson: "We'd love to be part of this again in the future."

BEST EVENT BY A CLINIC OR SOCIETY

"2005 Tooth Fairy Parade"

York Region Dental Hygienists' Society (YRDHS)

Santa was supposed to have top billing at the 2005 Santa Claus Parade in York Region, but to see the looks on the faces of the children as the Tooth Fairy went by, it would make you wonder.

An incredibly popular parade because it is the only one in the region held at night, the event features a number of floats, all brightly dressed with Christmas lights and adorned with holiday decorations. The YRDHS float featured the Tooth Fairy in a winter wonderland setting perched on her "Tooth Throne" among tooth-shaped ornaments. Society members, dressed up as tooth fairies and boxes of floss, handed out toothbrushes, floss, sugar-free gum and balloons.

"We encourage other members to try to do this," say event organizers. "It's a great community promotional tool and a great way to mingle with other members and their families.

Congratulations to all the winners and we hope to see you back here again next year!

The online continuing education course and toolkit will be available to CDHA members in May 2006

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

BREAK THE ICE

so your clients can break the tobacco habit

START A CONVERSATION, SAVE A LIFE

As a dental hygienist, you have a key role to play in helping clients quit tobacco. With just two minutes of conversation, you could quite literally *save a life*.

But how do you bring it up? It's uncomfortable to talk about, we know. That's why the CDHA and Health Canada are developing the online continuing education course *Tobacco Cessation: Strategies and Techniques*. It provides

- the 5 As of tobacco cessation (Ask, Advise, Assess, Assist, and Arrange)
- motivational interviewing (especially for those resistant to change)

You will also learn about chemical dependency, the symptoms of nicotine withdrawal, how to assess individual tobacco use and how to recognize the stages of change to assess readiness to quit.

David Chasey/Photodisc Green/Getty Images; Photodisc Collection/Photodisc Blue/Getty Images

COMING SOON:

TOBACCO CESSATION TOOLKIT FOLDER FOR CDHA MEMBERS

As a complement to CDHA's upcoming online Tobacco Cessation CE course, CDHA is also currently developing a limited number of toolkit folders that will be available to CDHA members on a first-come, first-served basis. The kit folders will not only give you a place to store your valuable tobacco cessation resources but will also include a set of portable reference cards that you can use to help your clients kick the tobacco habit. Included with the kit folder will be an order form listing a range of useful resources that can help you *make a difference*.

For more information on this and other important CDHA programs, contact us today at

Canadian Dental Hygienists Association
96 Centrepointe Drive, Ottawa, ON K2G 6B1
Tel: 1-800-267-5235 or (613) 224-5515
Fax: (613) 2247283 E-mail: info@cdha.ca

Health Canada Santé Canada

Le cours de formation continue en ligne et la trousse à outils qui l'accompagne seront mis à la disposition des membres de l'ACHD en mai prochain.

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

BRISER LA GLACE

pour que vos clients puissent perdre l'habitude de fumer

EN ABORDANT LE SUJET, VOUS POURRIEZ SAUVER UNE VIE!

En tant qu'hygiéniste dentaire, vous avez un rôle clé à jouer en aidant vos clients à renoncer au tabac. En leur parlant deux minutes, vous pourriez littéralement leur *sauver la vie*.

Mais comment aborder le sujet? Nous sommes conscients qu'il est difficile d'engager la conversation en ce sens. C'est pour cette raison que l'ACHD et Santé Canada travaillent à l'élaboration d'un cours de formation professionnelle continue en ligne *Renoncement au tabac : stratégies et techniques qui englobe* :

- les 5 consignes clés du renoncement au tabac (questionner, conseiller, évaluer, appuyer et assurer un suivi)
- l'entrevue motivationnelle (surtout pour les personnes qui résistent au changement)

Vous recevrez également de l'information sur la chimio-dépendance, les symptômes du sevrage de la nicotine, les façons d'évaluer la consommation individuelle de tabac et de reconnaître les étapes de la transformation pour déterminer si la personne est prête à cesser de fumer. Prenez note que le cours sera offert sur le site web de l'ACHD réservé aux membres dès la mi-janvier 2066.

David Chasey/Photodisc Green/Getty Images; Photodisc Collection/Photodisc Blue/Getty Images

DISPONIBLE TRÈS BIENTÔT :

LE GUIDE DESTINÉ AUX HYGIÉNISTES DENTAIRES

L'Association canadienne des hygienists dentaires en ce moment développe un dossier comportant un guide rempli de renseignements importants. Ce dossier ne servira pas seulement au rangement de votre précieuse documentation sur le renoncement, mais il comprendra un jeu de fiches de référence pratiques que vous pourrez consulter pour aider vos clients à se débarrasser de leur habitude de fumer. Vous y trouverez également une liste de documents utiles que vous pourrez commander afin de vous aider à *faire une différence*.

Pour plus de renseignements sur ce programme ou sur d'autres programmes importants de l'ACHD, veuillez communiquer avec nous dès maintenant à l'adresse suivante :

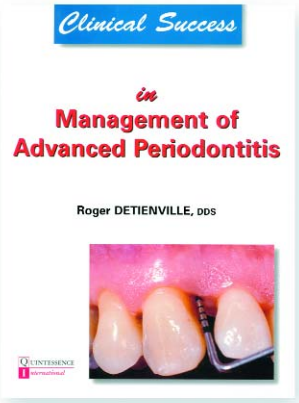
Association canadienne des hygiénistes dentaires
96, promenade Centrepointe, Ottawa (Ontario) K2G 6B1
Téléphone : 1-800-267-5235 ou (613) 224-5515
Télécopieur : (613) 224-7283; Courriel : info@cdha.ca

Santé Canada Health Canada

Clinical Success in Management of Advanced Periodontitis

by Roger Detienville, DDS. Paris: Quintessence International; 2005.

110 pages. ISBN 2-912550-41-6



THIS VERY COLOURFUL SOFT-COVERED textbook has 110 easy-to-read pages that include numerous case descriptions of individuals with advanced periodontitis. Each case includes multiple coloured glossy intra-oral photographs and radiographs along with a description of the case, its treatment, and its outcome capturing the multi-factorial nature of periodontal disease. It also includes an excellent description of biofilms and bacterial complexes, i.e., *red complex, orange complex, green and yellow complexes,* along with a brief review of host-bacterial interactions. A review of the most current AAP classification (1999) of periodontal disease is presented. However, the author indicates that he has limited the cases and discussion in the text to just chronic and aggressive cases of periodontitis, excluding cases of periodontitis associated with systemic disease. Given that most cases of periodontitis associated with systemic disease are "advanced" cases of periodontitis, the exclusion of this category somewhat limits the effectiveness of the text. Inclusion of advanced cases of periodontitis, particularly those associated with uncontrolled diabetes and AIDS, would have been more inclusive of what is found in practice.

The author makes a global statement that periodontitis is a risk factor for a variety of systemic diseases such as cardiovascular disease, atherosclerosis, pulmonary diseases, and pre-term low birth weight babies. Although a substantial number of cohort and case control studies exist that demonstrate higher odds ratios for the occurrence of these systemic diseases in individuals with periodontal disease, no causal relationship has been established for any of these systemic conditions. Thus the use of periodontitis as a "risk factor" for these diseases is misleading.

The book includes both non-surgical and surgical treatment of advanced cases of periodontitis with excellent photographs of some select surgical cases. The treatment protocol for non-surgical cases suggested by the author is not referenced nor could it be found in the periodontal literature. He suggests four to six initial therapy appointments of scaling and root planing specifically without anesthesia with the rationale of not being too invasive, i.e., avoiding tissue damage. He also includes standard polishing at the end of this therapy. After re-evaluation, he suggests more aggressive therapy with the use of local anesthesia and the application of surgical dressings. The current standard of non-surgical periodontal therapy cited in the literature continues to include the use of local anesthesia at quadrant or sextant initial therapy appointments with the intent to remove all etiological factors to promote a good healing response. Furthermore, there is no substantial evidence in the literature to support the beneficial effects of routine polishing except for esthetic reasons. Most North American dental hygiene schools therefore teach "selective polishing" as opposed to routine polishing. The use of surgical dressings is also no longer supported in the scientific literature. Treatment options presented in textbooks should be supported by scientific studies.

One excellent non-surgical treatment option that is well documented in the periodontal literature is two-stage initial therapy performed within 48 hours. Unfortunately, this treatment option is not mentioned at all. Additionally, the use of locally delivered chemotherapeutic agents such as doxycyline, minocycline, or chlorhexidine as adjunctive treatment options was not included. Despite the fact that these local agents have been shown to be more effective in mild to moderate cases of chronic periodontitis rather than advanced cases, a discussion would have helped to clarify their lack of usefulness in advanced cases. A good discussion was included of the use of systemic antibiotics. However, there was no mention of low-dose enzyme suppressants such as doxycycline hyclate that have recently been documented in the literature demonstrating considerable efficacy.

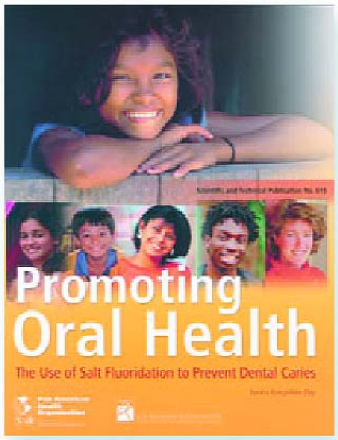
Overall, perhaps the treatment methods discussed in this text reflect the differences in philosophies between North American and European treatment protocols. However, the American Academy of Periodontology represents world-wide periodontal literature and many excellent published trials are of European origin. I would not recommend this textbook for dental hygiene students as recommendations in the text conflict with the periodontal literature. However, for a practising dental hygienist who would like to review some good advanced cases, it could be very helpful and informative. Study clubs seeking good cases to discuss could also benefit from this very colourful and easy-to-read textbook.

– Salme Lavigne, RDH, BA, MS(DH)
Professor and Director
School of Dental Hygiene, University of Manitoba

Promoting Oral Health: The Use of Salt Fluoridation to Prevent Dental Caries

by S. Estupiñán-Day. Washington (DC): Pan American Health Organization; 2005.

128 pages. ISBN 92 75 11615 6. US$28. Available from http://publications.paho.org



DR. SASKIA ESTUPIÑÁN-DAY[1] IS HEAD OF the Pan American Health Organization's (PAHO) Oral Health Program. She has written this well-referenced book to show how salt fluoridation has proven to be one of the most cost-effective public health interventions in history along with the iodization of salt. The book is intended to help countries implement programs of their own. The book is formatted in three parts. Part I is a narrative of the history and success stories of salt fluoridation. Estupiñán-Day discusses historical research from 1955-1980 first in Switzerland then Hungary and Colombia and traces the history of salt fluoridation in other European countries and the Americas.

The author explains why salt fluoridation is better suited to poorer countries in Latin America and the Caribbean than water fluoridation. She then summarizes the evidence and tracks the success of salt fluoridation from1980–2000 in reducing caries. The author references many other important issues and challenges in fluoride programs including enamel fluorosis, differences in caries incidence and prevention among various populations and ethnic groups, and the effectiveness of caries prevention in the Americas, Costa Rica, Jamaica, and Mexico. Estupiñán-Day concludes that salt fluoridation can reduce dental caries by as much as 84% at a cost of only 6 cents per person per year. The author notes that salt fluoridation is cost-effective and accessible when compared with other fluoride delivery systems, making it the most equitable, beneficial caries preventive plan for communities regardless of demographics, socio-economic status, and access to dental services.

Part 2 of the book provides step-by-step guidance on how to plan, promote, launch, operate, monitor, and evaluate salt fluoridation programs. It discusses in detail how the salt industry operates, including its manufacturing and marketing practices, and shows how to win the industry's cooperation. The book also provides blueprints for legislation, epidemiological surveillance, and biological monitoring that are necessary for carrying out successful programs. There is a detailed and useful operational toolkit for the planning, launching, and running of salt fluoridation projects. This section includes information on educating communities about salt fluoridation using plain language, analyzing what to teach about fluorides, who should provide education about salt fluoridation, the role of health professionals in educating about the need for and benefits of fluoridating salt and about the need for continuous education. The author includes useful information about strategic planning for the implementation of salt fluoridation programs; development of the program as well as the advantages and disadvantages of various methods of salt production including technology, development, and quality control issues with each method.

Dr. Estupiñán-Day uses the case history of Venezuela's successful salt industry including marketing of salt both internally and externally and how to conduct a feasibility study and program implementation. The toolkit includes information about how to conduct an institutional analysis and cost-benefit study of a salt fluoridation program utilizing baseline studies, surveillance systems, and quality control evaluations.

There is instruction that includes how to set up plant equipment for the production of fluoridated salt; the training of personnel for the program; development of monitoring infrastructure; mass communication strategy; initiation of epidemiological surveillance; chemical monitoring;

[1] Dr. Saskia Estupiñán-Day graduated in 1979 with her Doctor of Dental Surgery (DDS) from the Central University School of Dentistry in Ecuador and now specializes as a public health dentist. After a fellowship at UCLA Neuropsychiatry Institute in 1983, she received her Master in Public Health (MPH) from UCLA in 1988, and a PhD from Katholieke University Nijmegen in the Netherlands. She is currently Regional Advisor for Oral Health for the World Health Organization/Pan American Health Organization (WHO/PAHO) and Adjunct Professor of Dentistry and Associate Researcher at UCLA. She has worldwide experience in 35 countries in the development of oral health strategies, implementation of national programs, management of international technical cooperation of research projects/budgets, and leadership in scientific and academic communities. She has conceived and implemented major innovations in public health dentistry research and programs including fluoridation, HIV/AIDS, oral pharyngeal cancer, cranio-facial deformities, atraumatic restorative treatments, and application of cost-effectiveness analysis and policy support to national programs. She has provided technical assistance to most of the English-speaking Caribbean in relation to topical or systemic fluorides. She is the author or co-author of 43 scientific publications, technical reports and abstracts.

quality control in the production and distribution of fluoridated salt; and safety aspects in the production of fluoridated salt. The book then goes into long-term evaluation and consolidation, epidemiological surveillance elements, and quality control in production and distribution

There is specific information about biological monitoring and surveillance including oral health surveys for determining decayed, missing and filled teeth (dmft) and dental fluorosis in children 6–8, 12, and 15 years old; determining fluoride excretion in urine in children 3–5 years old; monitoring the nutritional status of preschool children; chemical monitoring; determining fluoride in drinking water, wells, and water supply networks. The book also includes helpful information on how to monitor fluoride concentration in salt in the distribution network, the salt plant's productions processes, salt distribution as well as distribution by health authorities, monitoring fluoridated salt in plants, warehouses, and points of sale, sampling in the plant by health workers, sampling at points of sale and warehouses by health workers and fluoride determination in salt. The author stresses the importance of monitoring the marketing and use of fluoride supplements (drops and tablets) and fluoride dentifrice use in preschool children.

Part 3 of the book is a tool-kit for decision-makers, health planners, legislators, epidemiologists, and health workers. It uses PAHO's recommendations for setting up and orchestrating a successful salt fluoridation program. This section includes a legal framework for mandatory iodization and fluoridation of salt and standardized research protocols that include the examination procedures and coding for visual-tactile oral health surveys; determining fluoride concentration in drinking water; determining urinary fluoride excretion in children: time-control urine sampling and determining the extent of use of fluoride-containing product.

A minor critique of the book is that the historical research upon which salt fluoridation success is based may not measure up to current standards for research rigor such as stating inclusion and exclusion criteria and using randomized, controlled trials. The author does make specific recommendations about what to include in further studies. There are some issues relating to globalization, immigration, esthetics, and fluorosis of importance to dental professionals in wealthier countries that were not addressed fully when recommending salt fluoridation as a solution to caries. The author does acknowledge that all fluoride prevention programs (no matter the delivery system) show an increase in fluorosis and that monitoring fluorosis is an integral aspect of salt fluoridation surveillance.

One issue that may become a concern in the future is the amount of dietary salt consumed in some countries, the enormous health care cost of treating heart diseases, and the need to reduce the dietary salt intake in persons at risk. However, the author emphasizes the small amounts of salt needed to deliver optimal levels of fluoride and compares salt fluoridation to the success of salt iodization for the prevention of iodine deficiency disorders. Salt fluoridation appears to be the only community health care measure for caries prevention that is equitable and feasible while still allowing for individual and community autonomy and freedom of choice.

Overall, this is an excellent, cost-effective reference for oral health educators and community oral health programs. It is filled with well-researched, practical scientific, historical, technical and behavioral information about salt fluoridation.

The publication was funded by the Kellogg Foundation, which has supported salt fluoridation efforts throughout Latin America and the Caribbean. The salt fluoridation program in the Pan American Health Organization embodies the principle of the Kellogg Foundation in "applying knowledge to the problems of the people."

– Ginny Cathcart, BA, Dip DH, MEd, RDH (RCR)
Dental Hygiene Program, Vancouver Community College

Web Site Credibility, Databases, and Search Engines

by CDHA staff

OVER THE PAST FEW ISSUES, WE HAVE FOCUSED ON some strategies to assist readers with Internet-based research. In this issue, we look at some reputable databases and explore a number of popular search engines. But before we do that, we should consider some general guidelines for evaluating web sites and the information they contain. When academic libraries are used to search for texts and journals, the information has already been assessed by publishers, librarians, and other professionals in the field. On the "open" Internet, however, these filters are absent and anyone can post information. So it is definitely "browser beware."

The University of California at Berkeley library has a web page on how the evaluate web pages (www.lib.berkeley.edu/TeachingLib/Guides/Internet/Evaluate.html). And the UCLA college library has an excellent page on "Thinking Critically about Discipline-Based World Wide Web Resources" (www.library.ucla.edu/libraries/college/help/critical/discipline.htm). Briefly, here are some questions to ask yourself about a site:

- Who is the author or creator of the site? Authorship is perhaps the most important criterion to establish because we need to know the basis of the site's authority. Can we verify the site's credentials? Is the author/creator a commercial company; a university or other educational institution; a health care body such as the Canadian Institutes of Health Research, the Canadian Public Health Association, or the Mayo clinic; a government site such as the National Library of Medicine? Or is the site created and maintained by one person? If so, what are this person's professional credentials and with what institution if he/she affiliated? Is he/she qualified to have a web site on this topic? With the reputable sites, it is usually very obvious in which category they belong. For sites that are less certain, you should be able to determine their credibility by looking for information under such tags as "About us" or "Contact us."
- Is there a bias, a commercial benefit possible to the author of the site?
- Is there a selected list of resources in a particular discipline or is a list presented that is supposed to be complete? If a select list, what criteria were used to determine the resources were chosen?
- Does the web site contain results of research? Is there a proper use of references to back up the author's hypotheses or assertions? Are there full citations for the references?
- Is the page up to date?
- What is the purpose of the site? To educate, persuade, entertain, or sell? Is it aimed at the general public or a professional audience? What is the level of content? A research-oriented site should have documents from respected journals. There should be a breadth and depth of coverage and the material should be up-to-date.

Databases and search engines

PubMed at <www.ncbi.nlm.nih.gov/entrez/query.fcgi> is the National Library of Medicine's search service that provides access to over 11 million citations in MedLine and related databases. It offers a "PubMed Tutorial" to provide suggestions for more efficient searching. Articles in PubMed are indexed using the NLM's controlled vocabulary database, MeSH (Medical Subject Headings). Using a controlled vocabulary for indexing allows you to retrieve information "that may use different terminology for the same concepts." Therefore, when you find one article that is precisely on-topic, check the indexing terms and search on those for efficient retrieval. Abstracts and some full text articles are available.

CHID or Combined Health Information Database at <www.chid.nih.gov>is a bibliographic database containing titles, abstracts, and information on health education resources. It is produced by National Health Agencies in the United States and is updated for times a year. Although it does not contain actual articles, it does provide information on availability and sources for ordering.

The Cochrane Library at <www3.interscience.wiley.com/cgi-bin/mrwhome/106568753/HOME> is a subscription service for the full reviews. Many institutions do have subscriptions and dental hygienists in Nova Scotia can also access the database. However, non-subscribers can certainly view a very informative summary including the background, objectives, search strategy, selection criteria, data collection and analysis, main results, authors' conclusions, and a synopsis. You can specify the dates you want, the "product" such as systematic reviews, controlled trials, methodology reviews, and other parameters.

Google Scholar at <www.scholar.google.com> was discussed in "Probing the Net" a year ago in this journal. Google Scholar works with academic publishers to index works and increase the availability of free full-text articles on line by removing subscription barriers. Search results are ranked and ordered by relevance. The site is growing

Web Site Credibility, Databases, and Search Engines
…continued on page 102

Technology and Education, Fluoride, Chlorhexidine

by CDHA Staff

A VARIETY OF SOURCES FOR THIS ISSUE… THE USE OF PDAs in education is still in its early days but there are still a couple of sites that report on investigations about the value of technology. The review of the book on salt fluoridation could inspire both the proponents and opponents of fluoridation to act. We are presenting both sides of this argument. We round out this month's selection with an information source for chlorhexidine.

"Portable Assessment – Towards Ubiquitous Education" (Robert Clark Centre for Technological Education, University of Glasgow)
www.ninelocks.com/ProjWeb/about.html

This project "explores the use of portable computing to increase the flexibility of access and delivery of course material in higher education. It develops a system for learning and assessment delivery via Personal digital Assistants (PDAs) and evaluates the benefits of such delivery…. The project targets an engineering environment but has potential for expanded scope across the University." It has a "PDAs in education" links to the symposium "Handheld Learning 2005," to how-to guides, news/reviews, PDA use in education and medicine. The links are not extensive but this is a new and interesting field.

Advanced Technology Applications for Education: Benchmark Study (NASA Learning Technologies)
http://learn.arc.nasa.gov/benchmark/0.0.html

The goal of this benchmark study by the National Aeronautic and Space Administration is "to understand the present and future roles of technology in education." "The development of advanced technology tools/applications is a part of this effort." PDAs are discussed briefly but this study is interesting in its overview of new ideas and trends in learning.

Chlorhexidine (Dental) (MedLine Plus)
www.nlm.nih.gov/medlineplus/druginfo/uspdi/202131.html

This information is provided in MedLine Plus' "Drugs & Supplements" area. It includes the following sections: Description; Before Using This Medicine; Proper Use of This Medicine; Precautions While Using This Medicine; Side Effects of This Medicine; and Brand Names.

Fluoride & Fluoridation (American Dental Association)
www.ada.org/public/topics/fluoride/

The American Dental Association is a strong advocate for fluoridation and has a comprehensive overview of the topic. From this page, you can go to "Fluoridation Facts,"

"Emerging Issues" (such as the link to the *ADA Statement on Water Fluoridation and Bone Cancer*).

Use of Fluorides in Caries Prevention (Canadian Dental Association Position Statement)
www.cda-adc.ca/_files/position_statements/fluorides.pdf

The Canadian Dental Association also supports "appropriate use" of fluorides. This three-page statement includes sections on Water Fluoridation; Fluoridated Toothpastes and Mouth Rinses; Professional Topical Applications of Fluoride Gels, Foams and Varnishes; Fluoride Supplements; and Fluoride Exposure from Multiple Sources.

Fluoride Action Network (FAN)
www.fluoridealert.org

The site is a private one, without government, university, or medical facility connections; readers should be aware of this. That said, the site does disclose the names of the staff, members of the advisory board, and founding members so you can scan this list and decide for yourself how reputable the site is. FAN takes a very different slant on the use of fluorides. It states that FAN "is an international coalition seeking to broaden public awareness about the toxicity of fluoride compounds and the health impacts of current fluoride exposures. Along with providing comprehensive and up-to-date information on fluoride issues to citizens, scientists, and policymakers alike, FAN remains vigilant in monitoring government agency actions that may impact the public's exposure to fluoride." An interesting alternative view of the debate.

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BRITISH COLUMBIA

HOPE Hope Family Practice Maternity Leave, $40/hour, easy work week Monday–Thursday. Three weeks' paid holiday. Daily production bonus! Start in April. Will help you in search for housing. Very very friendly team, top equipment – new chair, sonic, piezo, continuing education paid! Hope is a relaxing small town just 1.5 hours east of Vancouver in the beautiful Fraser Valley. Smiling? Call me at home ASAP at **604-869-3533** for many more details. Dr. Martin Drobis and team.

VICTORIA Dental hygienist position available PT progressing to FT 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. Fax: **250-386-3064**; tel: **250-386-3044**.

VICTORIA Spa-like dental hygiene clinic seeks an entrepreneurial dental hygienist to start her own independent clientele. It's great being in control of your own conditions. No waiting for dentist to do exam. Work in up-town shopping area. Interest to: **smiles_4u@shaw.ca** or write and send to Victoria's Dental Hygiene Clinic, 108–1030 Yates Street, Victoria, BC V8V 5A7. Telephone: **250-382-SMILE (7645)**; fax: **250-382-7643**. Attention: Mary Ellen Breckenridge, RDH.

ALBERTA

EDMONTON Experienced part-time dental hygienist required for a very busy S. Edmonton family practice. Hours are Monday and Tuesday evenings 5–8, and Wednesday and Friday 8–5. This is a one-year maternity leave starting June/06. Potential permanent part-time after the maternity leave. Please fax to **780-438-6603**.

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.

ROCKY MOUNTAIN HOUSE LOCATION, LOCATION, LOCATION!! If you are looking for a change, Rocky Mountain House has it all. Our staggered 4-day work week provides alternating 2- and 4-day weekends, a perfect blend of work and time for yourself. We offer exceptional wages and benefits. This permanent full-time position will complement our friendly staff of 10. Call us!! Contact Ruth at **403-845-3111** or fax your résumé to **403-845-7610**.

FORT MCMURRAY Dental hygienist required. Full- or part-time RDH position available immediately for a rapidly expanding family practice in Fort McMurray, AB. Flexible hours available. Please phone **780-743-3570** or Fax to **780-790-0809**.

NORTHWEST TERRITORIES

YELLOWKNIFE One dental hygienist position available immediately at the Adam Dental Clinic, Yellowknife, Northwest Territories – Canada's diamond capital! This dynamic city has all the amenities you could ask for. Generous signing bonus! Check out our web site, **adamdentalclinic.ca**. Contact Krista at **867-873-2775** or by fax at **867-920-2775**.

CONTINUING EDUCATION

UNIVERSITY OF MANITOBA, SCHOOL OF DENTAL HYGIENE will be offering a Local Anesthesia Continuing Education Program for Licensed Dental Hygienists, May 5–7, 2006, at the Faculty of Dentistry. Self-study portion six weeks in advance. **Registration deadline is March 1, 2006.** If you are interested in participating, you can obtain further information by contacting Lisa Chrusch, Administrative Assistant for The School of Dental Hygiene at **204-789-3683** or at **lisa_chrusch@umanitoba.ca**.

Advertisers' Index

Web Site Credibility, Databases, and Search Engines
(continued from page 99)

constantly and includes "peer-reviewed papers, theses, books, preprints, abstracts and technical reports."

Dogpile <http://www.dogpile.com> is a metasearch tool. It combines and analyzes results by searching the most popular web-based engines, such as Google, Yahoo, LookSmart, and others. This helps to eliminate some of the frustration caused by variations in search terms and results on individual engines. Once results are retrieved, duplicates are removed and the remainder are ranked by relevance.

Brainboost at <www.brainboost.com> is an answer engine rather than a Search Engine. Instead of typing in a search term, you can use ordinary English to ask a question. Brainboost will then retrieve search engine results and analyze them for the most probable response to your question.

EviDents Search Engine at <http://medinformatics.uthscsa.edu/evidents/> was also discussed last year but this is a good opportunity to refresh your memory. As we said before, this is a very specialized search engine that can narrow searches to specific clinical areas and to different aspects such as diagnosis, treatment, prognosis, etiology, etc. The good thing about this site is that you can specify that you want only systematic reviews.