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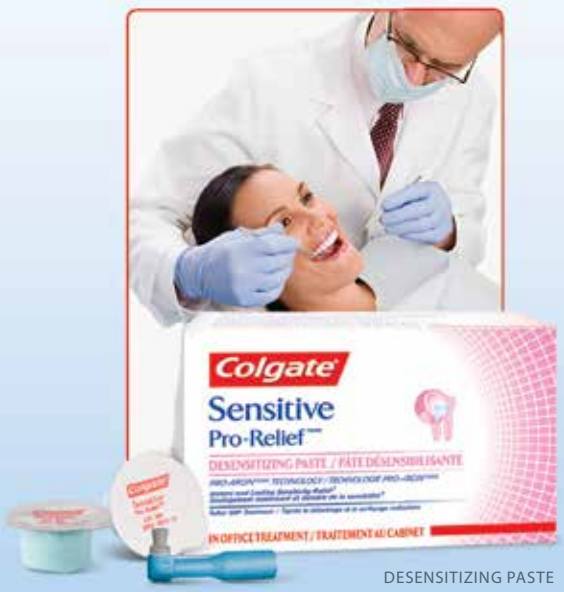

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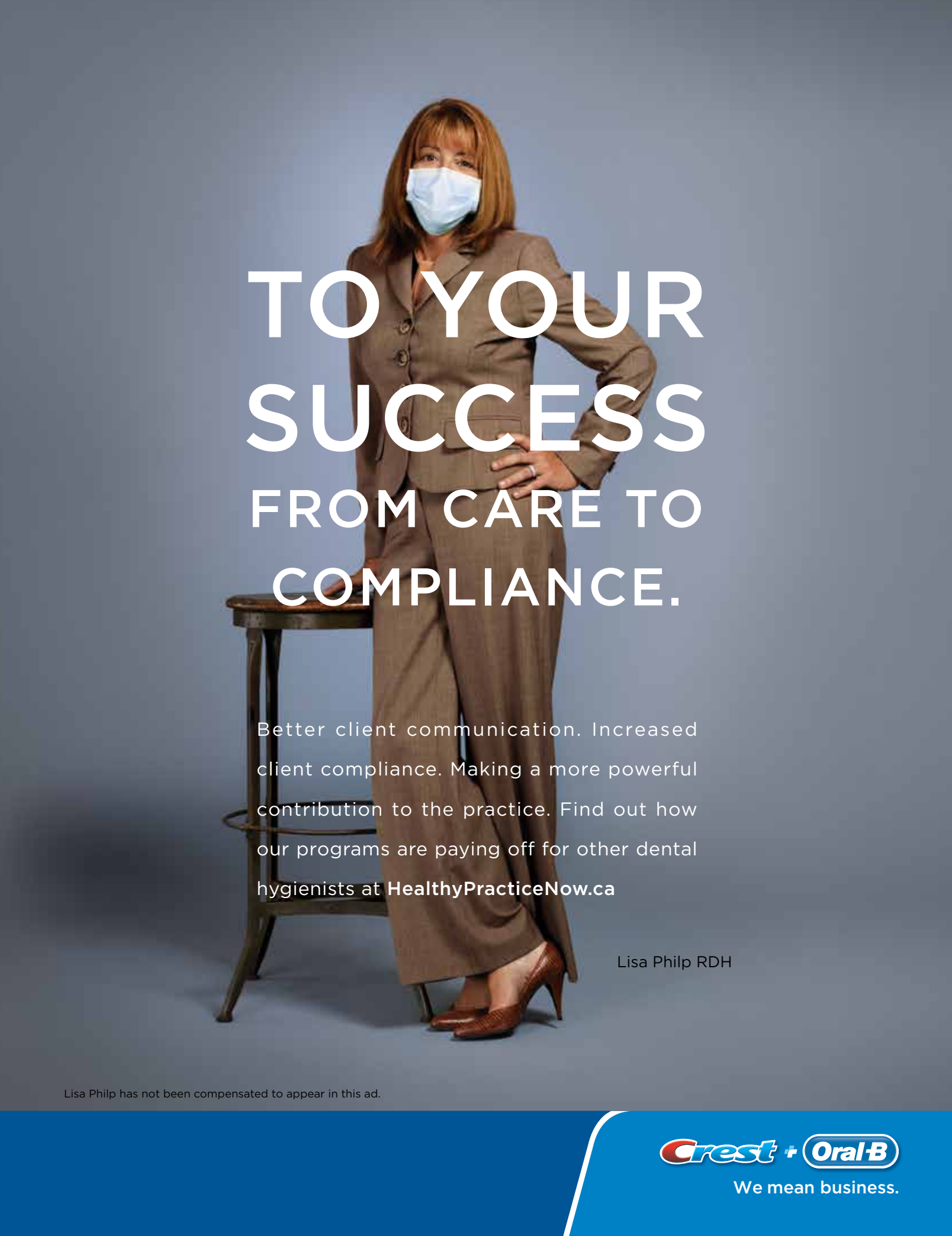
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Open access is a good thing

Katherine Zmetana, DipDH, DipDT, EdD

Scientific Editor, CJDH

In celebration of CDHA's 50th anniversary in 2013, the *Canadian Journal of Dental Hygiene* is going open access, with the February issue of volume 47 marking the launch of our new publishing initiative. If you are not fully aware of the significance of this move, consider that open access publishing provides free online access to research articles immediately on publication. This means that anyone, anywhere, member or not, now has access to the entire journal's content.

We are not the first to make the move; more and more professional journals are providing this option. Open access publishing offers many advantages—it costs little and reaches more people faster than print journals do through subscriptions and public libraries. Once barriers of cost are removed, research information becomes available beyond a privileged group of academics, private associations and large corporations. When we offer our research to others, they often reciprocate. It permits the possibility for more people to read and build on research in general. As a result, we all benefit with the ability to stay current with the latest in scientific findings—in our own fields and in fields of related or personal interest. We have the capacity to find solutions to new problems and to make better decisions whether in healthcare or in personal matters. It provides an opportunity to break down walls between the academic research community and the wider public. And in response, recognition of the value of science spreads and increases.

One of the little known facts to the general public is that authors are not paid for their articles, nor do they get royalties. Researchers write articles because it contributes to the advancement and dissemination of knowledge in their field of study, and it contributes to their advancement in the profession. The publication of a peer reviewed article is in effect the report of the work they have done, for which they have already been paid whether through grants, employment contracts or faculty salaries. It is part of the duty and responsibilities of being an educator and researcher.

Traditionally, researchers submit articles and are grateful for the prestige of acceptance, particularly since reputable journals have strict guidelines and a peer review process. It stands to reason that research that has been conducted through public funding—by taxpayers through government and universities—should in turn be available to the public. Readers, however, must pay a subscription fee to cover the cost of preparing, reviewing and processing the information, formatting, printing, and mailing. Internally, CDHA can partially cover this cost at the rate of approximately $1 per member per issue. Publishing houses charge considerably more because they need to make a profit. They also charge for copyright usage. Climbing costs and new copyright rules have resulted in many libraries unable to pay the associated fees, and as a consequence, research is less widely available, except to individuals who can afford the steep fees.

The Internet has afforded a way of saving on much of the cost and making research immediately available. Because there are no royalties involved, there can be no copyright infringement, as long as credit is given to the author. The worldwide web is widespread and almost anyone can get to a computer to find information. It is a more efficient way to get the research out there and to keep it fresh. Journals started going online when it became possible, but typically offered access to abstracts only, then charged a fee to download the full text article or set an embargo that required non members to wait a period of time, such as a year, before permitting free access.

There are good arguments for open access to journals that focus on research literature; there are virtually no disadvantages. Open access is not open content, which is the case in forums such as Wikipedia, where content is made available for public use and comment. Articles there can be revised, modified, rewritten and lengthened. Nor is open access a discussion forum, e-mail list, blog, or file sharing site. Authors are not told what to write on, as for magazines and newspapers where journalists are paid. The author still retains copyright, so any borrowing of information still needs to be credited, but it can be read and freely distributed. Articles continue to be peer reviewed, so there is no loss of quality. Readers can be confident and assured that the reliability of content is strictly maintained and upheld. More journals are embracing open access. It is part of giving back to the professional community.

We are pleased to be able to offer to a wider audience the excellent research we publish on oral health topics. In this issue we present some interesting work that has applications beyond dental hygiene. **Dr. Leandro Champrone** reports on a case series that documents the use of ultrasonic debridement to eradicate *H. pylori* from the oral cavity. It is a preliminary study that could have repercussions regarding cause and treatment of stomach

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Editorial, *Open access is a good thing*…continued from 5

ulcers as well as oral health conditions. The literature review conducted by **Leigha Rock** provides an exploration and evaluation of a relatively new therapy of using platelet rich fibrin in periodontal regeneration. This therapy may provide improved results in oral health, and it may also be considered for potential applications in other medical treatments. Research centering on evaluating a suction toothbrush for dependent adults with dysphagia by **Carol-Ann Yakichuck et al.** provide options for healthcare workers as well as for the afflicted adults and their dental hygienists. Similarly, **Stacy Stewart** reflects on daily oral hygiene in residential care, which has implications for interprofessional collaboration. **Sandy Lawlor** makes a strong case for the benefits of interprofessional practice amongst the health professions. It is therefore very much to our benefit to share our research information with colleagues of similar interests and different backgrounds.

RESOURCES

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Interprofessional practice: Enhancing the dental hygienist's role

Sandy Lawlor, RDH, BA(Psych), BSW

CDHA President

Evidence shows the costs and demands on our healthcare system are escalating.[1] This increase may be due to the longer life expectancy of the Canadian population, leading to a fast growing elderly population with chronic diseases such as diabetes and respiratory and cardiovascular diseases.[2] The belief is growing among healthcare providers that developing collaborative teams—with members contributing their expertise—provides maximum benefit to the client by reducing chances of error.[3] This method of delivery is believed to result in lowering costs to the healthcare system though we do not know if that is the case yet. Canada was one of the leaders in developing a new method of healthcare delivery known as interprofessional collaboration.[4]

Interprofessional collaboration, also known as interprofessional practice, is defined as a comprehensive approach to client centred care by multiple health professionals who work together formally or informally as a team to provide quality care.[5-8] This approach is vital to ensure improved client outcomes that cannot be achieved by working alone within one's own discipline.[9] It further recognizes that each profession brings knowledge, skills, values and attitudes which are complementary to each client case.[10] It also assists the client and his or her family to understand more about the client's health condition that can result in improved self care.[11]

In 2010, national competencies for dental hygiene were adopted for entry-to-practice Canadian dental hygienists. These competencies require dental hygienists to "function effectively within oral health and interprofessional teams and settings" and to "promote team relationships to support client services".[12] This has led to incorporation of these competencies into the curricula of dental hygiene education programs. This new curricula not only supports interprofessional practice but also contributes to developing dental hygienists of the future who will understand the value collaboration brings to healthcare outcomes.[13] In line with this new way of healthcare provision, the Canadian Dental Hygienists Association developed an "End" or goal that states, "Members engage in interprofessional practice."[14]

I often reflect on the changes in dental hygiene over the thirty-six years of my practice. I cannot help but note we have entered a new and exciting era of healthcare where there is increased collaboration

La pratique interprofessionnelle: Amélioration du rôle de l'hygiéniste dentaire

Sandy Lawlor, RDH, BA(Psych), BSW

L'évidence indique que les coûts et les exigences de notre système de soins de santé montent en flèche.[1] Cette croissance peut être attribuable à une plus longue espérance de vie chez la population canadienne, entraînant une croissance plus rapide de la population âgée ayant des maladies chroniques, telles le diabète ou les maladies respiratoires et cardiovasculaires.[2] Les dispensateurs et dispensatrices de soins de santé croient de plus en plus que le développement d'équipes collaboratrices – auxquelles chaque membre apporte son expertise – procure un maximum de bienfaits à la clientèle en réduisant les risques d'erreur.[3] L'on estime que ce mode de prestation fera baisser les coûts du régime des soins de santé, bien que nous ne sachions pas encore s'Il en est vraiment ainsi. Le Canada est un chef de file dans le développement d'un nouveau mode de prestation des soins de santé, appelée collaboration interprofessionnelle.[4]

La collaboration interprofessionnelle, appelée aussi pratique interprofessionnelle, se définit comme étant une approche globale des soins centrés sur la personne, grâce à la contribution de plusieurs professionnels de la santé qui, travaillant ensemble, formellement ou informellement, créent une équipe de prestation de soins de qualité.[5–8] Cette approche est indispensable pour assurer l'amélioration des résultats chez la clientèle; ce qui serait impossible si chaque professionnel travaillait isolément dans sa discipline.[9] L'on reconnaît aussi que chaque profession apporte son savoir, son talent, ses valeurs et ses dispositions, le tout se complétant pour chaque cas.[10] Enfin, cela aide le patient ou la patiente, ainsi que sa famille, à mieux comprendre l'état de santé que peut leur procurer de meilleurs soins personnels.[11]

En 2010, des normes nationales de compétence en hygiène dentaire étaient adoptées concernant l'admissibilité à la pratique des hygiénistes dentaires au Canada. Ces normes stipulent que

THIS IS A PEER REVIEWED ARTICLE.
This article is a personal commentary on one of the CDHA Ends as determined by the CDHA board of directors.
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amongst the professions. Two examples from my practice clearly illustrate and attest to this new way of providing healthcare.

In the first case, I worked closely with one of my clients after I noted a distinct lump on the left side of his neck during his routine appointment. After educating him about this noted change, I followed up with the client to ensure he saw his physician. When it was confirmed through tests that the client had chronic lymphocytic leukemia, I was consulted by his haematologist to assist in the development of an oral health plan, with input from the client, in an effort to minimize possible damage incurred from the radiation the client was to receive in the head and neck area.

Research findings illustrate that good oral health and access to oral health services contribute to good overall health especially where chronic diseases such as respiratory ailments, diabetes and cardiovascular disease are involved.[15] This is an area where the dental hygiene profession can contribute its expertise to interprofessional practice. With the establishment of self regulation and changes in legislation, dental hygienists are exploring new and creative ways to deliver preventive oral health services. This approach impacts other health issues and will undoubtedly increase dental hygienists' collaboration with their interprofessional colleagues.[5]

The second case in my practice is ongoing—it involves a professional collaboration between myself and a nurse practitioner with the bone marrow/stem cell transplant unit at the local cancer centre. The nurse initially contacted me to review some oral health concerns after one of her clients had received a bone marrow transplant. This nurse now makes referrals to our office, and has recruited me to do periodic oral health presentations to the bone marrow transplant support group. Such collaboration among professionals is boosting those in healthcare to increasingly work together towards interprofessional practice.

As dental hygienists we need to embrace our role as primary health professionals and be prepared to contribute to client centred care through interprofessional practice. It is an exciting time for us in healthcare.

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les hygiénistes dentaires doivent « agir efficacement au sein d'équipes ou de cadres de santé buccale et interprofessionnels » et «promouvoir les relations d'équipe pour soutenir les services à chaque client.»[12] Cela a mené à l'incorporation de ces compétences dans le curriculum des programmes de formation en hygiène dentaire. Ce nouveau curriculum ne fait pas que soutenir la pratique interprofessionnelle; il contribue aussi à la formation des futures hygiénistes dentaires qui comprendront l'importance de la collaboration pour les résultats des soins de santé.[13] Conformément à ce nouveau mode de prestation des soins de santé, l'Association canadienne des hygiénistes dentaires a mis au point une « Fin », ou un but, disant que « Les membres s'engagent dans la pratique interprofessionnelle ».[14]

J'ai réfléchi souvent sur les changements en hygiène dentaire au cours de mes trente-six années de pratique. Je ne puis m'empêcher de noter que nous sommes entrées dans une ère nouvelle et excitante de soins de santé, marquée par l'accroissement de la collaboration entre les professions. Deux exemples de ma pratique l'illustrent et attestent clairement de cette nouvelle façon de dispenser des soins de santé.

Dans le premier cas, j'ai travaillé étroitement avec un de mes clients après avoir noté une masse distincte sur le côté gauche de son cou lors d'un rendez-vous routinier. Après l'avoir bien informé sur ce changement, j'ai fait un suivi pour m'assurer que le client voie son médecin. Lorsque des tests ont confirmé que le client avait une leucémie lymphoïde chronique, son hématologue m'a consultée pour aider à l'élaboration d'un plan de soins de santé buccale, avec la participation du client, afin de minimiser les possibilités de dommage résultant de la radiation que le client devait recevoir dans la région de la tête et du cou.

Les résultats de la recherche illustrent qu'une bonne santé buccale et l'accès aux services de santé buccale contribuent à une bonne santé générale spécialement lorsque les maladies chroniques, comme les maladies respiratoires, diabétiques et cardiovasculaires sont impliquées.[15] Voilà un secteur où la profession de l'hygiène dentaire peut apporter son expertise à la pratique interprofessionnelle. Avec l'établissement de leur propre réglementation et les changements législatifs, les hygiénistes dentaires explorent des façons nouvelles et créatrices de dispenser des services de prévention en santé buccale. Cette approche, qui influe sur d'autres problèmes de santé, accroîtra sans doute la collaboration des hygiénistes dentaires avec leurs collègues des autres professions.[5]

Le second cas de ma pratique se poursuit. Il implique une collaboration professionnelle entre moi et une infirmière praticienne dans une unité de greffe de cellules souches de moelle osseuse dans un centre local de cancérologie. L'infirmière m'a d'abord consultée pour revoir certaines préoccupations de santé buccale après qu'un de ses clients eut reçu une greffe de cellules souches de moelle osseuse. Cette infirmière, qui s'en réfère maintenant à notre cabinet, m'a recrutée pour faire des exposés périodiques sur la greffe de moelle osseuse à des groupes de soutien. Une telle collaboration entre les professions incite davantage le personnel des services de santé à travailler plus étroitement ensemble en pratique interprofessionnelle.

En tant qu'hygiénistes dentaires, nous avons besoin de saisir notre rôle de professionnelles des soins de santé primaires et d'être prêtes à contribuer à une pratique interprofessionnelle de soins centrés sur le client. Nous en vivons des moments palpitants.

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Suction toothbrush use for dependent adults with dysphagia: A pilot examiner blind randomized clinical trial

Carol-Ann Yakiwchuk*, DipDH, BScDH, RDH, MHS; **Mary Bertone**[○], DipDH, BScDH, RDH; **Edmond Ghiabi**[Δ], DMD, MMSc, ABPDip, FRCD(C); **Sarah Brown**[§], BSc, RN, MN; **Monique Liarakos**[±], BA, RN, BN; **Douglas J. Brothwell**[♦], DMD, BEd, DDPH, MSc

ABSTRACT

Background: Aspiration pneumonia (AP) is a serious risk for dependent adults in long term care (LTC), especially for those with swallowing dysfunction. **Hypothesis:** To test whether a suction toothbrush reduces the incidence of aspiration pneumonia in dependent adults with dysphagia. **Methods:** This pilot examiner blind parallel group randomized control trial invited all dysphagic residents from one LTC facility to participate (protocol ref. #H2007:051). Caregivers were trained in mouth care using a suction toothbrush. Twenty-two participants were examined at baseline, received scaling and root planing (SRP), and were randomly assigned to equally sized suction or manual toothbrush groups. Participants then received twice daily mouth care for one year from trained caregivers. Oral health parameters were reassessed after one month, and pneumonia outcomes were monitored for one year. **Results:** The 22 consenting participants averaged 54.3 years of age and included 12 females (54.5%). The following changes between baseline and 1 month examination were statistically significant ($p<0.05$): plaque index 2.9 to 1.0; calculus index 1.1 to 0.2; pocket bleeding index 5.9 to 1.7; gingival index 1.7 to 0.9; and probing depth 3.3 mm to 2.6 mm. Of the 19 participants available at 1 year, six (31.6%) had experienced a total of 62 days with pneumonia with a mean of 3.3 days per subject. Study participants showed significantly lower pneumonia rates than did the general long term care population (1.2 versus 3.4 pneumonia days per 1,000 patient days) although no additional benefit was obtained with the suction toothbrush compared to the manual toothbrush. **Conclusion:** This study showed that SRP and daily mouth care improves oral health and reduces pneumonia rates in adults with dysphagia. The suction toothbrush produced results equivalent to those achieved with a manual toothbrush.

RÉSUMÉ

Contexte: La pneumonie par aspiration (PA) est un risque sérieux pour les adultes qui dépendent de soins de longue durée (SLD), notamment ceux qui ont des troubles de déglutition. **Hypothèse:** Vérifier si une brosse à dents à ventouse réduit l'incidence de la pneumonie par aspiration chez les adultes à charge atteints de dysphagie. **Méthodes:** Pour cet essai d'examen pilote à double insu, randomisé et contrôlé chez des groupes parallèles, on a invité à participer tous les résidents dysphasiques d'un établissement de SLD (réf. Protocole #H2007:051). Les dispensatrices de soins ont été formées aux soins buccos avec la brosse à dents à ventouse. Vingt-deux participants qui ayant subi l'examen de base et reçu le curetage et le surfaçage (CSF), ont été affectés au hasard à des groupes de brosse à dents à ventouse ou manuelle. Les participants ont ensuite reçu des soins buccaux deux fois par jour pendant un an de la part de dispensatrices formées pour ces soins. Les paramètres de santé buccodentaire ont été réévalués après un mois et les résultats de pneumonie ont été suivis pendant un an. **Résultats:** Les 22 participants consentants avaient environ 54,3 ans et comprenaient 12 femmes (54,5 %). Les changements suivants entre l'examen de base et celui du mois suivant étaient statistiquement significatifs ($p<0,05$) : l'indice de la plaque était 2,9 à 1,0; l'indice du calcul, 1,1 à 0,2 ; l'indice de saignement de la poche, 5,9 à 1,7 ; l'indice gingival, 1,7 à 0,9 ; et la profondeur du sondage, 3,3 mm à 2,6 mm. Parmi les 19 participants disponibles après un an, six (31,6 %) ont vécu 62 jours de pneumonie, avec une moyenne de 3,3 jours par sujet. Les participants de l'étude ont montré des taux significativement plus faibles de pneumonie que l'ensemble de population avec des soins de longue durée (1,2 versus 3,4 jours de pneumonie par 1 000 jours de patient) bien qu'aucun avantage additionnel n'aie été obtenu avec la brosse à dents à ventouse comparativement à la brosse à dents manuelle. **Conclusion:** Cette étude démontre que le CSF et les soins buccaux quotidiens améliorent la santé buccodentaire et réduisent les taux de pneumonie chez les adultes atteints de dysphagie. La brosse à dents à ventouse a donné des résultats équivalents à ceux obtenus par la brosse à dents manuelle.

Key words: oral health, oral hygiene, mouth care, aspiration pneumonia, deglutition disorders, dysphagia, caregivers, dependent adults, long term care

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BACKGROUND

The state of poor oral health of dependent adults and the elderly residing in long term care (LTC) facilities is well documented in the literature.[1–6] Yet, positive change in this area of nursing practice has been difficult to implement, and caregivers—laden with heavy care needs and other challenges—seem at a loss to improve this area of patient care. The resulting oral disease epidemic among Canada's growing population of older adults presents a significant healthcare challenge and health concern, especially with increasing evidence of the correlation between poor oral health and systemic conditions such as cardiovascular disease, diabetes mellitus, and respiratory diseases.[7–10] The most significant oral–systemic association that impacts the health of this population is aspiration pneumonia—the leading cause of death and second leading reason for hospitalization from LTC.[11–13] Caused primarily by the inhalation of oropharyngeal secretions colonized with pathogenic bacteria, aspiration pneumonia is responsible for more than 200,000 cases and over 15,000 deaths per year in the United States alone.[14] A recent report by the Manitoba Centre for Health Policy ranked respiratory infections as the most significant and leading quality of care issue in personal care homes in Manitoba, counting 8,000 cases across 122 not for profit care homes over the past five years.[15] The estimated direct cost per hospitalized case of simple pneumonia and pleurisy in 2005–06 in Manitoba was $2,827, representing total costs of over $7 million.[15] These statistics, while alarming, present an intriguing problem that warrants investigation to improve the oral and overall health outcomes of this population.

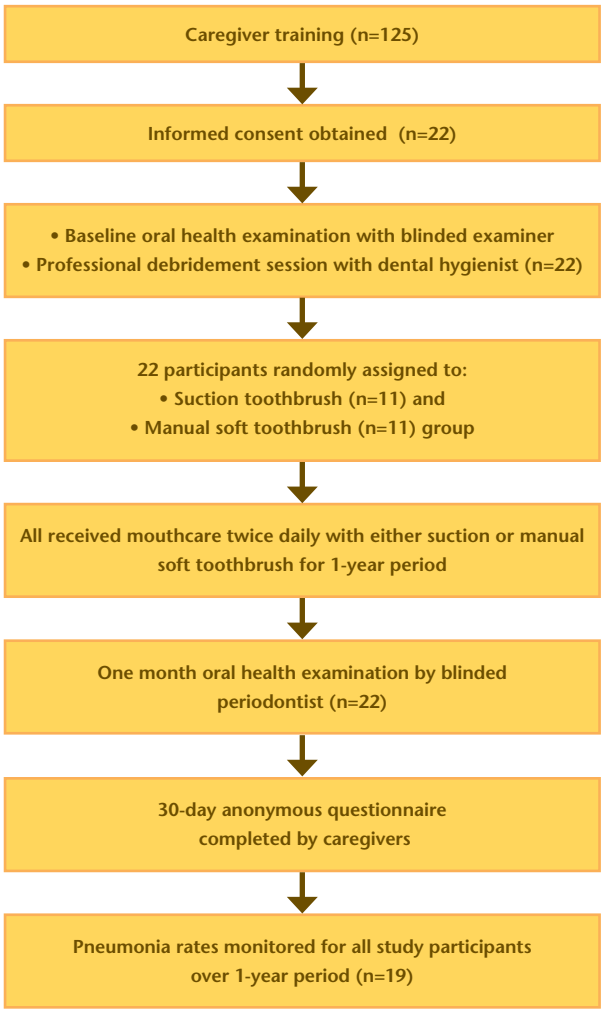
Poor oral hygiene and conditions that alter the microflora of the oral cavity have been associated with an increased risk for aspiration pneumonia among institutionalized adults.[14,16–23] Those with weakened immune systems,[24] poor management of oral pharyngeal secretions and reduced oral clearance,[25] impaired cough reflex sensitivity,[26] and dysphagia[13,25] appear to be at greatest risk. Results of a systematic review by Azarpazhooh and Leake[27] confirm previous results by Scannapieco[28] that rates of pneumonia among high risk populations were reduced by interventions that improve oral hygiene. Yet, mouth care is often neglected or inadequately performed by nurses, nursing assistants and residential care aides with many caregivers reporting limited or no mouth care training as part of their formal and continuing education.[2,28–31] Important barriers reported by caregivers, which may also impede their ability to provide daily mouth care, include: time constraints, lack of mouth care supplies, difficulty in brushing others' teeth, lack of cooperation by residents, and strong feelings about the unpleasantness of the task.[2,30,32–34] Clearly, not all barriers to oral health for residents in LTC are easily removed. Along with raising awareness of the importance of oral health through caregiver training and with addressing other systemic barriers, innovative interventions are needed to facilitate effective plaque removal, and to lower the risk for respiratory infections among this population. A number of researchers have reported significant reductions in oral bacteria and improved oral health using mouth care tools involving suction.[35,36] The *Plak Vac*® reusable suction toothbrush was identified by nurse managers as a potential tool for managing daily dental plaque build up and oral secretions during a mouth care training session. Yet, its effectiveness had not been investigated in the research. Based on a request from nursing staff to help improve the oral health of their chronic care patients, we assembled an interdisciplinary team to investigate the effectiveness of a reusable suction toothbrush in improving the oral health parameters and in reducing aspiration pneumonia rates for individuals with dysphagia.

METHODS

Consent and ethical consideration

Prior to the start of the study, ethics approval was obtained from the University of Manitoba Biomedical Research Ethics Board on February 29, 2008 and assigned the protocol reference number H2007:051. Site approval was granted from Deer Lodge Centre. Clinical resource nurses (CRN) from each of the three chronic care program (CCP) units identified potential participants, who were then invited to enrol in the study by the site coordinator, a clinical nurse specialist (CNS). If applicable, the resident's a legally acceptable representative (LAR) was approached and invited to grant consent on behalf of the individual.

Figure 1. Study protocol



Study population

This study took place at Deer Lodge Centre, a 431 bed LTC and rehabilitation facility located in Winnipeg, Manitoba. Deer Lodge Centre operates 129 beds in its CCP that provides care to individuals requiring professional intervention or close medical supervision or both. The study protocol is illustrated in Figure 1.

Participant selection

Since the degree of pneumonia reduction could not be ascertained from the published literature, this pilot study invited all dysphagic residents from one LTC facility to participate. The sampling frame included thirty-seven residents with a medical diagnosis of oropharyngeal dysphagia, and who were residing in CCP units with access to wall suction. Individuals were excluded if they had fewer than three scoreable sextants of natural teeth, required sedation or antibiotic premedication for dental care, or who were under a "do not resuscitate" order.

Caregiver oral health training and 30-day questionnaire

Prior to the start of the study, 125 CCP caregivers participated in one of 22 three part oral health training sessions facilitated by the study dental hygienists. Caregiver training included:

i. viewing a video on the reusable suction toothbrush;
ii. attending a 30-minute oral health education session or viewing a video focused on mouth care, the study protocol, and wall unit suction operation, and
iii. participating in a hands on mouth care skill development and coaching session for cooperative and care resistant residents.

Caregivers were invited to complete a voluntary questionnaire at the end of the thirty day period to provide feedback. Results of the caregiver questionnaire will be reported separately.

Examinations and debridement

A study dental examination tool was developed to gather demographic information and oral health parameters on six selected adult teeth: 1.6, 2.1, 2.4, 3.6, 4.1 and 4.4 for each participant.[37] If missing, the nearest adjacent tooth in the respective sextant was used. If no adjacent tooth was present, no score was given for that sextant. Demographic variables collected included name, age, sex, date of birth, unit number, and from whom consent was obtained.

The following clinical parameters were assessed for each participant: teeth remaining, modified plaque index,[38] calculus index,[39] pocket bleeding index,[40] gingival index,[41] and probing pocket depth. A single examiner periodontist carried out the baseline and 1-month dental examinations using a mouth mirror, Shepherd's hook explorer, and World Health Organization double ended periodontal probe. Standard infection control practices were followed for all procedures. Three dental hygienists performed periodontal debridement after the baseline examination for each study participant, to a maximum limit of one hour, based on resident need and level of cooperation.

Unit set up

The principal investigator used a computer generated random number list to randomly assign participants to one of two interventions—the Oral-B Advantage Plus® soft manual toothbrush (control) or Plak-Vac® reusable suction toothbrush (test) groups. A study toothbrush, non foaming toothpaste (Biotene™), water based mouth moisturizer (Biotene Oral Balance™), wall mounted toothbrush/product holder, digital pre-set timer, and weekly tooth brushing chart were made available in each participant's room.

Mouth care implementation

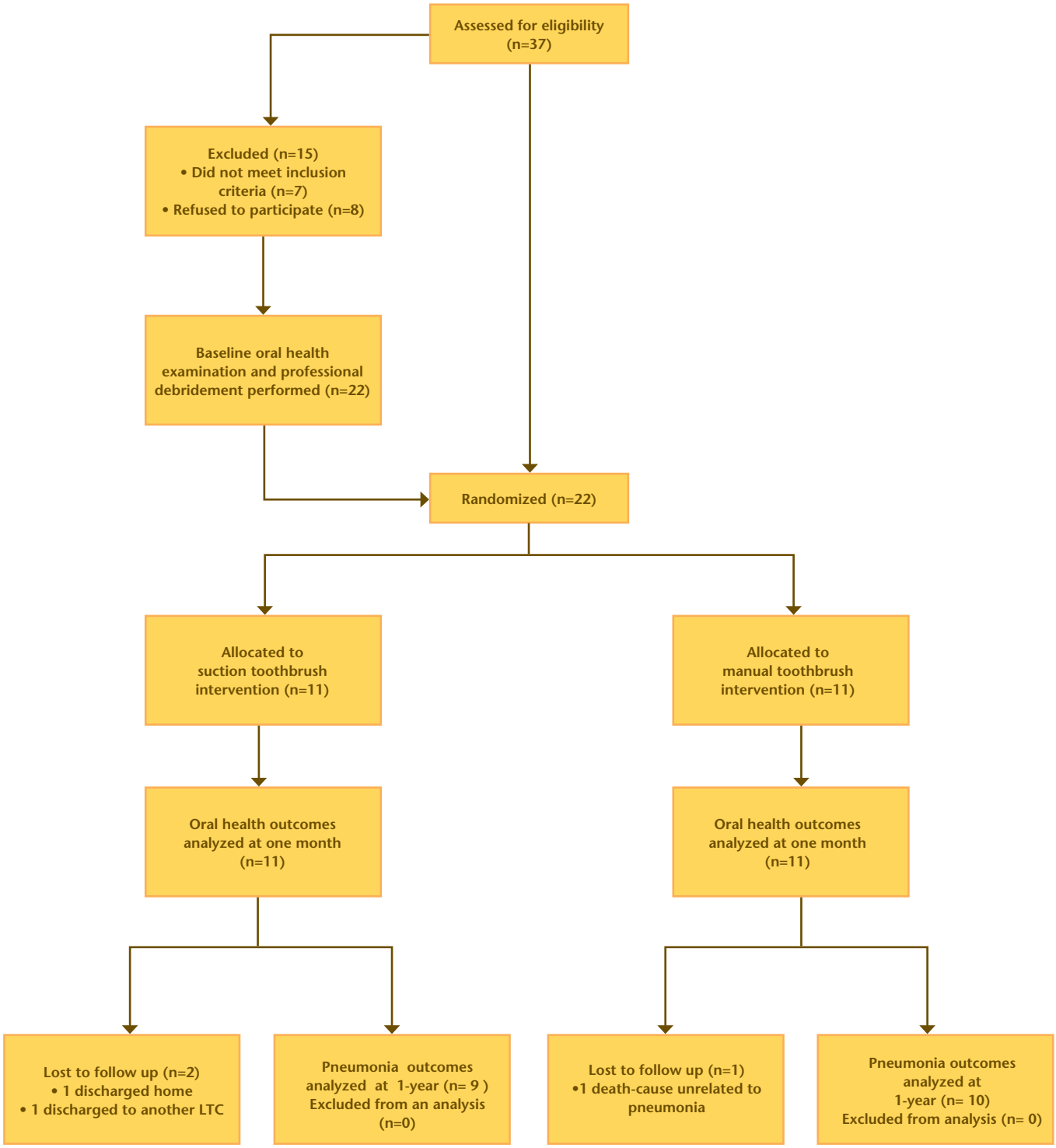
The study protocol called for each resident to receive or perform two minutes of timed mouth care twice daily, with each mouth care session recorded on the weekly tooth brushing chart. Study staff visited the units periodically—about twice weekly—to encourage caregiver participation, replace tooth brushing charts, and replenish mouth care products as needed. Study participants were re-examined at 1-month by the study dentist, who was blinded to each resident's mouth care regimen. Data were collected on each of the oral health parameters examined at baseline.

Pneumonia rates of study residents were tracked by the centre's infection control nurse (ICN), utilizing the existing

Table 1. Demographics of study participants.

	Manual soft toothbrush group at 1 month	Manual soft toothbrush group at 1 year	Suction toothbrush group at 1 month	Suction toothbrush group at 1 year
No. of participants	11	10	11	9
Gender	3 male 8 female	3 male 7 female	7 male 4 female	5 male 4 female
Age - Male (Standard Deviation) Age - Female (Standard Deviation)	45.0 (2.0) 60.0 (15.9)	45.0 (2.0) 60.9 (16.9)	56.3 (16.9) 46.3 (8.8)	52.6 (19.0) 46.3 (8.8)

Figure 2. Stages of participants' movement through the study.



infection surveillance report system in place at Deer Lodge Centre. Additionally, the ICN performed chart audits on study residents to determine if chest X-rays were taken or if antibiotics were administered. The pneumonia outcome recorded and reported in this study represents the number of days for which a diagnosis of pneumonia remained

Table 2. Outcome variable changes from baseline to 1 month follow up end scores.

Variable	Baseline exam (Standard Deviation)	1 month follow up exam (Standard Deviation)
Modified plaque index[25]	2.9 (0.76)	1.0 (0.21)**
Calculus index[26]	1.1 (0.55)	0.2 (0.15)**
Pocket bleeding index[27]	5.9 (8.88)	1.7 (4.58)*
Gingival index[28]	1.7 (0.35)	0.9 (0.28)**
Probing depth	3.3 (0.43)	2.6 (0.39)**

* p<0.05; **p<0.001

current—between initial diagnosis and final resolution.

Statistical methods and analyses

Data entry and analyses were performed by the authors and a University of Manitoba staff biostatistician using Epidata 3.1 and SPSS 16.0 for Windows. Frequency distributions were used to summarize data and potential associations between variables. The following statistical tests were applied:

i. Chi-square to analyze categorical data,
ii. Fischer's exact test to analyze categorical data with low cell size,
iii. ANOVA and paired T-test to analyze the relationship between continuous and categorical variables,
iv. Pearson correlation coefficient to analyze two continuous variables, and
v. The Mann–Whitney test to analyze continuous data where assumptions of normal distribution are violated.

RESULTS

Study participants

Demographics of the study participants are featured in Table 1, with Figure 2 illustrating the flow of participants through the study. Baseline and 1-month follow up examinations were completed in two consecutive days at the site dental clinic for nineteen subjects (87%), while the remaining three residents were examined on their respective units.

Three participants (14%) were lost during the 1-year follow up period. One participant died at four months of causes not related to pneumonia; one was discharged to a different LTC facility at five months, and one was discharged home at six months. None of these participants had been diagnosed with pneumonia at any period between the start of the study and the point at which they were lost from the study.

Participants received a mean of 3.2 (SD 0.9) units of debridement by a dental hygienist after the initial baseline examination. While twenty participants (90.9%) were totally dependent on others for daily mouth care, two were able to perform this activity independently. The randomized allotment process resulted in eleven participants being assigned to the test group using the reusable suction toothbrush and eleven to the control group using the manual soft toothbrush. The two groups did not differ significantly with regard to sex, age, number of remaining teeth, or any of the baseline oral parameters measured.

Baseline examination results

Results of the baseline examination are featured in Table 2. At baseline, participants averaged 23.3 (SD 6.1) remaining teeth. Plaque levels were generally high, with calculus a common finding reflecting a relative absence of effective daily mouth care and generally poor periodontal health.

One month follow up examination results

At one month, 100 per cent of participants were found to have improved modified plaque index,[25] calculus index,[26] and gingival index[28] scores. As shown in Table 2, the degree of improvement for each of these parameters was statistically significant (p<0.001). Mean probing depth scores were found to have improved for 21 of the 22 subjects (95.5%) from 3.3 mm to 2.6 mm, to a statistically significant (p<0.001) degree for the group (Table 2). The mean pocket bleeding index[27] at 1-month was significantly reduced (p<0.05) where 17 subjects (78%) improved, 4 (19%) remained the same, and 1 (5%) became worse. The degree of improvement by test and control participants did not differ significantly (p>0.05) for any oral health parameter. It is noteworthy that, following a single session of professional debridement and implementation of appropriate daily mouth care, substantial improvements in all parameters were achieved at one month.

Pneumonia outcomes

At the end of the one year followup period, 6 of the 19 remaining study participants (32%) experienced a total of 62 days during which they were diagnosed with pneumonia—pneumonia diagnosis days. The mean number of pneumonia diagnosis days was 3.3 days (SD 5.4) per subject, ranging from 6 to 16 days in duration.

On bivariate analysis, significantly more females (p<0.05 Fisher's exact test) developed pneumonia than did males

Table 3. Significant correlations between pneumonia and continuous variables.

	Days pneumonia diagnosis	
Baseline Mean probing depth	Pearson correlation	-.436*
	Sig. (2-tailed)	.042
1-Month Mean bleeding index	Pearson correlation	.462*
	Sig. (2-tailed)	.030

* Correlation significant at the 0.05 level (2-tailed)

(54.5% versus 0.0% respectively). On ANOVA, the number of pneumonia diagnosis days was also significantly higher ($p<0.05$) for females (5.6 days, SD 6.1) than for males (0.0 days).

Contrary to expectation, participants who developed pneumonia showed significantly lower ($p<0.05$) probing pocket depths (2.9 mm, SD 0.3) at baseline than did participants without pneumonia (3.4 mm, SD 0.4). However, individuals who developed pneumonia showed less improvement in probing depths (0.74 mm versus 0.42 mm) following initial debridement and implementation of a new daily mouth care protocol. This difference approached but did not reach statistical significance ($p=0.07$).

Participants who developed pneumonia showed significantly higher ($p<0.05$) bleeding index scores at their 1-month follow up examinations (3.5%, SD 8.5) compared with participants without pneumonia (1.0%, SD 1.8). Anecdotally, the individual who experienced the longest bout of pneumonia (16 days) had the highest bleeding index score at 1-month (20.8%).

As shown in Table 3, 2-tailed Pearson correlation coefficient analysis showed statistically significant ($p<0.05$) association between the number of pneumonia diagnosis days and both baseline mean probing depth and 1-month bleeding index scores. Test and control participants did not differ significantly on any other investigated parameter, that is number of teeth, age, plaque, calculus, or gingivitis index scores.

General versus study population

As previously mentioned, this institution routinely monitors pneumonia rates as part of its quality assurance program, and reports these results as the number of pneumonia days per 1,000 patient days. Other residents of the institution who were not participants in the study (general population) were not offered the professional debridement and daily mouth care protocol. For the time period covering the conduct of this study, study participants had a significantly lower ($p<0.05$) pneumonia rate (1.2 days/1,000 patient days, SD 0.8) on the Mann–Whitney test than did the general population residing in the same area of the institution (3.4 days/1,000 patient days, SD 1.3).

Table 4. Pneumonia rate by sex and type of toothbrush assigned.

		Manual soft toothbrush group at 1 month	Manual soft toothbrush group at 1 year	Suction toothbrush group at 1 month
Sex	Assignment	No pneumonia Number (%)	Pneumonia Number (%)	Total Number
Male	Suction brush	5 (100%)	0 (0%)	5
	Manual brush	3 (100%)	0 (0%)	3
	Total	**8**	**0**	**8**
Female	Suction brush	2 (50%)	2 (50%)	4
	Manual brush	3 (50%)	4 (50%)	7
	Total	**5**	**6**	**11**

$p>0.05$ (Fisher's exact test)

Suction (test) versus manual (control) toothbrush

The 1-year pneumonia incidence for participants in the suction toothbrush group was 18.2 per cent (2 of 11 subjects) compared with a 36.4 per cent incidence (4 of 11 subjects) in the manual toothbrush group. This difference was not statistically significant (p=0.318) on Fisher's exact test. When assessed for the total number of days spent with a diagnosis of pneumonia, it was determined that participants in the suction toothbrush group averaged 1.1 (SD 2.4) days with pneumonia compared with 4.6 days (SD 6.5) for participants in the manual toothbrush group. This difference approached but did not quite reach statistical significance on ANOVA (p=0.116). A retrospective power analysis revealed that this pilot study had a power of only 35 per cent, and that a sample size of 34 subjects would have been required for the observed differences to be statistically significant.

However, when these apparent differences in pneumonia rates were assessed while controlling for participant gender, it became obvious that the relationship between pneumonia and toothbrush group was being confounded by the uneven distribution of males and females in test and control groups. Despite the fact that there was no statistically significant association between subject sex and the toothbrush group to which they were randomly assigned, Table 4 clearly shows that any observed relationship is purely the result of variable confounding. The rate at which males developed pneumonia was zero per cent in the suction and manual toothbrush groups. However, the rate at which females developed pneumonia was 50.0 per cent in both the suction and manual toothbrush groups. There was no difference in pneumonia rate attributable to whether daily care was provided by a suction toothbrush or a manual toothbrush. The pneumonia rates were identical in the two groups when assessed separately for males and females.

DISCUSSION

Similar to the results reported by other researchers[1,2,17,21,29,30] this study also found evidence that the oral health needs were not being met for dependent adults in LTC. This was true for both daily mouth care and use of professional dental services. Upon baseline examination, high levels of plaque and calculus were evident. Not surprisingly, high degrees of bleeding, gingivitis and periodontitis were also found, creating a very plausible pathogenesis link to aspiration pneumonia. It is little wonder that respiratory infections have been identified as the leading problematic quality indicator in LTC[15] and cited as a major concern at this centre.

The 1-month results of this pilot, examiner blind randomized clinical trial allow us to draw two separate observations.

i. First, that professional debridement, caregiver training, and implementation of a unit specific daily mouth care regimen can lead to improvements in oral health parameters, and to substantial reductions in oral health risk factors for aspiration pneumonia. Therefore, continued efforts in this direction are urgently needed.

ii. Second, in dependent adults with dysphagia, a suction toothbrush design is able to produce equivalent oral health improvements to those found with a soft manual toothbrush. This finding provides additional support for use of a suction toothbrush as a viable, effective alternative to that of a manual soft toothbrush for adults at high risk of aspiration pneumonia.

Although no previous studies have examined the effectiveness of a reusable suction toothbrush in reducing the incidence of pneumonia, results of this study are consistent with previous research investigating innovative toothbrush designs incorporating suction.[35,36] Combining a powered toothbrush, suction and an antibacterial agent delivery system, Sumi et al.[35] reported improved gingival and plaque levels in frail dependent elderly individuals. The study design did not allow assessment of the independent effects of using a powered brush, suction, or an antimicrobial agent. Researchers Ferozali, Johnson and Cavagnaro[36] reported improved oral health parameters as well as reductions in pathogenic bacterial counts for subjects who had received intermittent suctioning during mouth care using a commercial one-use suction toothbrush.

After one year of follow up, pneumonia rates improved for the study population when compared to the general institutional population who did not receive the initial professional debridement and improved daily mouth care that was made available to study participants. These findings further support the conclusion of a recent systematic review that pneumonia rates among high risk populations are reduced by interventions to improve oral hygiene.[27] This knowledge has important implications for LTC in Canada. With pneumonia associated with high mortality and morbidity rates among dependent older adults in LTC,[11–13] decision makers can take steps to improve this diagnostic quality indicator.[15,42]

The original purpose of this study was to determine whether or not pneumonia rates could be improved in individuals with dysphagia by using a suction toothbrush design that eliminated plaque, debris, saliva, and toothpaste residue during the process of daily mouth care. In the 1 year follow up period, non significant (p>0.05) improvements were documented in the incidence of pneumonia and in the number of pneumonia diagnosis days experienced by participants assigned to the suction toothbrush group. However, on more detailed analysis, this apparent reduction was completely explained by the unequal distribution—of male and female participants—that occurred during random subject assignment. This confounding occurred despite the fact that the test and control groups did not differ significantly (p>0.05) by gender. While the findings of this study suggest no advantage to using a suction toothbrush to reduce pneumonia, there were design and use characteristics that caregivers preferred. Details regarding caregiver experience and preferences will be the topic of a separate paper.

This study has several limitations, including a small sample size, recruiting all participants from a single LTC facility, and having a relatively short period of one year to evaluate pneumonia outcomes. Generalizing the findings of this study to other facilities and residents living in LTC is not possible due to the differences in caregivers' oral

health knowledge and training, staff turnover rates, and the variability of resident demographics.

CONCLUSIONS

Effective daily mouth care remains an unresolved problem in LTC, with high levels of plaque and food debris, inflammation, and oral disease challenging individuals' oral health, quality of life and ability to stave off life threatening infections such as aspiration pneumonia.[1,2,17,21,27,28] This is especially alarming as the profile of dependent adults is changing in Canada towards an older, more frail, and more care dependent resident population with complex medical conditions.[43] Effective mouth care protocols, training, and interventions that offer ease of use and encourage compliance are therefore urgently needed to help address this problem.

Our study found that caregiver education and hands on training as well as implementation of a daily mouth care protocol with clearly established guidelines and caregiver accountability were effective means for improving the oral health of this population of dependent adults with dysphagia. A single session of professional debridement combined with adequate daily mouth care, regardless of study toothbrush type, were effective means for improving oral health and for reducing the pneumonia rate for this population of dependent adults with dysphagia in LTC. Importantly, study participants experienced better aspiration pneumonia outcomes than did other residents of the institution.

Finally, we conclude that while there was no oral health or aspiration pneumonia rate advantage for using a suction toothbrush over the manual soft toothbrush for this population, the suction toothbrush does hold promise in increasing caregiver compliance and success in maintaining dependent adults' oral health and quality of life.

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Daily oral hygiene in residential care

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ABSTRACT

Introduction: Significant improvements have occurred in the overall oral health status of the Canadian community population; however, oral health in residential care continues to be a long standing problem. Despite the importance of preventing oral diseases and of maintaining a person's psychosocial wellbeing, daily oral hygiene is recognized as a low priority for staff, administration and government inspectors. **Purpose:** The purpose of this paper was two fold: To present findings based on factors associated with daily oral hygiene in residential care homes in Ontario, and to discuss solutions based on current legislation in residential care. **Methods:** Data collected on 17,848 older persons in Ontario during *ideas for Health* projects used the Minimum Data Set (2.0), and identified the characteristics associated with having daily oral hygiene performed by staff or resident. **Results:** Approximately 2 per cent of residents were not receiving any daily oral care of teeth or dentures. Older persons with higher scores on the Activities in Daily Living (ADL) scale ($p=0.03$) and persons who were more care dependent ($p<0.0001$) were significantly more likely to receive daily oral care. **Conclusions:** While daily oral care is being provided to older persons with higher care needs, frail older persons in residential care with lower scores on the ADL scale are less likely to have daily oral care. This paper supports further educational and regulatory initiatives—including the integration of gerontology and geriatrics in the dental sector—as a solution to provide oral care to this segment of the Canadian population.

RÉSUMÉ

Introduction: L'état de santé buccodentaire de la population des communautés canadiennes s'est grandement amélioré; toutefois, les soins de santé buccodentaire dans les institutions demeurent un problème depuis fort longtemps. Malgré l'importance de prévenir les maladies buccodentaires et de maintenir le bien-être psychosocial des personnes, l'hygiène buccodentaire quotidienne demeure toujours une faible priorité pour le personnel, les dirigeants et les inspecteurs du gouvernement. **Objet:** Cet article a un double objet : présenter les données fondées sur les facteurs associés à l'hygiène buccodentaire des soins quotidiens dispensés dans les foyers de l'Ontario et discuter des solutions fondées sur la législation courante concernant les soins en institutions. **Méthodes:** Les données, qui ont été recueillies auprès de 17 848 personnes âgées de l'Ontario lors des *Projets d'idées pour la santé*, proviennent du Minimal de données (2,0) et identifient les caractéristiques associées à la réception des soins d'hygiène buccodentaire dispensés par le personnel ou les résidents. **Résultats:** Environ 2 pour cent des résidents ne recevaient pas de soins buccodentaires quotidiens, dents naturelles ou artificielles. Les personnes âgées qui avaient des résultats plus élevés dans les activités courantes dans l'échelle d'Activités de la vie quotidienne (AVQ) (p=0,03) et celles qui dépendaient le plus des soins (p=0,0001) étaient significativement plus portées à recevoir des soins buccodentaires. Conclusions : Alors que les soins buccodentaires quotidiens sont dispensées aux personnes plus âgées qui en ont le plus besoin, les plus dépendantes des soins en institutions, qui ont des résultats d'AVQ plus faibles, sont moins susceptibles d'avoir des soins buccodentaires quotidiens. Cet article soutient davantage les initiatives d'éducation et de réglementation pour résoudre la prestation de soins buccodentaires à ce segment de la population canadienne.

Key words: oral health, dental care, oral hygiene, long term care, geriatrics, interdisciplinary

INTRODUCTION

With an increase in dental service utilization since 1972, significant decreases in dental disease, including tooth loss and coronal caries have occurred in the Canadian population.[1] Despite this overall improvement in the oral health status and utilization, disparities in the overall Canadian population continue to exist.[1] Of notable concern is the ongoing issue of accessing dental care especially for older persons who live in residential care homes.[2–7]

Despite the recognized importance to older persons overall health and wellbeing, receiving oral healthcare in residential care continues be a long standing problem. While accessing dental professionals in residential care for emergency dental situations and yearly visits to dental professionals are typically covered under provincial *Long Term Care Acts*,[5] violations are known to occur. These barriers to providing dental care are well established in the literature; and often include financial,[8] demographic characteristics in older persons,[9] and environmental factors, including transportation and availability of dental providers,[10] and legislative barriers.[11] Both federal and provincial organizations in Canada are working towards solutions.[12,13]

Furthermore, daily oral hygiene is another known problem for staff members. Provincial *Long-term care Homes Acts* rarely regulate the maintenance of daily

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oral hygiene,[5] and again, where such regulation exists, violations still occur. British Columbia, for instance, has a regulation that residential care homes take joint responsibility with dental professionals and staff for the maintenance of daily oral hygiene. However, Jiang and MacEntee[11] had found that both staff and administration did not implement such regulation due to inadequate collaboration among dental professionals, administrators and government inspectors. Despite staff recognizing the importance of providing oral care, conflicting priorities,[14,15] attitudes from administration and clear lack of attention from government officials[11,14] prevent older persons in residential care from receiving basic oral care.

Solutions to providing daily oral hygiene for the prevention and maintenance of dental diseases in residential care are less established. While a number of organizations in Canada have developed educational materials for staff members in residential care,[16–19] these materials are often criticized for providing a "band-aid" approach to dental care. Of additional concern is that such initiatives often lack long term sustainability.[20] Consequently, active solutions by all persons involved in the overall care, including dental care of older persons, are urgently needed.

Few researchers within the gerontological literature have responded to providing solutions for older person's oral healthcare. While dental professionals have long advocated that oral healthcare will remain peripheral to other healthcare concerns until policy makers are informed of the problem,[4] gerontologists have well understood the history of abuse and neglect issues in residential care, including both the prevention and maintenance of the physical health and psychosocial wellbeing within these care homes. While parts of the dental literature have focused on establishing a causal relationship between oral health and systemic diseases,[21–36] older persons within care homes are already characterized by functional impairment along with clinical complexity. Instead of focusing on causal associations in these populations, ensuring both the prevention and maintenance of oral health for both the psychological and social wellbeing[37] and for nutritional aspects[38] of these persons should be of utmost priority for both gerontologists and policy makers in residential care.

Development of any innovative approaches to providing dental care for older persons in this population will require careful consideration of the trends—for example, baby boomer health dynamics—regarding the oral health status of all Canadians, including those in residential care. While less than ten per cent of the Canadian population reside in residential care,[39] community surveys indicate a need to provide ongoing preventive dental care in residential care, now and in the future.[1] While strategies for improving the oral health of older people have been discussed for global policy implementation,[40] there is a clear absence of discussions surrounding oral health status of baby boomers in the future of dental health policy, and of solutions to providing daily dental hygiene in residential care.

Given the demographic urgency of providing oral care to older persons, the purpose of this paper was to present findings from a 2008 presentation[40] during the Canadian Association on Gerontology – Annual Scientific and Educational Meeting (ASEM). Using the resident assessment instrument MDS 2.0 data, the mandated assessment instrument through residential care homes in Ontario, the paper illustrates the extent of the oral care problems in residential care and investigates the factors associated with daily oral hygiene. Ultimately, the paper provides evidence base for solutions and educational and research initiatives for oral health in residential care in Canada.

METHODOLOGY

Participants

The participants in the sample consisted of 17,848 older persons, with the average length of stay as 706.4 days (SD=1082.4) in residential care. Approximately 68 per cent of the sample was female, and 45.4 per cent had natural teeth. The average age of the persons in the sample was 82 years (SD=10.5).

Data collection and analyses

Secondary data analyses based on data collected in residential care homes in Ontario during the *ideas for Health* projects (2005–06) were examined.[39] During the data collection phase, all assessments that were completed from trained assessors on the MDS (2.0) instrument were investigated for missing data and outliers by at least two *ideas for Health* project staff. Any missing data were sent back to the participating site coordinators for completion. All data were collated by two *ideas for Health* staff members. Ethics approval for data collection for the *ideas for Health* project was previously obtained through the University of Waterloo.

Data were obtained for these presentations by this author[39–43] using a secure data server designated for student access from the *ideas for Health* principal investigator. All students signed and completed forms for data privacy, protection and confidentiality. As this was an original exploratory population based study to investigate the factors associated with daily dental hygiene in residential care, previously published literature on daily oral hygiene in residential care homes,[15] were cross walked with the MDS 2.0 assessment items. Frequency analyses of all oral health problems were first conducted to illustrate the extent of the oral health status. As this was an exploratory analysis, T-tests were used determine which MDS 2.0 items were associated with daily oral hygiene ($p<0.05$).

Measures

Items on oral health

The oral health status of older persons in residential care, as measured on the MDS 2.0, consists of oral hygiene measures—daily cleaning of teeth or dentures or both by resident or staff member—and oral status measures. These items are divided to include:

i. oral health problems—problems chewing, swallowing, and mouth pain, and
ii. oral health diagnoses—debris present in mouth prior to going to bed; broken, loose, or carious teeth; inflamed gums, swollen or bleeding gums, oral abscesses, ulcers or rashes.

These items are assessed by staff members, and provide a set of minimum data in residential care.

Activities of daily living

Lawton's activities of daily living (ADL) scale on the MDS 2.0 refers to a person's self performance regarding tasks of daily life—for example, moving between locations, eating, toilet use, and personal hygiene. Older persons can range from 0=independent (decisions are consistent, reasonable and safe) to 4=*severely impaired* (never or rarely makes decisions). Therefore, scores can range from 0 to 16, where higher scores indicate more severe impairment. Internal consistency for the ADL scale is high with alpha=0.90.[41,44]

Cognitive impairment

The MDS 2.0 cognitive performance scale is modelled from the mini mental state examination (MMSE) and test for severe impairment (TSI). In providing a functional measure to define the older persons cognitive status, the cognitive performance scale measures six items on the MDS 2.0; 1) short term memory, 2) whether or not the resident is able to recall the current season, 3) whether the resident remembers the location of his or her room, 4) resident remembers staff member's faces or names, 5) resident is aware that he or she is in a nursing home, and 6) if the resident is able to make decisions regarding tasks of daily life. Assessors complete this section by checking off which items the resident was able to complete or recall during the last seven days. The scale ranges from 0=*intact* to 6=*severe impairment*. This scale was has high reliability of alpha= 0.89.[44–46]

Aggressive behaviour

The frequency of behavioural symptoms is summed to create the aggressive behaviour scale, and includes:

i. verbal abuse—whether staff members or other residents screamed, threatened, or cursed at,
ii. physical abuse—others were hit, shoved, scratched or sexually abused,
iii. socially inappropriate behaviour—resident was disruptive or engaged in self abusive acts, and
iv. resisting care—medications and/or eating.

The scale has a high reliability of alpha = 0.79.[43]

Depressed affect

Mood items are used to screen for depression in residential care homes.[44] The scale consists of a core set of seven mood items which are: making negative statements, persistent anger, expressions of unrealistic fears, repetitive health complaints, repetitive anxious complaints, sad pained worried facial expressions, and tearfulness. Items are summed to give a possible score of 0–14, with higher scores indicating more depressive symptomology. The MDS 2.0 depression rating scale is validated against the Hamilton depression rating scale and the Cornell scale for depression in patients with dementia, as well as the *Diagnostic and Statistical Manual of Mental Disorders* – 4th ed. (DSM–IV).[47,48]

Changes in health, end stage disease, signs and symptoms (CHESS)

The CHESS scale was developed to detect frailty and instability in health.[45] The scale includes a count of health symptoms present, which are vomiting, dehydration, leaving food uneaten, weight loss, shortness of breath and edema. The scores on these items are added together, including items on end stage disease, decline in both cognition and activities of daily living. The scores on the scale range from 0=*no instability* to 5=*very severe instability*. Higher scores on the CHESS are shown with a reduction in survival time in chronic care populations.[45,48]

Index of social engagement

The index on the MDS 2.0 consists of social activity by the resident. These items consider whether the person is at ease interacting with others, is doing planned or structured and self initiated activities, and whether the person establishes his or her own goals, pursues involvement in the life of facility, and accepts invitations into most group activities. The items are summed together to create a social engagement index, resulting in a score of 0–6, with higher scores indicating more social engagement within the care home.[49]

RESULTS

Missing data and outliers for all measured variables were first investigated, and no problems were found. Characteristics of the study sample are presented in Table 1. Frequency analyses (n=17,848) determined that approximately 6 per cent (n=1070) of all residents in Ontario had debris present in their mouth prior to going to bed, and that they were experiencing oral health problems such as chewing problems (26.7%; n=4765), mouth pain (1.0%; n=178); broken, loose, or carious teeth (5.1%; n=910); inflamed gums, oral abscesses, mouth ulcers and rashes (1.3%, n=232).

Table 1. Characteristics of Ontario residents (n=17,848)

Characteristic	Number and Mean (SD)
Age at assessment	82.0 (10.5)
Length of stay	706.4 (1082.4)
Sex Female	68.3 (12187)
Oral status Dentures	54.6 (9744)

Table 2. Factors associated with receiving daily oral hygiene in Ontario's residential care homes.

Characteristic	No daily oral hygiene (n=499)	Received daily oral hygiene[a] (n= 17,349)	*p* value
Cognitive performance	2.7	2.8	*p*=0.57
Activities of daily living	2.9	3.5	*p*=0.03
Aggressive behaviour	1.6	1.7	*p*=0.76
Depression	1.8	2.1	*p*=0.17
CHESS	0.5	0.7	*p*<0.0001
Index of social engagement	2.4	2.5	*p*=0.23

[a] Received any daily oral hygiene (teeth or dentures) by staff or resident

The factors associated with receiving daily oral hygiene by staff or resident are presented in Table 2. Approximately 2 per cent (n=499) of older persons in the provincial sample had no daily oral hygiene. Older persons with higher scores on the ADL scale (p=0.03) were significantly more likely to have daily oral hygiene. Furthermore, higher scores on the CHESS scale, indicating more health instability, were significantly more likely to have daily oral health care (p<0.0001). There were no significant differences regarding impairments in cognition, aggressive behaviour, social engagement and depressive symptomology (Table 2).

DISCUSSION

The purpose of this paper was to present findings based on daily oral hygiene in residential care homes in Ontario, and to discuss solutions to providing such care. Older persons in this sample who had higher care needs were significantly more likely to have daily oral healthcare. These results highlighted that staff members in residential care were providing daily oral care to frail older persons who could not otherwise provide care to themselves—staff members undoubtedly cared for and made efforts for oral health and wellbeing of older persons. However, clinical complexity often resulted in rushed approaches to care including oral care. This was confirmed, as a number (n=499) of frail older persons reported no daily oral hygiene in Ontario's residential care homes in last seven days. This study additionally found that older persons who were frail but more care independent were less likely to have any daily oral care. Other research has found that older persons may hesitate to ask for assistance with oral hygiene.[15] Clearly, the development and implementation of strategies for oral healthcare involving government, dental professionals and gerontologists are much needed and long overdue for older persons in residential care in Canada.

Development of strategies for oral health in residential care homes is imperative to ensure the overall wellbeing of Canadian older persons. The development of organizational strategies offers solutions in both the prevention and maintenance of oral health in the residential care sector. The integration of dental care in residential care homes has illustrated ongoing difficulty from the perspective of dental professionals. Focus groups in the Pruksapong et al.[46] study had discussed a stronger need for administrative support for the provision of oral healthcare in residential care. Furthermore, the groups had indicated that lack of interest among dental professionals, and inadequate education were the main barriers in the provision of oral healthcare in residential care, highlighting the need for educational approaches to solve the issue of providing daily oral hygiene. As a solution, working groups from the Canadian Dental Association[9] have recommended both gerontology and geriatric education and training for the dental sector with the need for interdisciplinary and interprofessional team based, collaborative care.[11,12]

Interdisciplinary approaches to training in gerontology are often hindered due to the structure of Canadian universities.[47] The facilitation of gerontology at both undergraduate and graduate levels for dental professionals will assist in recruiting and preparing dental professionals for providing care to older persons in different care settings such as interprofessional teams in hospitals. It is important to note that while a lack of interest in providing dental care to this population can be addressed within dental education, there is a stronger realization of the need for both legislative and organizational changes for dentistry in residential care. For instance, while legislation in the majority of provinces has allowed independent dental hygienists to provide preventive care to this population, the scope of practice within residential care does not allow dental hygienists to provide dental care without a visit to dentist in last year.[49] Further regulatory initiatives in provinces regarding daily oral hygiene in residential care will assist in maintaining the overall oral and health of older persons. Both regulatory and educational changes to the practice of dentistry and dental hygiene—as with the creation of a specialized dental professionals—are imperative to meet the changing oral healthcare needs in this population, as are investigations surrounding baby boomer health dynamics in the future of dental health policy. Furthermore, systems' level research investigations and further investigation of different care models from gerontological researchers and practitioners will illustrate the most efficient and cost effective solutions to providing oral care in residential care.

Strengths and limitations

These results add to the literature on oral health in residential care by empirically investigating the factors associated with receiving daily oral hygiene. Strengths include the analyses of mandated data collected in Ontario. Limitations to the research are based on clinical observations in residential care. The MDS 2.0 oral assessments are often assigned to health professionals who do not have the knowledge or expertise in assessing a mouth. Therefore, while the MDS 2.0 is designed to provide minimum data for policy implementation,[49] the frequencies of the oral health items that appear on the MDS 2.0 may be an underestimation of the true extent of the problem.[48]

CONCLUSIONS

Improper oral hygiene practices lead to further oral health problems.[37] All residential care homes in Ontario had approximately 1 to 26 per cent of older persons experiencing oral health problems, such as problems chewing and mouth pain. These results have implications for those providing care to older persons. Chewing problems associated with or without dental pain are associated with physical problems with digestion,[37] leading to hunger and weight loss, and resulting in poorer nutritional outcomes.[38] Other oral problems are associated with speech problems, reduced social activities and intimate relationships.[37] Given the importance of proper nutrition in residential care, ensuring the prevention and maintenance of oral health throughout the lifespan—inclusive of older population in residential care—should no longer be a recognized low priority for administrators and staff members.

Solutions to providing daily oral hygiene in residential care homes must be developed in collaboration with all members in residential care, including government officials. For instance, time efficiency must be considered for frontline staff members when designing strategies to improve oral health, as many care aids frequently state that oral care cannot be completed during the period between wake, dress and breakfast routines. Further, better support for dental professionals in residential care as valued members of a care team will be imperative to ensure residential care homes maintain the overall health of these older persons. Finally, any strategy to promote and maintain the overall health and wellbeing of older persons in residential care must always consider the autonomy of older persons while promoting independence.

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Cobban SJ and Dempster LJ.
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The first issue of the *CJDH* each year records with gratitude those who worked behind the scenes to make possible publication of the articles that appeared in the issues of 2012.

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Potential of platelet rich fibrin in regenerative periodontal therapy: literature review

Leigha Rock, RDH, DipDH

ABSTRACT

Objective: To evaluate the literature regarding the effectiveness of autologous platelet rich fibrin (PRF) in the treatment of periodontal intrabony defects (IBD). **Method:** A detailed search was conducted through the electronic databases of PubMed, CINAHL, Google Scholar, and the Cochrane Central Register of Controlled Trials (CENTRAL); and five in vivo human peer reviewed trials addressing the effectiveness of PRF in periodontal IBD were included. **Results and Discussion:** Statistically significant results showed in: 1) all five studies in clinical and radiographic periodontal parameters with the use of PRF in open flap debridement (OFD) as compared to OFD alone; 2) three of the studies in probing depth (PD), and 3) four out of the five studies in clinical attachment loss (CAL). All studies presented statistically significant differences for IBD fill, as measured on standardized radiographs read by computer aided software. **Conclusion:** The potential clinical implications for this inexpensive and autologous material are promising. Further long term, larger, multicentred randomized controlled clinical trials are required to determine the effects of PRF on the regeneration of alveolar bone due to periodontal disease.

RÉSUMÉ

Objet: Cette étude a pour objet d'évaluer la littérature concernant l'efficacité de la fibrine riche en plaquettes (FRP) autologues dans le traitement des lacunes intra osseuses parodontales (LIO). **Méthode:** Une recherche détaillée a été faite dans les basses de données électroniques de PubMed, CINAHL, Google Scholar et le Cochrane Central Register of Controlled Trials (CENTRA). Y ont été ajoutées, les revues de cinq essais in vivo chez des groupes parallèles d'humains quant à l'efficacité de la FRP pour les LIO. **Résultats et discussion:** Les résultats statistiquement significatifs comprenaient ce qui suit : a) les cinq études cliniques et radiographiques des paramètres parodontaux, effectuées avec l'utilisation de la FRP dans le débridement avec lambeau ouvert (DLO) comparativement au DLO seul ; 2) trois des études de sondage de la profondeur (SP); et 3) quatre des cinq études qui portaient sur la perte d'attache épithéliale (PAÉ). Toutes les études ont présenté les écarts statistiquement significatifs pour combler les LIO, selon la mesure des radiographies standardisées lues par le logiciel de l'ordinateur. **Conclusion:** Les possibilités d'implication clinique de ce matériel autologue et peu couteux sont prometteuses. D'autres essais cliniques, de plus longue durée, plus étendus, multicentriques, randomisés et contrôlés sont requis pour déterminer les effets de la FRP sur la régénération de l'os alvéolaire à la suite d'une maladie parodontale.

Key words: alveolar bone loss; periodontitis; bone regeneration; blood platelets

BACKGROUND

Periodontal disease is an inflammatory disease that destroys the periodontium, including the alveolar bone, and if left untreated, can lead to tooth loss. The goals of conventional periodontal therapy, both non surgical and surgical, have aimed at improving the health of the periodontal tissues and at arresting the periodontal disease, but this therapy does not replace the lost tissues.[1] Over the years, there has been a growing interest in exploring the ability to regenerate the tissues lost to the disease, and thereby not only arresting the disease, but in reversing it.[2]

The regenerative and wound healing potential of platelets has garnered much attention over the last few years. The platelets release growth factors, which have been shown to stimulate bone growth and repair.[3,4] Research demonstrating the statistically significant benefits of platelet concentrates and osseous regeneration has been published in the areas of maxillofacial surgery and implantology.[5] It is plausible that the same benefits could be seen in periodontal applications such as in the treatment of intrabony defects (IBD). There is considerable experimental evidence on earlier regenerative techniques such as guided tissue regeneration, synthetic hydroxyapatite, anorganic bovine bone and first generation platelet concentrates such as platelet rich plasma (PRP).[5–7] A systematic review and meta analysis by Del Fabbro et al.[5] concluded a significant positive effect of the adjunctive use of PRP in intrabony defects. However, the cultivation of PRP is an expensive and time consuming process which requires the addition of anticoagulants, bovine thrombin or calcium chloride. Consequently, its use in private practice is limited.[8]

In 2001, Joseph Choukroun[8] introduced a technique to harvest PRF from a simple blood sample drawn from the patient. It is a simple and inexpensive procedure.[9,10] PRF is prepared by drawing a blood sample from the patient at the time of the surgical procedure. Nothing is added to the sample; it is kept completely autologous. The sample is

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placed in a specific centrifuge and is treated with a single, specific centrifugation. At the end of this process, three distinct layers are formed. The bottom layer consists of concentrated red blood cells. The middle layer is the dense PRF clot, and the top layer is liquid serum plasma. The PRF clot is removed with sterile forceps, and is compressed further with a special tool, creating a dense, elastic PRF membrane that can be used in various clinical applications as a filling material or as a suturable membrane.[8] The PRF created with Choukroun's technique contains concentrated leukocytes, platelets, and growth factors that are trapped within a fibrin matrix.[3,4,9] The growth factors are released from the platelets, and are thought to stimulate wound healing and bone regeneration.

OBJECTIVE

Dental hygienists are primary health practitioners whose area of expertise and responsibility focuses on the health of oral tissues and the periodontium. It is important for dental hygienists to work collaboratively and knowledgeably with other health professionals, including periodontists. Dental hygiene diagnosis and referral is within the scope of practice of a dental hygienist; it is important to be able to recognize when a referral is indicated and to be knowledgeable in the various options for periodontal treatment.[11]

Although there is a sizable body of evidence demonstrating the benefit of PRF,[3,4,12-19] its use in periodontics is relatively new. The purpose of this paper was to explore the use of PRF as a regenerative treatment in periodontal IBD. Did periodontal IBD treated with open flap debridement (OFD) and autologous PRF improve periodontal outcomes in adults with chronic periodontitis over those treated with OFD alone? This literature review built on current and previous research. The clinical use of autologous PRF in the treatment of periodontal intrabony defects is beyond the scope of previous literature reviews found to date.

METHODOLOGY

A detailed search of electronic databases was conducted including PubMed, CINAHL, Google Scholar, and the Cochrane Central Register of Controlled Trials (CENTRAL). The key words used for searching included: "alveolar bone loss"; "periodontitis"; "bone regeneration"; "blood platelets". Hand searches were also conducted. The references and bibliographies of related studies were also scrutinized.

The inclusion criteria for this literature review consisted of studies which were peer reviewed, and which were in vivo human trials. All controlled clinical trials involving the use of PRF were considered. The study also needed to address alveolar bone loss due to periodontitis. The articles excluded were expert opinion articles, literature reviews, animal trials as well as case studies. Studies that addressed the use of PRF in applications other than periodontitis—for example, implants, sinus lifts, orthopaedic surgery and plastic surgery—were also excluded.

RESULTS

Five studies fulfilled the inclusion criteria.[10,20–23] These studies comprised four randomized controlled clinical trials—one of which was of split mouth design and one controlled clinical trial. Three of the studies addressed the treatment of IBD with PRF.[10,20,21] One study evaluated the effectiveness of PRF verses PRP against a control,[23] and another study examined the effectiveness of PRF contrasted with PRF plus hydroxyapatite against a control (Table 1).[22] All of the studies had been peer reviewed. Fifteen papers did not meet the inclusion criteria but were considered for background information. Of these, one was a case study,[12] eight of the studies involved in vitro investigation of human cells,[3,4,9,13,24-27] and two involved animal studies.[4,28]

DISCUSSION

A methodological review of the available evidence was performed, and the quality of each of the studies was assessed. Well designed randomized controlled trials offer some of the strongest experimental evidence and can provide strong corroboration of a suspected causal association.[29] The sample population in each study was relatively small and drawn from a single dental school. All of the studies were of relatively short duration—nine months in each case. By using a convenience sample, and not a probability sample, the authors may have introduced selection bias, which would weaken the internal validity of the studies.[30] Blinding was used to control for assessment bias.[31] Four of the studies were double blinded. The fifth study was single blinded with blinded measurements, but it was not clear on whether the subjects were blinded. Appropriate inclusion criteria were used in each of the studies. All studies attempted to control for potential confounders such as systemic diseases, smoking, and medications. Each of the studies used effective methods and instruments to measure the outcomes in question. According to the Science and Therapy Committee of the American Academy of Periodontology,[32] probing depth, clinical attachment loss, and IBD fill are effective measures of periodontal outcomes. Each of the studies also made use of customized, acrylic stents to ensure reproducibility of measurements. Intra examiner reliability was measured. Extensive measures were taken to standardize radiograph technique, and radiographic outcomes were measured by computer aided software. Suitable statistical analysis for the variables being measured was employed in each of the studies. Each of the studies used "site" as the level of analysis. Individual sites within each mouth are not statistically independent units; they are dependent on the oral environment.[33] Two of the five studies suffered a relatively significant loss to follow up. In general, the results of a randomized controlled trial should be examined using an intention-to-treat analysis.[31] There was no mention whether this was done or not. Another significant point was that a related group of authors were involved in all of the studies included in the analyses.

Finally, there was a consistency of results among the studies. Each of the five studies showed a statistically significant result in clinical and radiographic periodontal parameters with the use of PRF in open flap debridement (OFD) as compared to OFD alone. Three of the studies

Table 1. Characteristics of included studies.

Author(s), year	Methods	Participants	Interventions	Outcomes	Location and funding
Sharma et al. 2011[10]	• Randomized controlled clinical trial • Parallel group • 2 treatment groups • 9 months duration	56 sites from 42 subjects.	Control: OFD Test: OFD+PRF	PD (p=0.006) and IBD (p<.001) found to be statistically significant greater than controls using manual probe with custom acrylic stent and standardized radiographs read by computer aided software.	University based. No funding received. Authors declared no conflict of interest.
Sharma et al. 2011[20]	• Randomized controlled clinical trial • Split mouth • 2 treatment groups • 9 months duration	36 sites from 18 subjects.	Control: OFD Test: OFD+PRF	PD (p<.001), CAL (p<.001), and IBD (p<.001) found to be statistically significant greater than controls using manual probe with custom acrylic stent and standardized radiographs read by computer aided software.	University based. No funding received. Authors declared no conflict of interest.
Thorat et al. 2011[21]	• Controlled clinical trial • Parallel group • 2 treatment groups • 9 months duration	32 sites from 32 subjects.	Control: OFD Test: OFD+PRF	PD (p<.01), CAL (p<.01), and IBD (p<.001) found to be statistically significant in OFD+PRF as compared to controls (OFD) using manual probe with custom acrylic stent and standardized radiographs read by computer aided software.	University based. Study was self funded. Authors declared no conflict of interest.
Pradeep et al. 2012[22]	• Randomized controlled clinical trial • Parallel group • 3 treatment groups • 9 months duration	90 sites from 62 subjects.	Control: OFD Test 1: OFD+PRF Test 2: OFD+PRF+HA	OFD+PRF showed IBD (p<.001) to be statistically greater than controls. OFD+PRF+HA showed CAL (p≤.05) and IBD (p<.001) found to be statistically significant different from controls using a manual probe with custom acrylic stent and standardized radiographs read by computer aided software.	University based. Source of funding not stated. Authors declared no conflict of interest.
Pradeep et al. 2012[23]	• Randomized controlled clinical trial • Parallel group • 3 treatment groups • 9 months duration	90 sites from 62 subjects.	Control: OFD Test 1: OFD+PRF Test 2: OFD+PRP	IBD (p <.001) was found to be statistically significant in both OFD+PRF and OFD+PRP groups compared to controls using a manual probe with custom acrylic stent and standardized radiographs read by computer aided software.	University based. Source of funding not stated. Authors declared no conflict of interest.

had a statistically significant result in probing depth (PD), and four out of the five studies had a statistically significant result in clinical attachment loss (CAL). All studies presented statistically significant differences for IBD fill, as measured on standardized radiographs read by computer aided software.

Biological aspect of PRF

PRF consists of platelets, leukocytes, cytokines, and stem cells within a fibrin matrix.[4,9,20,26] The leukocytes appear to strongly influence the release of growth factors, immune regulation, anti infectious activities, and matrix remodelling during healing.[4,9,20] It has been shown that PRF slowly releases growth factors—such as transforming growth factor-1β, platelet derived growth factor-AB, and vascular endothelial growth factor—and glycoproteins, particularly fibronectin and vitronectin, for more than seven days.[3,4,20–23] These growth factors are thought to stimulate bone regeneration through osteoblastic proliferation and differentiation.[3,9]

PRF compared to other treatment modalities

Biologically active molecules have been explored in periodontal regeneration in addition to autogenous and allogenous bone grafts and synthetic materials. These first generation materials have included insulin like growth factors, fibroblast growth factors, epidermal growth factor, platelet derived growth factors (PDGF), vascular endothelial growth factor, parathyroid hormone, transforming growth factor-β (TGF-β), bone morphogenetic proteins and platelet concentrates such as PRP.[22,23] The only other completely autogenous material available, at the time of writing, is intraoral or extraoral sources of autogenous bone. The inherent limitation to this method is that an autograft requires a second surgical site and procedure. In the case of synthetic hydroxyapatite alone, studies have shown excellent properties that permit the outgrowth of osteoblasts into the adjacent bone material. However, true periodontal regeneration is not achieved because the graft is encapsulated with a long junctional epithelium.[22]

PRF, a second generation platelet concentrate holds several advantages over first generation platelet concentrate materials. It is inexpensive and relatively simple to produce chairside.[8,10,14,21,23] Moreover, it is completely autologous. Unlike the first generation platelet concentrates, it requires no exogenous additives such as bovine thrombin or calcium chloride.[8,10,14,20–23] It also has the advantage of being able to be compressed, and formed into a membrane,[8,21,23] and it has been shown to release growth factors over a period of at least seven days.[3,4,20–23] Studies have shown a greater improvement in periodontal tissue regeneration with PRF than with PRP,[10,23] enamel matrix derivative, and guided tissue regeneration (GTR).[10]

Current uses and applications of PRF

Research on PRF has been concentrated in oral maxillofacial surgery. Multiple studies have been published on the advantageous effect of PRF in facial plastic surgery,[15,16,23] sinus lifts,[17,18,23,27,34] and other general surgery.[19] This has lead to exploration of treatment of gingival recession and root coverage, and to the investigation of PRF as an osseous regenerative therapy.

Other potential benefits to PRF as a periodontal regenerative therapy

PRF appears to accelerate healing and closure of wound margins in addition to its apparent osseous regenerative potential. Several authors claimed more rapid and enhanced wound healing with the use of PRF than without it[10,14,21] and attributed to both the growth factors and the fibrin matrix.[14,35] Several authors queried the potential for the regeneration of the soft periodontal tissues (gingiva) in addition to osseous tissues. Three of the studies showed coronal movement of the gingival margin in spite of recession that is often expected after periodontal surgery.[10,20,21]

Clinical implications

The use of PRF in clinical practice is quite practical because the fabrication of PRF is a simple, fast, and cost effective technique.[10,20,21] It is also less expensive to the patient than other methods such as other platelet concentrates or bone grafting.[21] Although the method for preparing PRF is relatively simple, expert training is required. PRF is a complex living biomaterial, and care must be taken in the preparation and conservation of the material. The success of this technique is dependent on the speed of collection of the venous blood specimen and on the transfer for centrifugation. Coagulation will begin to occur almost immediately because the sample is kept completely autologous.[20]

Careful candidate selection is important. Smokers were excluded from each of the studies. Results cannot be generalized to smokers.[20,22,23] Also, only systemically healthy persons were included in the studies. The success of PRF as a treatment modality in patients with systemic diseases such as insufficient platelet count, thrombocytopenia, afibrinogenemia, leukocyte adhesion syndromes, immune suppression, diabetes, and autoimmune disorders were not investigated. Only 3 walled IBDs and Class II furcations were included in the studies available. The filling of IBD with PRP appears to lead to very favourable results when at least three of the bony walls are intact. Different types of defects—for example, one walled or two walled—have different potentials for regeneration. The number of remaining bony walls present has been found to be correlated to potential osseous regeneration.[10]

Periodontics: a new clinical application for PRF

The current uses of PRF in periodontics include the treatment of gingival recession and, more recently, of osseous regeneration in periodontal IBD. The technique suggested for the clinical application of PRF in periodontal defects is that one PRF clot be placed in the IBD, and then be covered by two PRF membranes.[10,20,21,23] It has been suggested that the membranes will act as a barrier— a GTR membrane—to prevent the down growth of the junctional epithelium along the root surface. Another suggested technique is to mince a PRF membrane, place in the IBD, and cover with another PRF membrane.[12] Another method being explored is to mince a PRF clot and mix with a synthetic material, such as hydroxyapatite, before covering the graft with a PRF membrane.[23]

The consistency of the findings from these studies is promising. More studies investigating the use of PRF in periodontal regenerative therapy are needed.

CONCLUSION

The use of PRF in periodontal applications is in its infancy. The potential clinical implications for this inexpensive and autologous material are promising. Each of the studies assessed indicated improved periodontal outcomes with the adjunctive use of PRF in OFD. After assessing the strength and validity of the available studies, the results presented were only able to support the outcome question posed in this literature review in a moderately conclusive manner. Larger, longer termed longitudinal, multicentred, studies which employ strong sampling techniques are needed to answer the question definitively. Once more of these studies are available, a systematic review should be conducted. Ongoing research together with review type publications will help clinicians form an evidenced based decision on the potential referral for and clinical usage of this promising material.

Conflict of interest

The author declares that there was no funding for this review and no conflict of interest.

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Full mouth ultrasonic debridement in *Helicobacter pylori* eradication from the oral cavity: A case series

Elaine C. Escobar*[Δ], DDS, MSc, PhD; **Leandro Chambrone**[Δ‡], DDS, MSc, PhD; **Cláudio M. Pannuti**[Δ], DDS, MSc, PhD; **Marcia P.A. Mayer**[§], MSc, PhD, and **Lutiz A. Lima**[Δ], DDS, MSc, PhD

ABSTRACT

Objective: To evaluate whether full mouth ultrasonic debridement (FMUD) can eradicate *Helicobacter pylori* (*H. pylori*) from the oral cavity of patients with gingivitis and periodontitis after systemic eradication therapy (STT). **Methods:** Nine patients—six with gingivitis and three with chronic periodontitis—testing positive for *H. pylori* in the oral cavity after systemic triple therapy were evaluated. Microbiologic samples of DNA from six patients with gingivitis and three with periodontitis presenting *H. pylori* in the oral cavity after STT were evaluated by PCR, before and three months after FMUD. **Results:** Three months after treatment, *H. pylori* was eradicated from the oral cavity of five patients with gingivitis (83.3% of the gingivitis group). The DNA of *H. pylori* could not be recovered from saliva, the dorsum of the tongue or supragingival plaque of all patients. However, four patients (three with periodontitis and one with gingivitis) were still positive for *H. pylori* in the mouth (i.e. subgingival plaque) and two of them (one of each group) tested positive again in the stomach. *H. pylori* was still detected at the subgingival plaque of all patients with periodontitis and one with gingivitis. **Conclusion:** Within the limits of this case series, a single session of oral hygiene instruction combined with FMUD seemed to promote a positive effect in eradicating *H. pylori* solely from supragingival sites

RÉSUMÉ

Objet: Déterminer si le débridement global à l'ultrason de la bouche (DGUB) peut éradiquer la bactérie *Helicobacter pylori (H. pylori)* de la cavité buccale chez les patients atteints de gingivite et de parodontite après une thérapie systémique d'éradication (TSÉ). **Méthodes:** Évaluation de neuf patients — six ayant une gingivite et trois, une parodontie chronique — qui s'étaient avérés positifs pour la *H. pylori* dans la cavité buccale après une triple thérapie systémique. Les échantillons microbiologiques de l'ADN, des six patients qui ayant une gingivite et des trois ayant une parodontite, présentaient une *H. pylori* dans la cavité buccale après une TSÉ, ont été évalués par ACP, avant et trois mois après le DGUB. **Résultats:** Trois mois après le traitement, la *H. pylori* était éradiquée de la cavité buccale chez cinq patients atteints de gingivite (83,3 % de ce groupe). L'ADN de la *H. pylori* n'a pu être recouvré de la salive, du dos de la langue ni de la plaque supra-gingivale. Toutefois, quatre patients (trois avec parodontie et un avec gingivite) étaient demeurés positifs quant à l'*H. pylori* dans la bouche (c.-à-d. plaque sous-gingivale) et deux d'entre eux (un de chaque groupe) étaient de nouveau positifs dans l'estomac. La *H. pylori* a encore été décelée dans la plaque sous-gingivale de tous les patients ayant une parodontite et d'un ayant une gingivite. **Conclusion:** Dans les limites de cette série de cas, une simple séance de conseils en hygiène buccodentaire combinée à un DGUB semble avoir des effets positifs pour éradiquer l'*H. pylori* uniquement des sites supra-gingivaux.

Key words: *Helicobacter pylori*; dental scaling; polymerase chain reaction; gingivitis; periodontitis

INTRODUCTION

It is well established that the diverse microbial community formed on a tooth surface as a biofilm, embedded in an extracellular matrix of polymers of host and bacterial origin—dental plaque biofilm[1]—may lead to clinically significant infection and may result in gingival inflammation and periodontal tissues breakdown.[2] Such a complex microbial community aggregates several bacterial species, and it is usually considered focal and restricted to teeth surfaces. Despite being confined to the oral cavity, it may influence other body environments due to the concomitant, complex and dynamic interplay of numerous systemic biologic processes.[3] Examples associating periodontal pathogens and systemic diseases and conditions such as adverse pregnancy outcomes,[4,5] diabetes mellitus,[6] and atherosclerotic cardiovascular disease,[3] substantiate such interaction effects. Bacteria from the oral cavity can be ingested with saliva to reach the stomach. There is a growing base of evidence showing that bacteria from the gastric mucosa, *Helicobacter pylori (H. pylori)*, can be successfully identified and isolated in dental plaque biofilms.[7,8]

Originally classified as *Campylobacter pyloridis*,[9] *H. pylori*—a microaerophilic Gram negative, spiral shape bacteria—has been considered an important gastrointestinal pathogen associated to chronic gastritis gastric and duodenal ulcerations,[9] gastric carcinoma,[10] angina like chest

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pain,[11] atherosclerosis complications, gastric MALTomas, and autoimmune diseases.[12] Similar to the influence of periodontal pathogens in inflammation process,[3,4,6] *H. pylori* can lead to various interaction effects associated to bacterial load, such as endothelial and microvascular dysfunction, non specific inflammatory response, and an increase in cytokine levels, for example, IL-1β, IL-6, TNF-α.[12]

Systemic triple therapy (STT)—a combination of antimicrobials, antibiotics and proton pump inhibitors that increases the gastric pH—has been recommended to eradicate *H. pylori* from the stomach of patients with some diseases of the upper digestive tract[13,14] leading to high percentages of *H. pylori* eradication (80–90%) following seven to ten days of drug administration.[13,14] Nevertheless, gastric re-infection by these bacteria may be observed in some patients.[15] The oral cavity has been pointed out as a possible source of *H. pylori* in the gastric re-infection process after STT[7,8,14,16]—for example, there is evidence showing that the oral cavity of patients with gingivitis or chronic periodontitis, positive for *H. pylori* in their stomach—can be considered as reservoirs of *H. pylori* once it is detected in the saliva, supra and subgingival dental plaque of such patients.[7,8,14,16] Outcomes from previous studies have shown a great variability in the prevalence of *H. pylori* in the subgingival plaque of populations from the USA (0%),[17] Brazil (26.6%)[16] and Scotland (38%)[18].

Moreover, it has also been found that even after STT, supra and subgingival plaque of these patients can harbor *H. pylori*.[14,16] A previous study from our group showed that STT was effective in eradicating *H. pylori* from the stomach from 90 percent of the subjects, while it failed in eradicating *H. pylori* from the oral cavity of 60 percent of their subjects.[16] Only a single study so far has aimed to evaluate the possible association between dental plaque control and gastric *H. pylori* re-infection.[19] No study has been conducted to assess the effect of non surgical periodontal treatment contributing to *H. pylori* eradication from the oral cavity following STT.

The aim of this case series was to evaluate whether a single session of full mouth ultrasonic debridement (FMUD) was able to eradicate *H. pylori* from the oral cavity of patients with gingivitis or chronic periodontitis still positive for these bacteria in the mouth after STT.

MATERIALS AND METHODS

Study population

Detailed descriptions of the study protocol with patients' sample, upper digestive examination and STT—lansoprazole 30 mg; amoxicillin 1 g; and clarithromycin 500 mg, two times a day for seven days—advocated for *H. pylori* eradication, and microbiologic analyses used in this case series have been previously reported.[14,16]

Selection criteria

Nine patients, more than eighteen years of age (21–62 years old), but testing positive for *H. pylori* in oral cavity after STT—six with gingivitis and three with chronic periodontitis—treated in the study by Gebara et al.[14,16] were consecutively enrolled for this later case series. They came through the Gastroenterology Division of the Federal University of São Paulo (UNIFESP), and voluntarily signed an informed consent, before undergoing any treatment procedure, agreeing to their participation in the clinical protocol. Patients with a clinically healthy gingiva or those with aggressive periodontitis were not included. Patients who had used local or systemic antimicrobials in the two months prior to the case series with a history of any systemic disease known to affect host response as well as those who had undergone periodontal therapy were not included.

Ethical consideration

This case series was approved by the Ethics on Research Committee of Faculty of Dentistry, University of São Paulo, and was conducted in accordance with the Helsinki Declaration of 1975 as revised in 2000.

Questionnaire and clinical examination

At the initial examination, full medical and dental histories were obtained by one trained and calibrated dentist (ECE) using a health questionnaire. Data included full mouth probing depth measured at six sites around teeth, clinical attachment level and bleeding on probing (presence or absence) using a UNC-15 periodontal probe.

Patients presenting probing depth ≤3 mm and at least four sites exhibiting bleeding on probing were included in the gingivitis group and those exhibiting bleeding on probing and at least four teeth with a probing depth ≥5 mm were entered to the chronic periodontitis group. Chronic periodontitis was defined according to the criteria established by the American Academy of Periodontology.[20] After initial examination, all patients underwent oral hygiene instructions in toothbrushing and flossing, one session of oral hygiene instruction and FMUD for supra and subgingival plaque and calculus removal. This treatment section was performed by the same dentist or investigators in charge of the clinical examination.

Three months after FMUD, samples from the oral cavity were collected from saliva, microbiota from the dorsum of the tongue, supra and subgingival plaque. Non stimulated saliva samples produced during one minute were collected. A sterile wood wedge was used to collect microbiota from the tongue by scrapping the posterior third of its dorsum. Supragingival plaque was collected from two different teeth using a 13/14 MacCall curette. Subgingival plaque was obtained after removal of supragingival plaque by inserting two sterile paper points into the gingival sulcus/pocket for 20 seconds. Subgingival sampling sites in periodontitis patients exhibited clinical probing depth >5 mm and bleeding on probing, whereas with the gingivitis patients, the sampling sites showed clinical probing depth <3 mm and bleeding on probing. Each sample was immediately placed in a sterile tube containing 0.5 ml of Tris EDTA buffer. All samples were identified, transported in ice and stocked at -20° C for posterior microbiological analyses.

Table 1. Patients positive to *H. pylori* DNA, three months after triple systemic therapy and three months after oral therapy

		Saliva	Dorsum of the tongue	Supragingival plaque	Subgingival Plaque	Oral Cavity	Stomach
		N(%)	N(%)	N(%)	N(%)	N(%)	N(%)
After STT	G	0	0	2 (22.2)	5 (55.5)	6 (66.6)	1 (11.1)
	P	0	0	2 (22.2)	2 (22.2)	3 (33.3)	1 (11.1)
After OHI + FMUD	G	0	0	0	1 (11.1)	1 (11.1)	NE
	P	0	0	0	3 (33.3)	3 (33.3)	NE

STT - suystemic triple therapy; OHI - oral hygiene instruction; FMUD - single session of full mouth ultrasonic debridment; G - gingivitis group; P - chronic periodontitis group; N - number of patients; NE - data not evaluated

Microbiological procedures were performed as previously described.[16] DNA was extracted from the clinical samples by the boiling method. The detection of *H. pylori* DNA was performed by polymerase chain reaction (PCR) using the specific primers for the species JW 22/23, homologous to 16SrRNA.[16] Water was used as negative control of PCR reactions and DNA extracted from reference strain *H. pylori* American type culture collection (ATCC) 43629 as positive control.[16]

RESULTS

Following a single session of oral hygiene instruction and FMUD for supragingival and subgingival plaque and calculus removal, *H. pylori* was still detected in the oral cavity of less than a half (44.4%) of the overall sample of patients (Table 1). Four patients—one with gingivitis and all three diagnosed with chronic peridontitis—harbored *H. pylori* in subgingival sites of their mouths. Of these, one patient with gingivitis and one with periodontitis tested positive for the bacteria in the stomach. DNA from *H. pylori* was not detected on saliva, on the dorsum of the tongue or in supragingival plaque samples of any patient three months after periodontal therapy. Within each group, FMUD was able to eradicate *H. pylori* from the oral cavity of 83.3 percent of patients with gingivitis, while it failed in eradicating the bacteria from the oral cavity of all periodontitis patients.

DISCUSSION

No data have been published yet on the effect of non surgical periodontal therapy in eliminating *H. pylori* from supra and subgingival sites, and the few trials conducted in this field of knowledge have evaluated the detection or prevalence of *H. pylori* in the oral cavity[14,16,19] or the recolonization of the stomach after periodontal therapy.

Clinical results achieved with a unique session of FMUD, a "justified initial approach in the treatment of patients with chronic periodontitis" can control supra and subgingival infection, can reduce the number of appointments, chair time and local anesthesia, and can lead to less degree of discomfort when compared to conventional basic procedures.[21] Despite the clinical benefits achieved with FMUD, the eradication of *H. pylori* from all samples was not reached. Another non surgical treatment alternative could be manual debridement. Studies comparing manual and ultrasonic debridement have shown that both are equally effective in non surgical periodontal therapy of severe periodontitis in terms of clinical[21,22] and microbiological effects.[22]

It also should be considered that while the treatment option used in this case series was well established, the efficacy of non surgical treatment modalities may reduce the depth of intrabony defects, but cannot treat the pockets completely, especially the deepest ones (> 5 mm).[23] It is possible that other treatment modalities, such as open flap debridement, could achieve better outcomes. Therefore, the continued accumulation and metabolism of bacteria on subgingival surfaces seems to be the main reservoir for *H. pylori* in the mouth.[14] Moreover, this fact suggests that the present case series can contribute to the discussion on local and systemic effects of dental plaque biofilm and their influence in other body environments. It also raises the query: What is the impact of periodontal therapy on preventing re-infection of the upper digestive tract diseases? Several publications have clearly identified the role of periodontal diseases and pathogens on increasing the risk of adverse coronary,[3] glycaemic,[6] and pregnancy outcomes.[4,5] *H. pylori* has been found on the dorsum of the tongue,[14,16] in saliva,[7,8,14,16] in supra[7,8,14,16] and in subgingival plaque.[14,16] Besides, robust and evident data associating *H. pylori* presence in the oral cavity and gastroesophageal disease (P = 0.0001) have been found—without difference in *H. pylori*—between gastric biopsy and dental plaque among the patients with gastroesophageal disease.[7] Re-infection of the stomach after treatment and occurrence of the same clone of *H. pylori* in dental plaque and in gastric biopsy has already been detected.[24]

It should be noted that the detection of *H. pylori* by PCR does not imply in cell viability or pathogenicity.[25] The results of the present case series do not imply in cell viability—samples were collected three months after oral treatment, considerably reducing the possibility of DNA remnants of bacterial cells, killed after treatment since DNase activity was observed in saliva.[26]

The proposed periodontal treatment is inefficient to eradicate *H. pylori* from the oral cavity of patients with chronic peridontitis, and to eliminate the associated increased risk of gastric re-infection when the bacteria are present in the mouth.[7,8,14,16] Therefore, well designed

randomized controlled trials are required to confirm whether non surgical periodontal therapy can primarily and efficiently eradicate *H. pylori* from the oral cavity, and secondarily prevent gastric re-infection. Other treatment modalities involving surgical procedures or the use of local antimicrobials or both are of interest. In addition, it should be considered that only nine patients, six with gingivitis and three with periodontitis were evaluated in this case series, and thus a robust assessment of the outcomes of the proposed therapy could not be reached. As a result, definitive responses could not be found. This issue needs to be taken into consideration when interpreting the present findings.

In summary within the limits of this case series, a single session of oral hygiene instruction combined with FMUD seems to promote a positive effect in eradicating *H. pylori* solely from supragingival sites, independently of the periodontal diagnosis. However, further investigation following more strict methodological guidelines and comprising larger samples of patients are required to access the real effects of this therapy, and thus to ensure validity and reliability of results.

Acknowledgement

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Conflict of interests

The authors report no conflicts of interest related to this case series.

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Errata

Can J Dent Hygiene. 2012:46(**4**);208 and 209. Published on 1 November 2012.

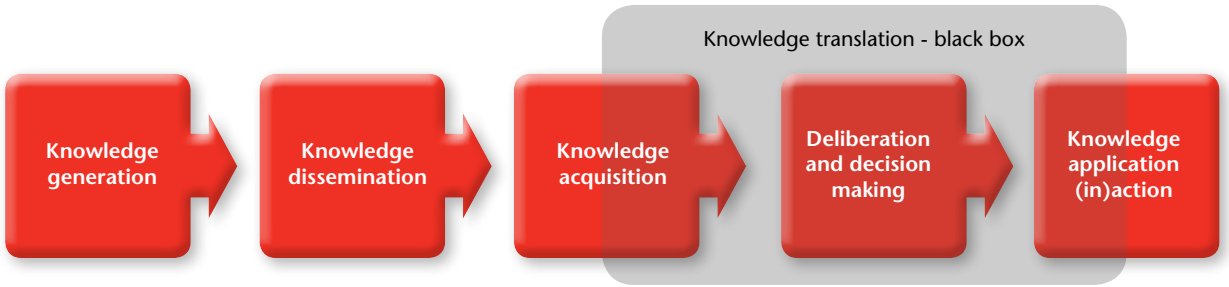
Title: *Exploring dental hygiene clinical decision making—a mixed methods study of potential organizational explanations: Phase 1*

Author: Joanna Asadoorian, RDH, PhD

Correction to:

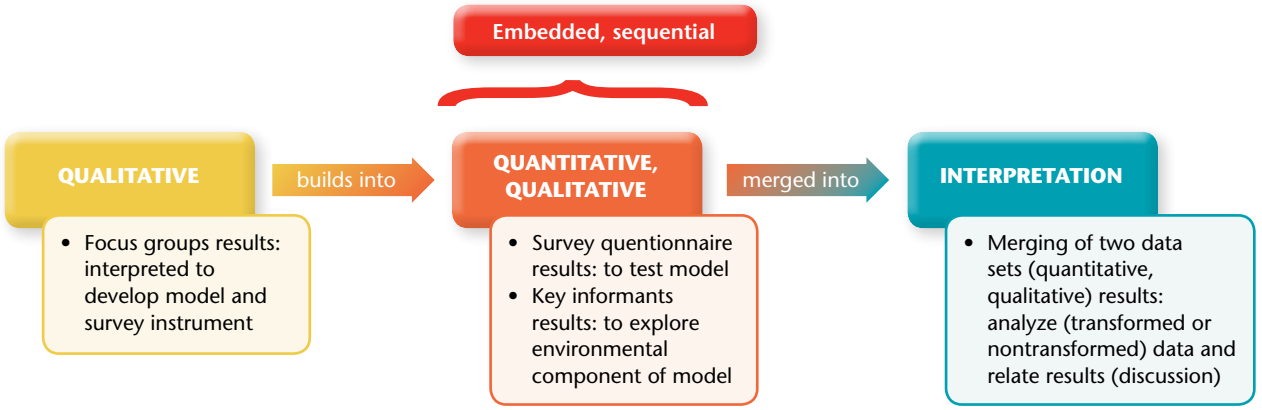
1. Figure 1. Knowledge translation process on page 208. The label highlighting a part of Figure 1 of the above mentioned article was published incorrectly, and the corrected figure is published below.

Figure 1. Knowledge translation process.



2. Figure 2. Mixed methods design on page 209. A curly bracket under the heading, "Embedded, sequential" was inadvertently omitted. The corrected figure is published below.

Figure 2. Mixed methods design.



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Cavitron® Plus and JET Plus—Redesigned with ergonomics and performance in mind

- *NEW* **Tap**-On™ **Technology** improves efficiency and is designed to reduce hygienist leg strain
  —A single tap activates or deactivates scaling or air polishing, allowing you to rest your foot during the procedure
- *NEW* prophy mode auto cycles alternate between air polish and rinse without a need to touch the pedal*
- Additional power options enable quick removal of tenacious calculus
- More precise water control for improved lavage

*Prophy mode auto cycles available on Cavitron® JET Plus unit only.

New look includes a more intuitive interface design.

For more information, call **1.800.263.1437** or visit **www.dentsply.ca**

There's only one Cavitron®.

Now with **Tap**-On™ **Technology**

Cavitron® plus: **Cavitron® jetplus:**

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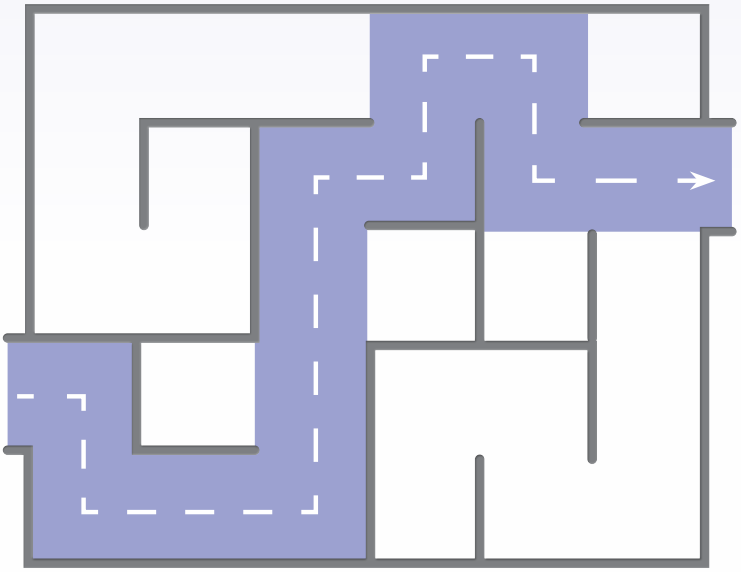
DENTSPLY CANADA

Implacare® II:
THE WAY TO GO FROM THE ONES WHO KNOW



PERIODONTAL

YOUR PATH TO IMPLANT MAINTENANCE

Hu-Friedy's latest development in implant maintenance, Implacare II, provides thinner working ends and new designs so you have the choices you need for the best adaptation and efficiency. More importantly, since Implacare II is made from Plasteel, a high-grade, unfilled resin, it will cause the least amount of alteration to implant abutment surfaces.*

› PLASTEEL™ | › 20% THINNER TIP DESIGNS | › 5 TIP OPTIONS

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How the best perform Hu-Friedy®