TITLE PAGE

A pilot study on the feasibility of training nurses to formulate scheduled multi-component oral health interventions in a residential aged care facility.

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Title:

A pilot study on the feasibility of training nurses to formulate multi-component oral health interventions in a residential aged care facility.

Abstract

Objectives: This 10 weeks feasibility study investigated whether residential care nurses with 12 hours advanced oral health training in assessments and saliva testing could formulate, implement and monitor individualised oral care plans of early dementia residents.

Method: Four trained lead advocate nurses using SXI-D, OHIP14, OHAT assessments and a modified saliva test formulated Nurse Scheduled Comprehensive Oral Care Plans (NSCOCs) by selecting and scheduling preventive products and procedures multiple times throughout the day to alkalisate the mouth of 8 residents as an adjunct to assisted brushing and high fluoride toothpaste.

Results: Nurse assessments, saliva tests and care plans were validated against Oral Health Therapist (OHT) findings. Care plan agreement between Nurse and OHT intervention

selection and scheduling was high (75-88%). Untrained nurse compliance was very high, 86%-99% for the 5930 4930 scheduled interventions. Untrained nurses delivered multiple scheduled interventions by following NSCOCPs despite initially not understanding the reason for each of nine interventions categories. NSCOCPs could track and monitor whether a recommended intervention had been completed by general nursing staff over three nursing shifts.

Conclusion: The role of nurses may have to be expanded beyond traditional roles to meet the growth and changes in oral health needs in residential facilities. Intensive training of a few lead advocate nurses to assess risk and formulate individualised NSCOCPs provides a method to transfer knowledge to untrained staff and deliver multi-component preventive interventions soon after entry into residential care where timely visits by dental professionals to examine residents and prescribe preventive interventions are infrequent or unlikely.

Abbreviations

NSCOCP	Nurse Scheduled Comprehensive Oral Care Plan;
OHT	Oral Health Therapist;
OHAT	Oral Health Assessment Tool;
OHIP14	Oral Health Impact Profile;
SXI-D	Summated Xerostomia Inventory-Dutch Version
ADL	Activities of Daily Living;
SRSpH	Sublingual Resting Saliva pH

Keywords

Dementia; Oral health; Multi-component interventions; Nurse; Residential oral care plans

A pilot study on the feasibility of training nurses to formulate multi-component oral health interventions in a residential aged care facility.

Introduction

Poor oral health in residential care is multifactorial. This study developed new methods using nurse formulated oral care plans to mitigate: a.) The lack of timely visits by dental professionals to examine and prescribe preventive interventions, b.) Polypharmacy induced salivary gland hypofunction and the resultant diminished ability of saliva to neutralise mouth acids and re-mineralise teeth and c.) Ineffective assisted brushing.

These and other risk factors combine, resulting in a pathogenic aciduric oral environment that causes disease adversely affects oral and systemic health.

Studies show assisted brushing and oral hygiene programs in residential care are difficult to implement, to maintain in the long term and have satisfactory results.¹⁻⁴ The effectiveness of oral hygiene programs based predominantly on assisted brushing decreases over time and renewal of the oral hygiene intervention programs are necessary.⁵

Residents who exhibit resistance to mouth care tend not to receive regular care despite strategies such as Rescuing, Distraction, Bridging, Hand over Hand and Chaining being available.⁶⁻⁸

Although dental caries increments in nursing homes have been studied, most studies on residential oral health care programs look at the effectiveness of a single or limited number of interventions^{9,10} rather than multicomponent interventions acting together as a form of compound therapy. In addition, oral care interventions may have to be performed multiple times by different residential care staff during the course of the day when residents cannot maintain their own oral health due to frailty, dementia or compromised salivary function. There is a lack of adequate studies of dental caries increments after implementation of a comprehensive oral health program using a scheduled multi-combination therapy approach. Poor oral health in older people who live in residential care facilities is a multifactorial problem and therefore requires multi-component system changes at an institutional level to deliver appropriate oral health preventive interventions to residents at an individual level.

~~Our~~ The purpose of our study was to ~~explored~~ explore the feasibility of integrating new multi-component intervention protocols into nurse care plans with the expectation that future trials may show this approach to be more effective than an oral care plans concentrating on individual risk factors and single or limited number of preventive interventions. ~~As poor oral~~

~~health is multifactorial~~ A limited intervention approach may prove ineffective as the positive benefits of a single intervention may be swamped by the negative effects of all other factors combined. ~~This approach.~~ This study aimed to enable nurses to select and schedule multi-component preventive interventions throughout the day tailored to the individual as determined by nurse oral health assessment and testing. The combination of all or some of the preventive interventions acting together may have an additive and greater effect on positive outcomes than relying on a single intervention. Similar approaches are found in other studies such as improving general health care of older persons^{11, 12} and in preventing falls¹³ in which more than one risk factor is related to outcome.¹⁴ The first step is to show that this kind of intervention is feasible and if so, the effectiveness of this approach would need to be determined by future randomised controlled trials.

Most studies investigating nurse oral health training in residential facilities usually involve one session between 45 minutes to 4 hours and are predominantly a single 60-90 minute education session, often without further follow up training.^{1, 3, 15} Oral health programs commonly provide special training to some nurses to become 'Dental Champions or 'Lead Advocate Nurses'. Oral health program content tend to be theoretical concentrating on the importance of oral health, various plaque control methods, assisted brushing, use of high fluoride toothpaste and chlorhexidine rinses or toothpaste.^{3, 4, 16}

Our approach was innovative by combining ~~advanced oral health~~ theoretical tuition with practical skills training involving questionnaires, oral assessments and saliva testing to lead advocate nurses and making these skills part of their usual routine. ~~The approach aimed to enable nurses to select and schedule multi-component preventive interventions throughout the day tailored to the individual, as determined by nurse oral health assessment and testing.~~

~~The primary reason for undertaking this study was to explore~~ This study investigated whether lead advocate nurses with advanced oral health training could:- (a) carry out a multi-factor oral health risk assessments and saliva tests on early or mild dementia residents, (b) select appropriate multi-component preventive interventions and products (c) formulate individualised comprehensive oral care plans (in this study termed, 'Nurse Scheduled Comprehensive Oral Care Plans' (NSCOCPs) by scheduling selected interventions and products throughout a 24 hour cycle, (d) be responsible for implementing the plans and (e)

monitoring care plan compliance by untrained nursing staff over the 3 nursing shifts in a 24 hour working day.

The secondary aim of this study was to explore a method whereby regular interventions can be scheduled and delivered through NSCOCs after meals to alkalise the mouth and neutralise a low pH oral environment.

Method

Eight early dementia residents were recruited for the study. Ethics approval was given by the Concord Repatriation Hospital Human Research Ethics Committee LNR/14/CRGH/133 (CH62/6/2014-107) and approval for recruiting nurses and residents was gained from the residential facility CEO and unit managers. The study was conducted over a 10 week period.

Eight selected residents were female, ranging in age from 73 to 97 years (mean 87 years), completed dental examinations at baseline and at 10 weeks by a dentist using a portable reclining dental chair, head light, compressed air/water, disposable mirror, probe, tweezers and gauze. Medical status, medications, anti-cholinergic burden scores, social history, Activities of Daily Living, Decayed Missing Filled Teeth and Greene and Vermillion plaque scores were recorded. Six non-resident volunteers underwent assessments and saliva tests by the lead advocate nurses as training participants prior assessing and testing residents. Nursing home managers nominated four nurses who were team leaders within the facility to become trained lead advocate nurses. The nurses were selected on their leadership skills and not on seniority, with at least four years aged care nursing experience, no previous training in oral health preventive interventions or the implementation and supervision of resident oral health care plans

Two registered nurses (with university degrees) and two assistants in nursing (without university degrees) were trained over 12 hours in three weekly 4-hour blocks with additional reading material provided between training sessions. The first four hours of training was theoretical, utilising educational tutorials available over the internet focusing on dental literacy, oral hygiene, assisted brushing and high fluoride toothpaste.¹⁷ Training included use of a dental mirror and toothbrush to access the mouth, assisted brushing, removal and cleaning of dentures and implant retained prosthesis. Additional ~~nurse~~ education material was developed to teach nurses a broader range of factors associated with oral health and disease

and included modules on:- ~~assisted brushing~~; diet and frequency of eating and its effects on mouth pH, polypharmacy and salivary gland hypofunction, the Summated Xerostomia Inventory-Dutch Version (SXI-D)¹⁸⁻²¹; oral health related quality of life using the Oral Health Impact Profile (OHIP14) questionnaires.^{18, 22-24}, ~~the nature and role of~~ and the Oral Health Assessment Tool (OHAT).^{25, 26 27, 28}

OHAT is designed for use by non dental professionals consisting of a visual inspection of eight oral health domains (lips, tongue, gums and oral tissue, saliva, natural teeth, dentures, oral cleanliness and dental pain). Each domain is assessed as 'Healthy, Changes or Unhealthy' and can be scored 1,2,3 for statistical purposes. A 'Healthy' or 'Changes' assessment can be managed by oral health care planning within a facility while 'Unhealthy' indicates the need for dental referral.

~~and how to perform~~ Additional training using a modified commercially available saliva test ~~using a commercially available saliva testing kit~~ Saliva Check BufferTM (GC Australia)²⁹ and on the selection and scheduling of various products to formulate NSCOCPs was emphasized.

A second session involved four hours of practical training on SXI-D, OHIP14 questionnaires, OHAT assessments and saliva tests on the four lead advocate nurses themselves and ~~on 6~~ 6 volunteers as training prior assessing residents. Volunteers were asked not to eat or drink 1 hour before their morning OHAT and saliva tests. Nurses worked in pairs with one nurse performing saliva tests and assessments while the other nurse cross-checked test protocols and recorded results.

Trained lead advocate nurses completed resident SXI-D and OHIP14 questionnaires on an earlier day to OHAT and saliva tests. Nurses reminded participants ~~to were asked to ensure residents did not to eat or drink for at least an hour before resident morning~~ OHAT and saliva tests which were conducted between 9:00am to 12:00pm.

Saliva test kit protocols were modified to include new test procedures more suited to testing dementia residents by: a) collecting whole resting saliva (spit/drool method) and whole stimulated saliva (chewing wax) for only 3 minutes, b) a new method to assess resting saliva pH using Sublingual Resting Saliva pH (SRSpH) by wetting a disposable applicator placed under the tongue for 2 seconds to wet pH paper, (c) weighing collected saliva (MyWeigh

GEMPRO 500 micro-balance) to assess volume and (d) dividing by 3 minutes to obtain flow rates.

SRSpH was compared to 3 minute whole resting saliva pH collected by the spit/drool method to wet pH paper.

were taken of (a) Sublingual resting saliva pH (sourced by wetting an applicator under the tongue for 2 seconds to wet pH paper), (b) 3 minute resting saliva collection by the spit/drool method to re-assess resting pH and then weighed (MyWeigh GEMPRO 500 micro-balance) and divided by 3 minutes to assess resting saliva flow rate³⁰⁻³², (c) Sublingual saliva pH 5 minutes after a glucose challenge, (d) of stimulated saliva pH, and flow rate and buffering capacity was collected while after chewing wax for 3 minutes^{33,34}, (e) sublingual saliva pH at 5 minutes after the introduction of a small increment of sodium bicarbonate containing toothpaste into the mouth.

The saliva test protocol sequentially recorded:- (a) SRSpH, (b) Saliva consistency and lip hydration as per test kit instructions, (c) 3 minute collection of whole resting saliva by weight (d) whole resting saliva pH, (e) 1 minute whole resting flow rate,³⁰⁻³² (f) SRSpH 5 minutes after a 1 minute 20% glucose rinse, (g) 3 minute whole stimulated saliva weight (chewing wax)^{33,34}, (h) whole stimulated pH, (e) 1 minute whole stimulated flow rate (f) buffering capacity as per test kit protocol, (g) SRSpH at 1 and 5 minutes after a small increment of a sodium bicarbonate toothpaste (Colgate Acid Neutraliser) was placed into the mouth.

Trained lead advocate nurses formulated individualised oral care plans based on their findings without any input from the training staff. All nurse assessment and test results were coded using a 'traffic light' colour system of Red (very unhealthy/very poor/very acidic), Yellow (unhealthy/acidic) and Green (healthy/normal). The use of colour coding simplified oral assessments, saliva test results and proved very helpful for lead advocate nurses when formulating and monitoring NSCOCs.

Two Oral Health Therapists (OHTs) verified baseline nurse OHAT assessments, saliva tests and nurse oral care plans by repeating OHAT and saliva tests to formulate OHT care plans within 3 days of nurse assessments blind to other's nurse results. Care plans were reviewed by the principal dentist prior to implementation.

The NSCOCP template form (Fig.1) includes a daily time log dividing the 24 hour working day into 6 three hour daytime periods (6:00-9:00am, 9:00-12:00am, 12:00-3:00pm, 3:00-6:00pm, 6:00-9:00pm, 9:00-12:00am) and 1 six hour night time period (12:00-6:00am). Scheduling and recording each intervention in a timeline format was seen as critical to the design of the plan as it provides a structured framework for delivering multiple interventions at different times of the day, particularly after meal times and allows an easy rapid visual method of tracking untrained nurse compliance and responsibility. The trained lead advocate nurses selected various preventive products from the following range of commercially available products:-high fluoride toothpastes, re-mineralising agent, chewing gum, sodium bicarbonate toothpaste, high pH oral moisturising agent and an anti-bacterial toothpaste.

The delivery of preventive products as an intervention were designed to be simple, requiring minimal training, timed around meal times, was similar to administering medications at set times and aimed to be easily incorporated into nurse daily routines.

The frequency of each intervention and product was determined by the trained lead advocate nurse and scheduled by ticking the appropriate time line and column on a pre-printed NSCOCP template form. The completed template was inserted into the inside cover of a folder. Each day, a new blank form was placed beside the NSCOCP. Trained lead advocate nurses provided practical training and tutored untrained nurses on the use of different products and interventions during the first few weeks of the study. After 3 weeks, untrained nursing staff could follow care plans without close supervision. Each nurse was required to time log completed scheduled intervention by ticking or initialling the corresponding time line on the blank form.

Lead advocate nurses who formulated plans became responsible for implementing NSCOCPs, mentoring and monitoring compliance of untrained nursing staff on a daily basis while researchers monitored plans on a weekly basis.

Fig.1a.) Front page NSCOP template

Fig.1b.) Reverse page NSCOP template

Results

All participants were female were residents of a nursing home with mild or early dementia sufficient to affect their Activities of Daily Living (ADL). Review of ADL care plans found 7 out of 8 participants needed assistance with taking medication, toileting, dressing and were at risk of falling. Five participants could walk less than 5 metres unassisted. The ADL domains Personal hygiene, Toileting and Nutrition described 7 participants as having unsteady hand and poor hand/finger co-ordination while the domain Nutrition described 7 participants as having weak grip strength for holding utensils. The ADL domain of Oral Care was independently assessed by other nursing staff prior the study's commencement and found all participants lacked the ability to care for their own teeth.

Nurse mean SxD-I scores (range 5-25, lower the better) of participants and volunteers (n=6) were 7.8 and 8.8. A volunteer with Sjogren's syndrome and a volunteer taking anti-cholinergic medication were asked to participate in this study to help nurses better understand the effects of disease and medication on salivary function. Removing these two volunteers as outliers, lowered the mean SxD-I volunteer scores (n=4) to 6.5.

Nurse mean OHIP14 scores (range 14-70, lower the better) of participants and volunteers were 17.4 and 18.0 respectively including both volunteers with Sjogren's and anti-cholinergic medication.

Nurse mean OHAT (range 7-32, lower the better) scores of participants and volunteers, were 9.9 and 7.5 respectively. In general, Nurse and Oral Health Therapist OHAT assessments, saliva test results and oral care plans made blind to each were similar. Baseline mean participant OHAT scores by OHTs and mean participant and by nurses OHAT scores were similar, 9.8 and 9.9 respectively.

Participants 1-8 were taking 9,10,11,10,10,10,8,4 medications respectively. These medications corresponded to an Anti-Cholinergic Burden Score formulated by St Vincents Hospital, Darlinghurst NSW of 7,11,5,7,8,5,6, 2 respectively.

Nurse and OHT saliva test results of participants were similar with Participants 1,2,3 and 7 having whole resting saliva flow rates, as per the test kit guidelines, in the 'unhealthy' low (0.1-0.3mg/min) or very low (<0.1mg/min) range while all volunteers were in the healthy range (>0.3mg/min) except for Volunteers 2 and 3 with Sjogren's syndrome and taking anti-cholinergic medication respectively. (See Fig. 2.)

Participants 1,2,3,4 had whole stimulated saliva flow rates in the unhealthy very low (<2.1mg/min) range while participants 3,6,7,8 and all volunteers (including Sjogren's and anticholinergic medication volunteers) were in the healthy range (>3.0mg/min).

Figure 2.

Baseline OHT and Nurse SRSpH and +3 Minute Whole Resting Saliva pH Compared

The Sjogren's volunteer had insufficient saliva to record resting saliva flow or pH and was removed from this data set as an outlier. Mean nurse SRSpH compared to 3 minute whole resting saliva pH of all participants were 6.2 (acidic) and 5.2 (highly acidic) respectively while volunteer results (n=5,) were 6.9 (healthy) and 7.4 (healthy) respectively. Mean OHT SRSpH compared to OHT 3 minute whole resting saliva pH of participants were 6.1 (acidic) and 6.3 (acidic) respectively.

Clinical examination findings by a dentist are shown in Table 1 below with Participants 1,2,3 and 8 having 3,3,6,and 8 carious lesions respectively.

Table 1: Participant Clinical Findings

Table 2. shows participant nurse baseline pH results compared to OHT and nurse pH results of participants compared to volunteers at various stages of saliva testing.

Table 2; Mean pH score at various saliva test stages

~~During saliva testing,~~ In summary, both nurse and OHT saliva test results found both sublingual mean resting saliva pH participant SRSpH and 3 minute resting saliva pH in the unhealthy acidic or very acidic zones, pH dropped further into the acidic zone after a glucose challenge, then rose into the healthy zone after chewing wax and remained in the healthy zone after a small increment of sodium bicarbonate toothpaste was placed into the mouth. By contrast, volunteer saliva pH test results for each stage were in the healthy range.

Table 3. shows comparison of nurse and OHT developed care plans having a high level of agreement (81%), ranging from 75-88% for individual interventions. The most common disagreements were 8 cases in which lead advocate trained nurses recommended interventions for residents that had not been recommended by the OHT with the majority of disagreements related to the unassisted brushing of teeth, assisted brushing of teeth and the use of an anti- microbial toothpaste (0.12% Curascept Curaden Swiss, Australia). In four cases, trained lead advocate nurses care plans omitted interventions recommended by OHT with sodium bicarbonate toothpaste ('Re-buffer' intervention) omitted from 2 care plans

while an oral moisturiser (Oral7 Gel Auspharm) and unassisted brushing of dentures was omitted from 1 care plan each.

Table 3: The number of nurse-developed care plans

In this study, Neutrafluor5000 (Colgate – Palmolive Co.) and GC Dental Mousse Plus (GC Co.) were considered to be a ‘Remineralisation’ intervention as both products are used to remineralise teeth. Similarly, chewing gum (Xylitol Gum Miradent Gum Hager, Werken GMBH and Co.) and sodium bicarbonate toothpaste (Colgate Acid Neutraliser, Colgate – Palmolive Co.) were considered a ‘Re-buffer’ intervention as both interventions neutralize mouth acids and raise saliva pH.

When Re-mineralising’ and ‘Re-buffer’ interventions were combined, the level of agreement between nurse developed NSCOCs and OHT developed care plans on whether or not an intervention was necessary at least once a day was very high, varying from 75% for Re-buffer, Curascept, Unassisted Brushing teeth and Assisted Brushing teeth to 87.5% for Remineralisation, Oral7 artificial saliva, Unassisted Denture Brushing and Assisted Denture Brushing.

Table 4. shows untrained nursing staff compliance with following trained lead advocate nurse intervention recommendations was very high. Over the 10 week study period, there was 92.6% compliance for 4930 interventions. Compliance for recommending individual interventions ranged from 86-99%, with the lowest rates of compliance for Xylitol gum (86%), Re-buffer (86%) and unassisted brushing of teeth (88%).

Table 4: The number of instances

Interventions recommended for use at least once a day were provided to residents in greater than 95% of instances over the study period.

Discussion

Our study found that lead advocate nurses, after 12 hours of advanced oral health training in OHIP14, SXI-D, OHAT and a modified saliva test assessing saliva function, could formulate advanced oral care plans tailored to meet the individual risk factors of early dementia residents. This level of training was greater than most other oral health studies involving residential care nurses.⁶ A high correlation between nurse and OHT assessments and oral care plans was found.

Nurses carried out a total of 17 OHATs, (3 nurses on themselves, 6 volunteers prior 8 participant OHATS) and 13 saliva tests (6 volunteers prior 7 participants). OHTs carried out 14 OHATs and 14 saliva tests (8 participants at baseline and 6 at 10 weeks).

Nurses were initially very slow, taking over an hour to test and assess volunteers. However, nurses became rapidly more proficient with each assessment and performed OHAT and saliva tests on the last two participants within 40 minutes and would likely have further reduced assessment times with more experience.

Despite the total number of assessments and tests being too low to provide statistically significant results, trends were evident.

The validity of self-reported information amongst individuals with cognitive impairment may be problematic. In all cases, except for one participant, OHIP14 and SXD-I questionnaires required lead advocate nurses to explain and provide assistance to early dementia participants to complete questionnaires which may have biased participant's answers.

Despite these limitations, OHIP14 and SxD-I questionnaires were useful as nurse training tools as questionnaires enabled concepts and discussions about oral health, dry mouth and quality of life that nurses may not otherwise be exposed to.

All participants were taking between 4 and 11 medications with Anticholinergic Burden Scores between 2 and 11.³⁵⁻³⁸ However, often participant's current medications were not the same when compared to medications taken 6 month earlier. At the time of this study, Participant 8 with the most (8) carious lesions had an anti-cholinergic burden score of only 2 with normal resting and stimulated saliva flow rates. Participant 8 was taking anti-psychotic and anti-depressant medications 6 months earlier but stopped taking these medications at the time of the study. This may imply that past history of non-current medications may need to be examined when assessing risk.

This study found SRSpH assessments of participants by nurses and OHTs to be reliable with all residents, except one participant, having mouth pH in the acidic (pH 6.0-6.6) or highly acidic (pH <5.8) zones. (See Fig. 2) Nurse SRSpH and 3 minute Resting Whole Saliva pH assessments by OHTs were similar. Trained lead advocate nurses found all volunteers, except the Sjogren's volunteer, to be in the healthy zone (>pH 6.8) for both SRSpH and 3 minute whole resting saliva pH.

SRSpH may provide a new additional method to assess the risk of oral disease by both non-dental professionals and dental professionals in residential facilities. SRSpH provides a quantitative measure of mouth pH at rest that is rapid, requires little training and minimally invasive. SRSpH may be the only assessment possible where co-operation is lacking. In contrast SxD-I, OHIP14 and OHAT are qualitative assessments, subjective in nature and require a greater degree of patient co-operation.

Insufficient saliva under the tongue to wet a disposable applicator to wet pH paper during SRSpH assessments may be a strong indicator of a very dry mouth and was found to be associated with very low resting saliva pH, very poorer resting saliva flow and usually but not always poorer stimulated salivary flow.

Nurse saliva testing re-enforced class room theory that low mouth pH at rest could be lowered further by glucose, raised to healthier levels simply by chewing and maintained at healthier pH levels using sodium bicarbonate toothpaste even when some residents had very poor saliva function. This training approach enabled lead advocate nurses to select and

schedule appropriate preventive products into NSCOCPs as nurses better understood their purpose.

Transference of knowledge of both oral care protocols and preventive products to all untrained nursing staff is difficult, particularly when as in this study, up to 10 -12 permanent, casual and part time staff were involved in the care of one resident. This study found scheduled multicomponent preventive interventions could be effectively delivered by untrained staff over 3 shifts in a 24 hour period through NSCOCPs.

Trained nurses were responsible for implementation of their care plans and for mentoring untrained staff. Personal ownership and oversight of NSCOCPs was encouraged and seemed to be a strong motivator and that may help explain the very high compliance rates of untrained staff, ranging from 86.2% – 99.2% out of 4930 scheduled individual interventions. A randomised control study would be needed to determine whether nurse ‘ownership’ of care plans within an institution would have compliance rates comparable or better than care plans prescribed by dental professional from outside an institution.

Another possible explanation for high compliance may be due to interventions, such as small increments of sodium bicarbonate toothpaste or issuing chewing gum after meals being similar to daily nurse routines of dispensing medications after meals.

An important aspect of this study was to allow trained nurses to perform the same assessments (SXI-D, OHIP14, OHAT and saliva tests) on both participants and volunteers thereby allowing nurses to compare ‘normal healthier’ results of volunteers to the poorer oral health results of participants with compromised saliva function and poor oral hygiene. The combination of advanced class room education with practical training enabled lead advocate nurses to have a broader understanding of individual risk factors as well as the advantages and the limitations of specific interventions and products involved in maintaining a healthier oral environment.

Within the general community, dental professionals are expected to be solely responsible for assessing, treating and advising on matters related to oral health and dental professional advice needs to be sought before commencement of preventive interventions can be delivered by non-dental professionals. This expectation carries into the aged care facility and acts as a

barrier to commencing preventive interventions on entry into residential care.

At present, most dental practitioner contact with the elderly people in residential care and those housebound is limited to emergency treatment with little or no ongoing treatment, preventive advice or monitoring.^{1,39,40 4,35,36} Dentists responding to an Australian state wide survey in Victoria, indicated low interest in providing dental care in residential settings. A focus on treating people in private practice becomes a barrier to delivering dental care in residential settings.^{39 35}

Appropriate treatment and preventive intervention pathways need to be selected based on levels of dependency^{41 37} and the ability to co-operate.^{42 38} Ideally, early nurse assessments of new residents to formulate individualised oral care plans based on risk of oral disease, dependency and level of co-operation would enable individualised oral care to commence soon after entry into a residential facility.

Early nurse assessments of residents to formulate NSCOPs may offer another dimension in the delivery of oral care when timely visits by dental professionals to examine residents and prescribe preventive interventions are unlikely or infrequent.

NSCOP procedures can be modified to allow nurses to triage and refer residents to a dental professional when assessment results are very poor. Procedures can be further modified to include remote monitoring of nurse test results and suitability of care plans by dental professionals away from RACFs-residential facilities.

Increasing frailty and dementia results in progressive increase in dependencies on others to perform daily oral care tasks.^{43,44 39,40} In this study, 7 out of 8 participants had descriptors: 'unsteady hand/fingers, poor co-ordination and weak grip strength for holding utensils' in their ADL domains of Personal hygiene, Toileting and Nutrition. Monitoring these descriptors within ADL domains may be important non-oral indicators of an increased risk to oral health due to the inability to manipulate a toothbrush for adequate oral care.

~~The primary component of this feasibility study was to develop a suitable nurse training program whereby trained lead advocate nurses formulated, implemented and monitored individualised NSCOPs and to determine whether untrained staff would comply with care plans within the scope of their duties. The short study period and low participant numbers~~

precluded findings as to whether multicomponent interventions scheduled throughout the day would improve oral health and a larger long term randomised controlled trial would be required to determine whether this approach proves effective.

The secondary component of this study investigated whether it was possible to implement care plans aimed at actively alkalising the mouth to neutralize mouth and dental plaque acids as an adjunct to assisted brushing and high fluoride toothpaste. Although assisted brushing and high fluoride toothpaste is an integral component of NSCOCPs it was not the predominant method to improve oral health.

A major difference between this study and other nurse training programs was the emphasise placed on saliva function and use of products to maintain high mouth pH throughout the day. Appropriate interventions such as chewing gum^{45-48 41-44}, sodium bicarbonate toothpaste^{48,49} and high pH mouth moisturisers^{50,46}-can be delivered in NSCOCPs to improve both saliva function and raise mouth pH. Where both nurse assessments and dental professional examinations are not likely, instituting similar high pH oral care plans may be of benefit to very high risk dependant residents.

This study did not attempt to determine if one product or group of products was more effective than other products on the market and future studies may be needed to determine the effectiveness of products acting together as a form of compound therapy.

Conclusion

In residential care settings, the roles of nurses delivering oral care may have to be expanded beyond traditional roles and expectations to meet the growth and needs of an ageing population in residential care.

This feasibility study found that trained lead advocate nurses could carry out multi-factor risk assessments and saliva tests on early dementia residents and select appropriate preventive interventions and products similar to OHTs. Trained nurses were able to formulate individualised oral care plans called NSCOCPs by scheduling multi-component preventive interventions over a 24 hour period similar to OHT care plans. Trained nurses were responsible for implementing their care plans and were able to monitor compliance and transfer knowledge to untrained staff working 3 nursing shifts within their scope of duties.

This study found a very high rate of compliance by untrained staff ranging from 86.2% – 99.2% for 4930 scheduled individual interventions.

The scheduling of frequent simple preventive interventions aimed at raising mouth pH throughout the day, particularly after meals, was found to be practical.

NSCOCPs may provide a new treatment strategy to alter an aciduric oral environment to a healthier environment where polypharmacy induced salivary dis-function results in an aciduric pathogenic oral environment. Actively alkylising the mouth may be an effective adjunct to assisted brushing and high fluoride toothpastes where assisted brushing is difficult or ineffective.

This study found the advanced training of only a few nurses to assess residents to formulate, implement and monitor individualised NSCOCPs allowed knowledge transfer to untrained nursing staff and the possibility of early commencement of preventive interventions soon after entry into a residential facility and for periodic review when visits by dental professionals to examine residents and prescribe preventive oral care are untimely or unlikely.

~~In residential care settings, the roles of carers, nurses and managers in delivering oral care may have to be expanded beyond traditional roles and expectations. Adequately trained nurses may be in a more effective position to make early assessments of residents, formulate, deliver and monitor oral care on a daily basis than waiting for dental professional to examine and recommend preventive interventions.~~

~~This feasibility study found that trained lead advocate nurses could assess early dementia residents to formulate and implement individualised oral care plans as part of the scope of duties and deliver scheduled multi-component preventive interventions within the normal daily routine of a nursing home over a 24 hour period. NSCOCPs simplified the knowledge transfer to untrained nursing staff and allowed trained nurses to effectively monitor care plans over 3 nursing shifts during a 24 hour period.~~

~~Poor oral health is multi-factorial and NSCOCPs allow simple preventive interventions to be scheduled multiple times throughout the day as a form of compound therapy. NSCOCPs may offer a treatment method to actively alkalise the mouth to alter a pathogenic aciduric oral environment to a healthier environment as an adjunct to assisted brushing and high fluoride toothpastes where assisted brushing is difficult or ineffective.~~

~~The advantage of trained nurses being able to assess and implement care plans should ensure residents could be assessed and commence a preventive oral health program soon after entry into a nursing home and be periodically re-assessed thereafter when visits by dental professionals to prescribe preventive oral care are untimely or unlikely.~~

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TABLES and FIGURES

Table 1. Participant Clinical Findings

Participant No.	Decayed Teeth	Missing	Filled Teeth	Unfilled Teeth	Fixed Dental Units*	Function Pairs	Notes
1	3	7	12	13	25 ^{+1P}	12	#16 Fistula
2	3	6	22	4	26	12	
3	6	13	16	3 ^{+1 R}	19	6	#24 Fistula P/CoCr

							5 teeth/-
4	0	11	11	10	23 ^{+2P}	9	
5	0	6	22	4	26	12	#26 Implant fixture only
6	0	27	-	5	5	0	F/ CoCr 8 teeth
7	0	8	18	6	26 ^{+2P}	11	
8	8	12	19	1 ^{+1R}	20 ^{+1P}	7	#42 Fistula

* 'Fixed Dental Units' signifies number of natural or prosthetic teeth that cannot be removed from the mouth.

^{+P} signifies number of pontics included in total occlusal surface count

^{+R} signifies number of retained roots in total of unfilled tooth count

Table 2. Mean pH score at various saliva test stages

Baseline Saliva Test Stages	Mean Nurse pH Participants	Mean OHT pH Participants	Mean Nurse pH Volunteers
Sublingual resting saliva (SRSpH)	6.2	5.4	6.9
+3 minute collection of resting saliva	6.2	6.3	7.4
Glucose challenge: wait + 5 minutes	6.2	5.8	7.0
Chewing wax: collection after 5 minutes	7.0	7.0	7.7
Sodium Bicarbonate toothpaste	7.1	7.0	7.6

Colour bands (Red: Highly Acidic (<pH5.8), Yellow: Acidic (pH6.0-pH6.6), Green: Normal (>pH6.8)
(OHT) Oral Health Therapist

Table 3. The number of nurse-developed care plans that were concordant (agreement) and discordant (omissions/errors) with care plans developed by OHT for the same resident, by intervention; (n = 8 residents)

Intervention	Errors ^a	Omissions ^b	Agreement ^c	Agreement
Remineralisation ^d	1	0	7	87.5%
Oral7	0	1	7	87.5%
Re-buffer ^e	0	2	6	75%
Curascept	2	0	6	75%
UB teeth	2	0	6	75%
UB dentures	0	1	7	87.5%
AB teeth	2	0	6	75%
AB dentures	1	0	7	87.5%
Total	8	4	52	81.3%

a. Errors: The nurse recommended the use of an intervention not recommended by the OHT.

b. Omissions: The nurse failed to recommend the use of an intervention that was recommended by the OHT.

c. Agreement: The nurse and OHT recommendations agreed on whether or not an intervention was necessary at least once a day.

d. Remineralising agents: Neutrafluor5000 and/or GC Tooth Mousse Plus combined.

e. Rebuffering agents: chewing gum and/or Colgate Acid Neutraliser toothpaste. combined

UB: Unassisted brushing

AB: Assisted brushing

(OHT) Oral Health Therapist

Table 4. The number of instances in which daily recorded notes indicated compliance (agreement) or non-compliance (disagreement) with recommendations in NSCOCs

Intervention	Disagreement ^a	Agreement ^b	Total	Agree %
Neutrafluor	38	455	493	92.3
Mousse	4	489	493	99.2
Oral7	6	487	493	98.8
Gum	67	426	493	86.4
Re-buffer	68	425	493	86.2

Curascept	12	481	493	97.6
UB Teeth	58	435	493	88.2
UB Dentures	32	461	493	93.5
AB Teeth	37	456	493	92.5
AB Dentures	43	450	493	91.3
Total	365	4565	4930	92.6

- a. The number of instances where an intervention was not implemented at the recommended times per day
b. The number of instances where an intervention was implemented at the recommended times per day

UB: Unassisted brushing

AB: Assisted brushing

(NSCOC) Nurse Scheduled Comprehensive Oral Care Plans

Fig.1a. Front page Nurse Scheduled Comprehensive Oral Care Plan template

Appendix F RN INTERVENTION CARE PLAN (Print 1 page per day for 77 days) * 20 Residents in 20 Folders)														
Date	Surname	First Name	Room No.	Participant No.										
Accepts Intervention [Y]		Is independent []		Can't swallow []										
Will NOT accept Intervention [X]		Needs Reminding []		Can't rinse/spit []										
Will not open mouth []		Needs Supervision []		Constant grinding []										
Aggressive/kicks/hits []		Needs Full Assistance []		Head down/moves []										
Bites toothbrush/staff []														
					<div> <div> DRY MOUTH Normal [] Dry [] Very dry [] Extremely dry [] </div> <div> Wont remove dentures [] Soak dentures [] </div> </div>									
INTERVENTIONS (Intervention NOT Required = /)														
Place Tick on Eating	Food Management Meal or or Snack	Remineralisation Neutrafluor 5000	Hydration GC Mousse	Artificial Saliva Water mls	Saliva Gland Stimulation Oral7	Rebuffer Xylitol Gum	Anti-Microbials Colgate Acid Neutraliser	Brushing Unassisted Curascept	Brushing Unassisted Teeth	Brushing Assisted Teeth	Brushing Assisted Dentures	Brushing Assisted Teeth	Brushing Assisted Dentures	
6:00am - 9:00am														
9:00am - 12:00pm														
12:00pm - 3:00pm														
3:00pm - 6:00pm														
6:00pm - 9:00pm														
9:00pm - 12:00am														
12:00am - 6:00am														
TOTALS														

ADDITIONAL NOTES	
6:00am - 9:00am	
9:00am - 12:00pm	
12:00pm - 3:00pm	
3:00pm - 6:00pm	
6:00pm - 9:00pm	
9:00pm - 12:00am	
12:00am - 6:00am	

Sublingual Resting pH (SRpH) v's 3min Whole Resting Saliva pH

The chart displays pH values for two groups: Participants (1-8) and Volunteers (1-6). For each individual, four data series are shown: Nurse SRSpH (blue), Nurse 3min Whole Resting Saliva pH (red), OHT SRSpH (green), and OHT 3min Whole Resting Saliva pH (cyan). A horizontal red line at pH 5.5 separates the 'Highly Acidic' region from the 'Acidic' region, and a horizontal green line at pH 6.7 separates the 'Acidic' region from the 'Normal' region.

	Participants 1	2	3	4	5	6	7	8	MEAN		Volunteers 1	2	3	4	5	6	MEAN
Nurse SRSpH	5.6	6.2	6.8	6.6	7.8	5.2	5.2	6.0	6.2		6.8		6.6	7.5	6.8	6.8	6.9
Nurse 3min Whole Resting Saliva pH	5.0	6.2		6.6	6.8	5.2	5.0	6.6	5.2		7.4		7.0	7.8	7.4	7.4	7.4
OHT SRSpH	6.0	6.2	6.2	6.4	7.2	5.4	6.0	5.6	6.1								
OHT 3min Whole Resting Saliva pH	6.2	6.2	6.2	6.6	6.8	6.6	5.4	6.0	6.3								

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Participants 1, 2, 3, 8 with 3, 3, 6, 8 carious lesions respectively

Participant 3, +3 minute whole resting saliva collection was omitted-nurse error:

Volunteer 2, with Sjogren's syndrome had too little saliva to measure pH was not included in data set as considered an outlier

Volunteer 3, taking anti-cholinergic medication

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