



Feature Article

Dental care practices and oral health training for professional caregivers in long-term care facilities: An interdisciplinary approach to address oral health disparities

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ABSTRACT

The objectives of this study were to: 1) Assess and analyze the knowledge and attitudes of caregivers towards dental care for older adults in long-term care facilities; and 2) Train administrators, medical staff, and caregivers in the oral health competencies necessary to provide daily oral health care for residents of Assisted Living Communities in Oregon. Our results indicate that although the majority of caregivers felt comfortable with regard to their oral health background and daily activities, they expressed a need for additional training in several areas. Caregivers who participated in the training recognized the poor oral health of their residents and felt the training curriculum provided them with competencies needed to improve their daily oral health services. This innovative training demonstrates that oral health can be integrated into daily routines which could improve oral and systemic health and reduce inequities in oral health care for older adults.

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Introduction

Current population projections suggest that 20% of the U.S. population in 2050 will be 65 years and older compared to 13% in 2010 and 9.8% in 1970.¹ This vast increase in the elderly population is due to an overall decrease in mortality rates of older people and from improved healthcare, which has raised life expectancies on a global level.² In the United States, there were an estimated 8.7 million people using long-term care services in 2014, and it is expected that 27 million Americans will be living in nursing homes or other assisted residential settings by 2050.^{3,4} Among this growing elderly population, there is an increasing number of citizens with natural teeth as well as out-of-pocket payments for dental services due to the lack of coverage for dental care under Medicare.^{5,6} Literature suggests that the oral health of the elderly population in a global context is poor and in need of further research and reform.⁷

Recently, the non-governmental organization, Oral Health America, has assessed edentulism, adult Medicaid dental benefits, community water fluoridation, basic screening surveys, and state oral health plans as factors affecting the oral health of seniors nationwide. This study assigned each state a ranking based upon the assessment results and compared state rankings from 2013 to rankings in 2016. Although the oral health of seniors in Oregon improved, Oregon's current composite score of all five factors is 47%, which suggests that the overall oral health of seniors in Oregon is poor.⁸

Many other factors impact the oral health of seniors, including barriers that compromise the oral health of seniors such as underestimation of dental health problems, means of transportation to dental care facilities, lack of dental coverage under Medicare, perceived value for dental care, and caregiver attitudes and practices toward oral care.^{9–14} Older populations face oral related ailments such as xerostomia, periodontal disease, dental caries, and orofacial pain.^{15–18} It has also been shown that poor oral hygiene can exacerbate conditions commonly afflicting seniors, such as cardiovascular disease, diabetes, osteoporosis, and respiratory disease.^{19–22} Difficulty chewing food due to edentulous status may also lead to lack of appropriate nutrition and affect overall health and quality of life.^{23–25} Moreover, those who are dependent on

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caregivers for bodily care assistance exhibit worse oral hygiene than those who are self-sufficient for bodily care.¹⁶ Importantly, there has been an identified connection between poor oral health and higher mortality rates in a cohort of elderly people.²⁶

There are studies from various countries outside the United States that rate the oral health of residents in Assisted/Aged Care Facilities (ACF's) as poor.^{14,27,28} The poor oral health of seniors is due in part to a limited number of professionally trained caregivers.^{3,4} A publication by Jablonski et al in 2014 confirms the need for increased oral health and hygiene training in caregivers, as licensed practitioners lack sufficient training in areas of oral health and hygiene.^{3,29} A 2016 Western Australian study by Adebeyo et al reported that caregivers had little knowledge of appropriate preventative oral care and in order to improve oral health of residents, ACF's need "ongoing professional development".³⁰ Several other studies and trainings have been done in this area of research that have produced similar results.^{31–33}

Several intervention studies have aimed at improving the oral health services provided by caregivers. Some studies have discussed that there is inadequate oral care of seniors and ACF's need to have new dental procedures implemented.^{13,14} In a pilot study conducted in 2011 by Jablonski et al, interventions aimed at training caregivers in threat-reduction techniques during oral health treatment were successful at reducing care-resistant behaviors in seniors with dementia and allowed for more frequent oral health exams.³⁴ Similarly, a 2011 Australian intervention study by Blinkhorn et al showed that adding oral hygiene protocols to the daily care routine greatly improved nurses' cooperation and oral health of seniors residents.³⁵

A recent study by Albrecht et al in 2016 as part of the Cochrane Library assessed the effects of oral health educational interventions for nursing staff aimed at improving dental health. They searched numerous databases including the Cochrane Oral Health Trials Register, ClinicalTrials.gov, and World Health Organization International Trials Registry Platform. The researchers screened 1454 abstracts and assessed nine studies that met their criteria. Interventions assessed by the researchers reported on the oral health-related knowledge and attitudes of caregivers, but none actually reported on the oral health-related knowledge and attitudes of residents. One study included in their assessment by MacEntee et al in 2007 reported no significant changes to oral health of seniors with a pyramid-based educational intervention, however, in 2012, De Visschere et al reported a small, but statistically significant improvement in denture plaque following a 6-month supervised educational intervention.^{36–38}

These studies present a case for additional research on caregiver attitudes and practices of oral care in ACF's, along with training interventions aimed at improving the poor oral health of institutionalized elderly residents. Because of the total lack of information about the situation in this State, the aims of this project were to assess the oral health attitudes/practices of long-term care facilities' caregivers in Oregon (Stage 1) and to create and implement geriatric oral care training program for caregivers of assisted living facilities based on their attitudes/practices and educational needs of senior residents (Stage 2).

Materials and methods

The study protocol was approved by the Oregon Health & Science University Institutional Review Board (IRB00009667).

Study design

There were two stages of this study, the first, Caregivers' Attitudes Study, was a cross-sectional study that took place during

2014–2015 and consisted of surveys measuring the attitudes of caregivers in ACF's in Clackamas County, Oregon. The Caregivers' Attitudes Study demonstrated a need for a training intervention and prompted the second study, the Caregivers' Training Study, which assessed the efficacy of an oral health care training intervention for caregivers in a separate set of facility participants. The overall study design is illustrated in Fig. 1.

Sample

Stage 1

The sampling frame for the Caregivers' Attitudes Study was a list of licensed long-term care facilities in Clackamas County, obtained from the State of Oregon's Department of Human Services. Facilities were stratified by urban/rural status (facility zip code). In order to capture facilities of different capacity, a systematic probability proportional to size (PPS) sampling method was used to select 10 ACF's in Clackamas County, Oregon, to participate in the study. In case of a refusal to participate, PPS sampling was used to select a replacement facility. Of the 10 ACF's selected, a total of 8 facilities participated in the study.

Stage 2

In the subsequent study, Caregivers' Training Study, the sample of assisted care facilities was selected through an outreach program. A list of facilities within 20 miles of the Oregon Oral Health Coalition office in Wilsonville, Oregon was created and sorted by capacity, distance, and Medicaid acceptance using online resources such as the DHS Office of Licensing and Quality Care County Listing of Assisted Living Facilities and the Aging and Disability Resource Connection of Oregon. 33 facilities were contacted via phone, emails, and drop-ins and 10 agreed to schedule a training day and participate in the study.

Data collection

Stage 1

In the first part of the study, Caregivers' Attitudes Study, a 21-item questionnaire was developed from the literature³⁹ to explore general knowledge, attitudes, facilitators, and barriers towards providing oral care among caregivers. The survey gathered caregiver demographics, oral care provided in the aged care facility, residents' oral care, and factors that influence oral care. The questionnaire was accompanied by a letter of intent for the study and mailed to the administrators of the selected ACF's to be distributed to all caregivers throughout the facilities. Data collected from the Caregivers' Attitudes Study demonstrated that caregivers expressed the need for additional oral health care training and inspired the following study, Caregivers' Training Study (Fig. 1).

Stage 2

The Caregivers' Training Study provided a geriatric oral health training intervention to caregivers of 10 assisted living facilities. Prior to the administration of the intervention, the two 5-item pre-training surveys were administered to participating ACF's. The first survey, Administrator Survey, was administered to the ACF's and gathered information on the facility, administrators, residents, and staff. The second survey, Caregiver Survey, was then administered to caregivers to understand caregivers' perceptions of residents' oral health care.

Results from Stage 1 and Stage 2 surveys were taken into account as assisted living community administrators and geriatric dental hygienists met to design the training curriculum, which was also compared to senior health projects that had been implemented in other locations, as reflected in the references. Further

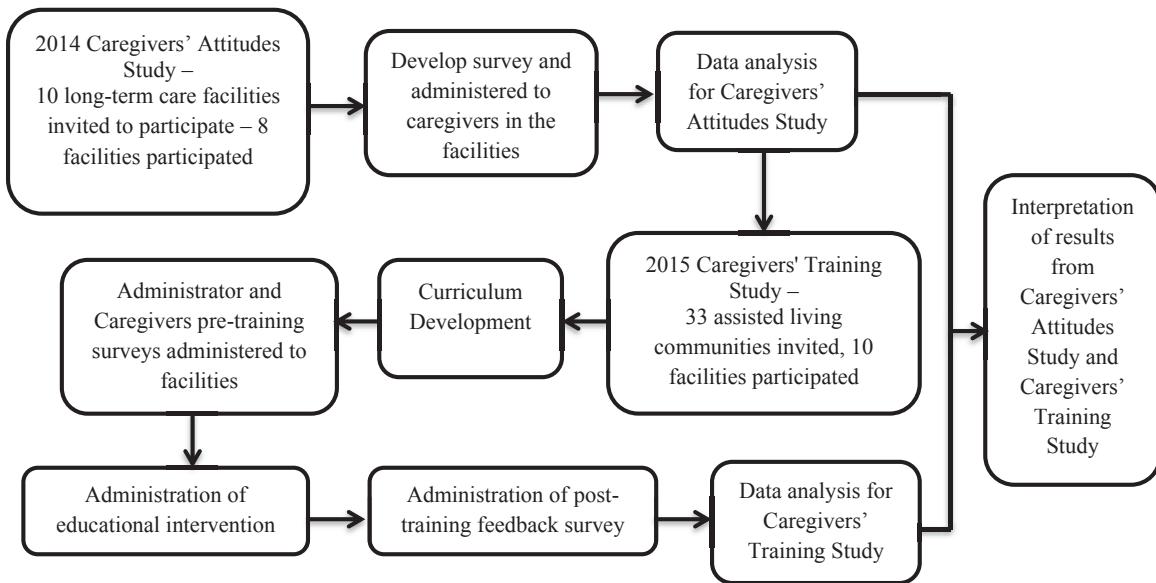


Fig. 1. Cross-sectional study design.

modifications of the training program was done with consideration of health literacy levels among caregiver staff and senior residents and vision and hearing loss in senior residents as well as the health training experience of staff. The training curricula consisted of the unique oral health needs of seniors and emphasized topics in general oral health care practices for seniors, medication effects on oral health, and dental coverage and access to care among others. The training intervention was designed to be presented to both caregivers and residents with a consistent message for caregiver and senior resident groups. The training intervention was ultimately administered to ACF caregivers and staff members.

The project Oral Health Educator presented the training program in a single, 45-min long session to each participating facility during a monthly staff meeting. The intervention was administered in presentation format using Power Point slides and included time for audience engagement and interaction. At the end of each intervention, a post-training feedback survey was completed by all participants and used a Likert scale to assess the perceived value and efficacy of the training intervention. The survey helped identify possible improvements to the intervention.

Data analysis

Overall, data was analyzed by calculating numeric values and descriptive statistics by utilizing SPSS v22 and coding qualitative responses into subcategories. In addition, for the Caregivers' Attitude Study, since caregivers were asked to provide one or more areas of interest for further oral health training, the SPSS Multiple Response function was used to rank these interests.

Results

Stage 1

The questionnaire in the Caregivers' Attitude Study was sent out to 10 ACF's in Clackamas County, Oregon. Responses were received from 8 institutions totaling 70 caregivers. The characteristics of caregivers showed that they were predominately female (90%) and from the U.S.A. (70%). Other caregivers originated from Africa (4%), Australasia (11%), Mexico/Cuba (9%), Russia/Europe (6%). Caregivers

included certified nursing assistants (55.7%), registered nurses (8.6%), licensed practical nurse (8.6%), unlicensed assistive support (11.4%) and no response (15.7%). The participants' were also grouped by age 20–30 (31.4%), 31–40 (28.6%), 41–50 (17.1%), and 51+ (22.9%) (Table 1).

Approximately two-thirds (68.6%) of respondents reported feeling adequately trained in oral care (Table 2). However, up to 75% of the respondents reported it is "often" and "sometimes" that residents' medical requirements take more time than oral health, residents refuse oral health care, do not open their mouth, do not understand directions, use abusive/offensive language or hits/kicks/bites during oral health activities. Between 15% and 20% of respondents were unsure whether the patient had any barriers or difficulties for carrying out oral health activities. This is likely due to the distribution of responsibilities among caregivers, as some caregivers might not tend to the oral care needs of residents and could not accurately report which oral health activities were carried out (Table 3). Many caregivers felt the need for additional training in topics of medication effect on oral health (60%), detection of oral cancer (46%), recognition of gum disease (40%), and recognition of dry mouth (29%) (Table 4).

Stage 2

The following year, the Caregivers' Training Study was implemented. A total of 10 ACF's participated in the training intervention and groups ranged from 7 to 20 participants. 265 caregivers directly received training and 821 senior residents were indirectly benefited. The majority of caregivers were classified as Aides (81%) with a minority amount of Nursing Assistants (9%), Nurses (8%) and Other (2%).

Responses to the pre-training survey were received by 84 caregivers in the Caregivers' Training Study (32%). Of the caregiver respondents, 54% classified senior resident oral health status as "poor". The most commonly reported oral health assistance activities provided by caregivers included brushing aid, prompting and set up, denture cleaning, and rinsing. Prior to the training, 83% of caregivers reported that they felt confident in providing sufficient oral care to meet residents' needs and 12% were unsure. Of the 5% who stated they were not confident to provide oral care to

Table 1

Caregivers characteristics (Caregivers' Attitudes Study) (N = 70).

	N = 70	%
Level of nursing education		
Registered nurse	6	8.6%
Certified nursing assistant	39	55.7%
Licensed practical nurse	6	8.6%
Unlicensed assistive	8	11.4%
No response	11	15.7%
Gender		
Female	63	90.0%
Male	7	10%
Age		
20–30	22	31.4%
31–40	20	28.6%
41–50	12	17.1%
51+	16	22.9%
Country of origin		
Africa	3	4%
Australasia	8	11%
Mexico/Cuba	6	9%
Russia/Europe	4	6%
U.S.A.	49	70%

residents, most mentioned they would like to have a presentation with demonstration and learn how to provide oral care to residents with dementia or anxiety. When residents presented with oral health concerns, 64% of caregivers referred to medical aides and 51% referred to registered nurses for assistance. Additionally, 23% of caregivers directly contacted the resident's dentist or primary care provider and 10% contacted the family so that families could schedule appointments with the health care provider. Nearly 22% of caregivers reported that residents were completely dependent on caregivers for oral care and 64% believed that while some residents are self-sufficient, others are dependent, which varies from resident to resident and depends on factors such as the resident's mental status and care plan.

Post-training feedback surveys following the training intervention completed by 132 staff members (50%) revealed that 45% served as caregivers, 22% were medical aides, 20% were other staff members, and the remaining 16% included registered nurses, physicians, and certified nursing assistants. The efficacy and value of the training intervention was also measured. 92% of participants agreed that they had learned new skills and 1.5% reported that they did not learn new skills. While 98% of participants felt they were competent to apply those new skills in daily care, less than 1% reported not feeling competent at all. Notably, 98% of participants reported being highly satisfied and none were unsatisfied with the overall training (Table 5).

Discussion

The Caregivers' Attitudes Study (Stage 1) results showed that approximately two-thirds (68.6%) of the caregivers felt that their

Table 2

Caregivers' reported oral health training by perceived adequacy of training (Caregivers' Attitudes Study) (N = 70).

Reported training in oral health	Perceived adequacy of training to care for residents oral health		Total		
	Not adequate	Adequate			
Did not receive training	16	66.7%	8	33.3%	24 100%
Did receive training	6	13.0%	40	87.0%	46 100%
Total	22	31.4%	48	68.6%	70 100%

$\chi^2 = 21.04$; df = 1; $p < 0.001$.

Table 3

Perceived barriers/difficulties for carrying out oral health Activities (Caregivers' Attitudes Study) (N = 70).

N = 70	Often	Sometimes	Never-rarely	Don't know
Caregivers feel they have enough time for residents' oral health care	34.3%	28.6%	15.7%	21.4%
Residents' medical requirements take more time than oral health	31.4%	30.0%	18.6%	20.0%
Resident refuses oral health care	25.7%	48.6%	10.0%	15.7%
Resident doesn't open mouth	21.4%	48.6%	14.3%	15.7%
Resident doesn't understand directions	25.7%	50.0%	8.6%	15.7%
Resident uses abusive/offensive language	11.4%	37.2%	31.4%	20.0%
Resident hits/kicks/bites	7.1%	31.4%	41.5%	20.0%

training for oral health was adequate but needed further training in specific topics of oral health. Due to the belief that the oral health of the elderly in ACF's could be improved by further training for caregivers in oral health care, the training curriculum specifically targeted for caregivers was developed. The findings from the post-training feedback survey of the Caregivers' Training Study (Stage 2) show that there remain caregivers in ACF's that lack the appropriate amount of training to actively incorporate preventive oral care to their residents in Clackamas County, Oregon. Caregivers may also feel confident that they are adequately trained in oral health care, however, they may not be up to date on the newest or most effective practices when assisting with oral care in geriatric patients.

This study identified important information about caregivers perceived adequacy of performing oral care on ACF residents, perceived barriers/difficulties for carrying out oral health activities, observations about residents' eating ability and expression of interest in oral health training by prioritized area. Succeeding this study, the training yielded important information about caregivers perceived level of confidence before training, oral health status of seniors and understanding of essential competencies after the training. A continuance of this study could be used to identify the largest barriers to oral care in ACF's in Oregon and other places alike and develop trainings/work flow that would become the standard of care for institutionalized elderly. The discrepancy between caregivers' perceived sufficiency of knowledge and practice experience and their capabilities in reality is of concern because this in itself may create a barrier for initiating a relevant training program.

The results indicate that there are many barriers to providing adequate oral health care to residents of ACF's and indicate a need for additional oral health training for caregivers in these ACF's. These findings agree with those of Frenkel et al.⁴⁰ Sumi et al.⁴¹ and Blinkhorn et al.³⁵ However, Simons et al countered these results by showing that even after a health training with practical skills the

Table 4

Caregivers' expression of interest in oral health training ranked by most prioritized area (Multiple responses. Responses are ranked according to the frequency with which they were selected. Totals add to more than 100%) (Caregivers' Attitudes Study) (N = 70).

Oral health area for training	% of respondents who mentioned
Effects of medication on oral health	61.80%
Recognition of gum disease	39.70%
Detection of oral cancer	30.90%
Recognition of oral diseases	29.40%
Recognition of tooth decay	25.00%
Care of dentures	19.10%
Care of natural teeth	17.60%
Recognition of dry mouth	17.60%
Oral care of cognitively impaired residents	8.80%
Recognition of plaque	7.40%

Table 5

Staff member perceived value of training intervention *after* training (Caregivers' Training Study) (N = 132).

N = 132	Number of participants	Percentage of participants
Overall satisfied with training		
Agree	130	98.4%
Neutral	2	1.52%
Disagree	0	0%
Will incorporate new skills learned in daily care		
Agree	129	97.7%
Neutral	2	1.52%
Disagree	1	0.76%
New information and skills learned		
Agree	121	91.7%
Neutral	9	6.81%
Disagree	2	1.52%

barriers to care remained and the training failed to improve the oral health of seniors.⁴² This may also be related to infrastructure challenges in the facility due to wide ranging expectations to caregivers' ability to manage multiple tasks. A very effective training program was reported by McNally et al in 2015 that used an integrated approach that included multiple areas. The criteria were developed and refined over a 12-month period that involved "education, provisions of resources, an oral care champion, support from managers and administrators and appropriate organizational policy."⁴³

Overall there are many pilot trainings being developed to improve the oral health status of the elderly on a global scale. This study was the first of its kind in Oregon and its practical uses could be vast by shedding light on the existing problem of poor oral care for seniors in ACF's. By developing and refining training programs and policies for ACF's and implementing oral care practices into daily routines, the oral health status of seniors in Oregon might improve. Due to the projected increase of aged populations it is important to develop and test these programs before there is an even larger population of people receiving inadequate oral care. In addition, such activities may have policy implications in the State. The latest Oregon State Plan on Aging 2014–2015⁴⁴ comprises Healthy Aging and Nutrition as one of its focus areas. However, healthy eating without any reference to dental diseases impact on the ability to eat or the serious implications of oral infections on general health ignores some of the sad realities of life of many seniors.

Increasingly, interdisciplinary approaches in health care are being recommended to improve patient outcomes.⁴⁵ The traditional isolation of dental care in the health care arena is slowly being addressed as has been promoted by including oral health in national nursing education and Physician Assistant curriculum.^{46,47} The work carried out by for instance New York University College of Nursing's Oral Health Nursing Education and Practice Initiative (OHNEP)⁴⁸ has particular relevance for activities as described in this study. With better educational preparation in oral health issues of the professions who are the predominant caregiver groups, oral health care can become a natural part of daily activities in ACF's and continuing education in this field can become an integrated part of in-service training.

A limitation of this study was that it was done by mailed survey, which carries a certain risk of bias in the caregivers' responses. Ideally, the caregiver population which undertook the Caregivers' Attitude Study should also have been undergoing the subsequent training, the Caregivers' Training Study. This, however, was not possible in practice. So the two stages of the study included two different groups of caregivers. However, there was a considerable concordance between their perception of own skills and need for additional training. Oral health outcomes were not measured and

there were no follow-up studies done to test how effective the training was in improving resident oral health status, nor was a follow-up done on the caregivers' continued use of oral health care practices. The effect of this was ameliorated by the pre- and post-surveys conducted in relation to the training to measure staff satisfaction and the likelihood caregivers would use their newly acquired competencies.

Conclusions

In our 2014 Caregivers' Attitudes Study (Stage 1), the majority of caregivers felt comfortable with regard to their oral health background and daily activities. However, caregivers expressed a need for additional training in several important areas of dental diseases and medical–dental interactions. Caregivers who participated in the training (2015 Caregivers' Training Study-Stage 2) recognized the poor oral health of their residents and felt the training curriculum provided them with competencies needed to improve daily oral health services. This innovative training demonstrated that oral health can be integrated into daily care routines which could improve oral and systemic health and reduce inequities in oral health for older adults. Further research may include additional administrator and caregiver input on how to most effectively implement oral care into ACF routines so that the activities are sustained.

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References

1. An Aging Nation: The Older Population in the United States. U.S. Department of Commerce Economics and Statistics Administration U.S. Census Bureau. Retrieved from: <https://www.census.gov/prod/2014pubs/p25-1140.pdf>. Accessed 23 August 2016.
2. Kandelman D, Petersen PE, Ueda H. Oral health, general health, and quality of life in older people. *Spec Care Dent.* 2008;28(6):224–236.
3. Harris-Kojetin L, Sengupta M, Park-Lee E, et al. Long-term care providers and services users in the United States: data from the national study of long-term care providers, 2013–2014. National Center for Health Statistics. *Vital Health Stat.* 2016;3(38).
4. Harris-Kojetin L, Sengupta M, Park-Lee E, Valverde R. Long-term care services in the United States: 2013 overview. National Center for Health Statistics. *Vital Health Stat.* 2013;3(37).
5. Slade GD, Akinluge AA, Sanders AE. Projections of U.S. edentulism prevalence following 5 decades of decline. *J Dent Res.* 2014;93:959–965.
6. Ferguson DA, Steinberg BJ, Schwien T. Dental economics and the aging population. *Compend Contin Educ Dent.* 2010 Jul–Aug;31(6):418–425.

7. Petersen PE, Kandelman D, Arpin S, Ogawa H. Global oral health of older people – call for public health action. *Oral Biol Dent*. 2015;3:1. <http://dx.doi.org/10.7243/2053-5775-3-1>.
8. A State Of Decay. Are Older Americans Coming Of Age Without Oral Healthcare?. Retrieved from: http://b.3cdn.net/teeth/492f646d03c892b6aa_l6m6bj3ql.pdf. Accessed 23 August 2016.
9. Gaszynska E, Szatkó F, Godala M, Gaszynski T. Oral health status, dental treatment needs, and barriers to dental care of elderly care home residents in Lodz, Poland. *Clin Interv Aging*. 2014;9:1637–1644.
10. Montini T, Tseng TY, Patel H, Shelley D. Barriers to dental services for older adults. *Am J Health Behav*. 2014;38(5):781–788.
11. Thompson B, Cooney P, Lawrence H, Ravaghi V, Quiñonez C. The potential oral health impact of cost barriers to dental care: findings from a Canadian population-based study. *BMC Oral Health*. 2014;14:78.
12. Marino RJ, Khan AR, Tham R, Khew CW, Stevenson C. Pattern and factors associated with utilization of dental services among older adults in rural Victoria. *Aust Dent J*. 2014 Dec;59(4):504–510. <http://dx.doi.org/10.1111/adj.12216> [Epub 2014 Sep 26].
13. Jablonski RA, Munro CL, Grap MJ, Schubert CM, Ligon M, Spigelmeyer P. Mouth care in nursing homes: knowledge, beliefs, and practices of nursing assistants. *Geriatr Nurs*. 2009 Mar–Apr;30(2):99–107. <http://dx.doi.org/10.1016/j.gernurse.2008.06.010> [Epub 2008 Nov 17].
14. Cornejo-Ovalle M, Costa-de-Lima K, Perez G, Borrell C, Casals-Peidro E. Oral health care activities performed by caregivers for institutionalized elderly in Barcelona-Spain. *Med Oral Patol Oral Cir Bucal*. 2013;18(4):e641–e649.
15. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. *Lancet*. 2005;366(9499):1809–1820.
16. Locker D. Dental status, xerostomia and the oral health-related quality of life of an elderly institutionalized population. *Spec Care Dent*. 2003;23(3):86–93.
17. Simons D, Brailsford S, Kidd EAM, Beighton D. Relationship between oral hygiene practices and oral status in dentate elderly people living in residential homes. *Commun Dent Oral Epidemiol*. 2001;29(6):464–470.
18. Montal S, Tramini P, Triay J-A, Valcarcel J. Oral hygiene and the need for treatment of the dependent institutionalised elderly. *Gerodontology*. 2006;23(2):67–72.
19. Andersson P, Hallberg IR, Lorefält B, Unosson M, Renvert S. Oral health problems in elderly rehabilitation patients. *Int J Dent Hyg*. 2004;2(2):70–77.
20. Geismar K, Stoltze K, Sigurd B, Gyntelberg F, Holmstrup P. Periodontal disease and coronary heart disease. *J Periodontol*. 2006;77(9):1547–1554.
21. Australian Research Centre for Population Oral Health. The relationship between diabetes and oral health among Australian adults. *Aust Dent J*. 2008;53(1):93–96.
22. Martínez-Maestre MÁ, González-Cejudo C, Machuca G, Torrejón R, Castelobranco C. Periodontitis and osteoporosis: a systematic review. *Climacteric*. 2010;13(6):523–529.
23. Porter J, Ntouva A, Read A, Murdoch M, Ola D, Tsakos G. The impact of oral health on the quality of life of nursing home residents. *Health Qual Life Outcomes*. 2015;13:102.
24. Lamy M, Mojon P, Kalykakis G, Legrand R, Butz-Jorgensen E. Oral status and nutrition in the institutionalized elderly. *J Dent*. 1999 Aug;27(6):443–448.
25. Walls AWG, Steele JG. The relationship between oral health and nutrition in older people. *Mech Ageing Dev*. 2004 Dec;125(12):853–857.
26. Hämäläinen P, Meurman JH, Keskinen M, Heikkilä E. Relationship between dental health and 10-year mortality in a cohort of community-dwelling elderly people. *Eur J Oral Sci*. 2003 Aug;111(4):291–296.
27. Ajwani S, Tervonen T, Närhi TO, Ainamo A. Periodontal health status and treatment needs among the elderly. *Spec Care Dent*. 2001 May–Jun;21(3):98–103.
28. Gluhak C, Arnetz GV, Kirmeier R, Jakse N, Arnetz G. Oral status among seniors in nine nursing homes in Styria, Austria. *Gerodontology*. 2010 Mar;27(1):47–52. <http://dx.doi.org/10.1111/j.1741-2358.2009.00281.x> [Epub 2009 Mar 26].
29. Jablonski RA. Oral health and hygiene content in nursing fundamentals textbooks. *Nurs Res Pract*. 2012;2012:372617. <http://dx.doi.org/10.1155/2012/372617> [Epub 2012 Apr 9].
30. Adebayo B, Durey A, Slack-Smith LM. Culturally and linguistically diverse (CALD) carers' perceptions of oral care in residential aged care settings in Perth, Western Australia. *Gerodontology*. 2016 Jan 14; <http://dx.doi.org/10.1111/ger.12219> [Epub ahead of print].
31. McKelvey VA, Thomson WM, Ayers KM. A qualitative study of oral health knowledge and attitudes among staff caring for older people in Dunedin long-term care facilities. *N Z Dent J*. 2003 Dec;99(4):98–103.
32. Nicol R, Petrina Sweeney M, McHugh S, Bagg J. Effectiveness of health care worker training on the oral health of elderly residents of nursing homes. *Commun Dent Oral Epidemiol*. 2005;33(2):115–124.
33. Reed R, Broder HL, Jenkins G, Spivack E, Janal MN. Oral health promotion among older persons and their care providers in a nursing home facility. *Gerodontology*. 2006;23(2):73–78.
34. Jablonski RA, Kolanowski A, Therrien B, Mahoney EK, Kassab C, Leslie DL. Reducing care-resistant behaviors during oral hygiene in persons with dementia. *BMC Oral Health*. 2011;11:30. <http://dx.doi.org/10.1186/1472-6831-11-30>.
35. Blinkhorn F, Weingarten L, Boivin L, Plain J, Kay M. An intervention to improve the oral health of residents in an aged care facility led by nurses. *Health Educ J*. 2011;71(4):527–535.
36. Albrecht M, Kupfer R, Reissmann DR, Mühlhauser I, Köpke S. Oral health educational interventions for nursing home staff and residents. *Cochrane Database Syst Rev*. 2016 Sep 30;9:CD010535 [Epub ahead of print].
37. MacEntee MI, Wyatt CCL, Beattie BL, et al. Provision of mouth-care in long-term care facilities: an educational trial. *Commun Dent Oral Epidemiol*. 2007 Feb;35(1):25–34.
38. De Visschere L, Schols J, van der Putten G-J, de Baat C, Vanobbergen J. Effect evaluation of a supervised versus non-supervised implementation of an oral health care guideline in nursing homes: a cluster randomised controlled clinical trial. *Gerodontology*. 2012 Jun;29(2):e96–e106. <http://dx.doi.org/10.1111/j.1741-2358.2010.00418.x> [Epub 2010 Sep 14].
39. Webb BC, Whittle T, Schwarz E. Provision of dental care in aged care facilities NSW Australia – Part 2 as perceived by the carers (care providers). *Gerodontology*. 2015 Dec;32(4):254–259. <http://dx.doi.org/10.1111/ger.12103> [Epub 2013 Dec 12].
40. Frenkel H, Harvey I, Newcombe RG. Improving oral health in institutionalised elderly people by educating caregivers: a randomised controlled trial. *Commun Dent Oral Epidemiol*. 2001 Aug;29(4):289–297.
41. Sumi Y, Nakamura Y, Nagaosa S, Michiwaki Y, Nagaya M. Attitudes to oral care among caregivers in Japanese nursing homes. *Gerodontology*. 2001;18(1):2–6.
42. Simons D, Baker P, Jones B, Kidd EA, Beighton D. An evaluation of an oral health training programme for carers of the elderly in residential homes. *Br Dent J*. 2000 Feb 26;188(4):206–210.
43. McNally M, Martin-Misener R, McNeil K, et al. Implementing oral care practices and policy into long-term care: the Brushing up on Mouth Care project. *J Am Med Dir Assoc*. 2015 Mar;16(3):200–207. <http://dx.doi.org/10.1016/j.jamda.2014.08.018> [Epub 2014 Oct 11].
44. Oregon State Plan on Aging: FFY 2014–2015. Oregon Department of Human Services. Retrieved from: <https://www.oregon.gov/DHS/SENIORS-DISABILITIES/SUA/Pages/Area-Agency-Aging.aspx>. Accessed 03 January 2017.
45. Institute of Medicine. *Health Professions Education: A Bridge to Quality*. Washington, DC: The National Academies Press; 2003.
46. Haber J, Spielman A, Wolff M, Shelley D. Interprofessional education between dentistry and nursing: the NYU experience. *J Calif Dent Assoc*. 2014 Jan;42(1):44–51.
47. Jacques PF, Snow C, Dowdle M, Riley N, Mao K, Gonsalves WC. Oral health curricula in physician assistant programs: a survey of physician assistant program directors. *J Phys Assist Educ*. 2010;21(2):22–30.
48. Dolce MC, Haber J, Shelley D. Oral health nursing education and practice program. *Nurs Res Pract*. 2012;2012:149673. <http://dx.doi.org/10.1155/2012/149673> [Epub 2012 May 17].