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Dickinson C, Beatty CF, Marshall D. A pilot study: are dental hygienists in Texas ready for the elderly population explosion?

A pilot study: are dental hygienists in Texas ready for the elderly population explosion?

Abstract: *Purpose:* At the beginning of the 20th century, people 65 and older comprised 4.1% of the population. By the year 2030, it is estimated that people 65 and older, the 'Baby Boomer' generation, will comprise more than 20% of the population. This will have a profound effect on the practice of dentistry and on society as a whole. The purpose of this study was to determine whether dental hygienists in Texas felt prepared and willing to treat the elderly in alternative practice settings such as nursing homes. *Methods:* After institutional review board approval, a questionnaire was mailed to 500 hygienists. A 5% systematic sample of dental hygiene graduates was taken from four dental hygiene schools in Texas, United States of America (USA). Of these, 175 were returned for a 35% response rate. Questions asked were degree held, how prepared the participants felt to treat the special needs of the elderly, if participants were willing to work in alternative practice settings such as a nursing home and if they felt additional education was needed. Frequency distributions, correlations and chi square were used to analyse the data. *Results:* Results revealed 86.5% of the respondents felt prepared to somewhat prepared to treat the special needs of the elderly based on education; equally, 86.5% felt more education was needed to better prepare them to treat the elderly. Over half of the respondents would not be willing to work in alternative practice settings such as nursing homes. *Conclusion:* The average respondents do not feel fully prepared to treat the elderly with special needs, and they think more education is needed to better prepare them to treat this important target population.

Key words: baby boomer and medically compromised; dental hygiene education; dental hygienist; elderly

Introduction

The 65 plus age group is the fastest growing segment of the population in the USA. The United States Census Bureau estimates that by the middle of the 21st century, the number of persons 65 and older will double to approximately 80 million (1). Baby Boomers were born between the years 1946 and 1964, and there were 77.3 million Boomers in 2008. (2) The oldest Boomers are becoming 'empty-nesters' and positioning themselves for retirement as the first Baby Boomers are turning 65 this year (2011) (3).

This portion of the population will also have an impact on the dental hygiene profession. Older people with limited access to care are less likely to schedule dental visits on a regular basis. In 2000, 40% of the

people 65 and older had regular dental visits. Of the residents living in long-term care facilities, only 19% reported receiving regular dental hygiene care. Younger long-term care residents have been shown to receive dental hygiene care more often than older residents (4). One of the USA *Healthy People 2010* goals was to increase the proportion of long-term care residents who use the oral health care system each year from 19% in 1997 to 25% by the year 2010 (5).

The average age that people go into nursing homes or access long-term care services varies by medical history, cognitive ability and capacity to function on their own in a private setting. According to the American Association of Retired Persons, the population age 85 and older is the most likely to need long-term services, and this population is growing at a dramatic rate (6). More than 50% of nursing home residents have no close relatives, and 46% have no living children. The average age of a nursing home resident is 78; 70% are women, 82% are 65 and older and 36% are 85 and older. People living in nursing homes who are cognitively impaired average at least 55% of the nursing home population; 66% of these are widowed, and 74% are on Medicaid (7).

The Centers for Disease Control and Prevention reported in 2006 that about 25% of adults ages 60 and older had lost all their natural teeth (8). National Oral Health Surveillance data indicate that older adults are retaining more of their teeth and fewer numbers are losing all their teeth (9). This trend is expected to continue which will result in an increased number of persons over the age of 60 who will need dental hygiene care.

Researchers have indicated people's value of appearance and the desire for physical attractiveness do not appear to decline with age (10). In addition, maintenance of oral health and oral aesthetics has been reported as important for successful ageing (10). As society has become more aesthetically conscious, not only will dental hygiene professionals be treating a large elderly population who are dentulous, but also these patients may have more cosmetic dentistry concerns, such as lumaneers, implants, crowns and bridges.

Compared with previous generations, Baby Boomers are more educated, will have more money at retirement and are considered more health conscious. Because of advances in biotechnology, the work scientists are doing with tissue regeneration and artificial organs and the increased use of life-saving drugs, Baby Boomers will most likely grow old with most of their natural teeth (11). Even though Baby Boomers have worked hard at being active and healthy, it is important to pay attention to the lifestyle factors that contribute to an increase in rates of arthritis, diabetes and cardiovascular disease in the growing elderly population. A recent study of health and functioning of Baby Boomers approaching age 60 revealed a reversal in the last decade of their previous decline in fair or poor health status (12).

As people age, they are at a greater risk for a variety of debilitating diseases. This results in an increased prevalence of arthritis, Alzheimer's disease, Parkinson's disease, diabetes, hypertension/cardiovascular disease and oral diseases (12–17). Therefore, there is a need for a higher level of care for people ages 65 and older. These diseases create challenges for dentists and dental hygienists in terms of complex medical histories, adaptation of oral hygiene, education of care givers and management of care (18). The dental hygiene profession should be prepared and willing to provide advanced dental hygiene care for this growing segment of the population in alternative practice settings such as nursing homes.

Patients with these chronic diseases may be on multiple medications. Many medications used to treat systemic diseases affecting the elderly can cause xerostomia and gingival overgrowth. Xerostomia currently affects approximately 20% of the elderly (19). In addition, the number and type of medications used to treat and control their systemic conditions sometimes create the need to adjust dental hygiene needs and patient management for the elderly Therefore, oral health professionals will need to be more thorough with medical history evaluations and stay current with the ever-changing medications available on the market.

Some Baby Boomers with systemic conditions will continue to be treated in private dental practices, while a significant portion, especially those over the age of 85, will require treatment in long-term care facilities. As Baby Boomers age, the need for long-term care by the population will more than triple. There are currently 16 million Americans in nursing homes, and the federal government finances 69% of nursing home spending. In 2005, overall expenditures for long-term care reached $143 billion. This will increase significantly with 37 million Baby Boomers needing long-term care in the future (20).

The longer individuals live, the greater the likelihood that chronic illnesses will develop, causing an increased need for assistance with activities of daily living such as, eating, dressing and personal oral hygiene (20). As a result, a greater number of older patients will have limited manual dexterity which compromises their ability to perform thorough personal oral hygiene care. As the need for long-term care will more than triple, there will be a large segment of the elderly population needing advanced dental hygiene care (11).

Nurses play an important role in the care and management of long-term healthcare residents. As the primary care givers, nurses and CNAs are responsible for the residents' preventive health services, including their dental hygiene needs. However, there are gaps in the education of nurses and CNAs in relation to oral health. Current literature reports disparities in access to care and inadequate daily oral care for long-term care residents, bringing attention to the need for collaboration between the CNA and the dental hygienist (21).

Public health practitioners advocate for more community oral health programmes to address the problems with access to care for the elderly, both now and in the future (22). The dental hygiene profession needs to establish more mobile facilities, develop collaborations with nursing homes and seek funding sources to bring oral health care to the elderly. Expansion of the mid-level oral healthcare provider would improve access to care for the elderly by extending primary dental care outside

of the traditional private practice setting (23) and enhancing collaborations between oral and other healthcare providers in the nursing home (24). The purpose of this study was to determine whether practicing dental hygienists in Texas were ready to meet the challenge of filling the oral health needs of the growing elderly population, as measured by their confidence in their educational preparation and willingness to treat this population in alternative practice settings such as nursing homes. A secondary purpose was to determine whether their perception of preparedness to treat conditions associated with the elderly related to their willingness to work in an alternative practice setting such as a nursing home.

Methods and materials

After institutional review board approval, a survey was conducted of dental hygienists licensed and living in Texas. A two-step, 5%, systematic, cluster sample of 500 dental hygienists was drawn from 2500 dental hygiene alumni of four of the 21 dental hygiene schools in Texas. The names were accessed from the Texas State Board of Dental Examiners. The sample represented graduates from two associate degree and two Bachelor's degree dental hygiene programmes. These programmes had been in place for over 30 years and were located in different geographic regions of the state.

A questionnaire was developed from a review of the literature to include medical conditions and problems related to treating the elderly. The detailed questionnaire consisted of 15 items regarding respondent demographics, knowledge of the growing elderly population, preparedness to treat the elderly with special needs, preparedness treating the elderly in a clinical setting, the appeal of treating the elderly in a clinical setting and the willingness to work in alternative practice settings. Details of the questions on the questionnaire are reflected in the tables presented in the Results section. The questionnaire was reviewed for face and content validity by dental hygiene educators, a dentist and dental hygienists in the field, a statistician and dental hygiene students studying advanced dental hygiene research.

The mailing of the questionnaire included a cover letter and a stamped, self-addressed envelope to encourage response. A follow-up mailing was not conducted. Of the 500 questionnaires mailed, 207 were returned. Of the 207 returned questionnaires, 15 were excluded because the respondents were not actively practicing, and 17 were excluded because of incomplete data. This resulted in 175 surveys eligible for data analysis, representing a response rate of 35%.

The chi square test was applied to data to assess significance of a trend in response. Strengths of relationships were assessed with Cramer's V test. Significance level was set at 0.05.

Results

The sociodemographic distinctiveness of this population is shown in Table 1. Gender was similar to the profession of dental hygiene (19), with the vast majority being female. Over half of the respondents worked in a city averaging a population of >50 000, and the majority were located in urban areas. Of the practice settings identified, more than half of the respondents had experience in a general dentist's office. The majority of the rest were equally distributed between periodontal and paediatric offices.

Table 1. **Sociodemographic, training characteristics and practice characteristics of respondents (*n* = 175**

Sociodemographic characteristics		
Mean age (SD)	42.19 years (11.049)	
	%	*n*
Gender		
Male	1.8	3
Female	98.2	162
Practice location		
Urban	86.2	144
Rural	13.8	23
Size of area of practice		
<5000 people	4.4	7
5001–14 999 people	13.8	22
15 000–49 999 people	13.8	22
over 50 000 people	68.1	109
Training characteristics		
Type of degree		
Associate	54	95
Bachelor's	43	76
Master's	3	3
Practice characteristics		
History of working in (type of practice)		
General dentist	58.0	88
Paediatric practice	21.3	36
Periodontal practice	28.7	29
Educational institute	5.2	9
Community practice	2.3	4
Long term care facility	1.7	3
Nursing home	1.7	3
Hospital	1.1	2

The '*n*' differs for demographic characteristics because some participants did not answer certain questions.

As can be seen in Table 2, approximately half of the respondents answered that they had knowledge of the growing elderly population. Approximately two-thirds of the respondents felt confident in treating the advanced needs of the medically compromised elderly patient, but the majority would not be willing to work in an alternative practice setting such as nursing homes. The vast majority believed that expanding the hygienist's role in nursing homes was important and believed further education was needed to be able to do this. Over half of the respondents indicated that working in a nursing home would 'not be at all appealing'.

Table 3 presents respondents' perception of general preparedness to treat special conditions of the elderly. The majority believed themselves to be between somewhat prepared and prepared to treat patients with conditions more commonly seen in private practice, such as oral pathology, effects of multiple medications, Parkinson's disease and depression. Furthermore, the majority felt more fully prepared to treat patients

Table 2. **Knowledge, preparedness and willingness to treat the growing elderly population**

Survey questions		%	χ^2	*P*-value
Did you know by the year 2030 adults at least 65 years of age will comprise 20% of the US population?	Yes	49.7	0.006	0.94
	No	50.3		
Do you feel confident treating the advanced needs of medically compromised elderly patients?	Yes	64.5	14.54	0.001*
	No	35.5		
Would you be willing to work in an alternative practice setting treating predominately elderly populations, such as a nursing home?	Yes	9.0	8.40	0.002*
	No	61.0		
Do you feel expanding the role of dental hygienists within nursing home facilities is important?	Yes	96.5	147.84	0.001*
	No	2.3		
Do you feel more education would better prepare you to clinically treat the elderly population? Would you be willing to further your education?	Yes	85.9	88.60	0.001*
	No	14.1		
Do you personally feel that further education is needed to better prepare you to treat the advanced needs of medically compromised elderly patients?	Yes	81.5	68.68	0.001*
	No	18.5		
How appealing do you find working in a nursing home facility to be?	Not at all	54.3	55.16	0.001*
	Somewhat	37.0		
	Very	8.7		

*Statistically significant.

with conditions that are seen on a daily basis, such as high blood pressure, diabetes, xerostomia, limited manual dexterity, arthritis/chronic joint symptoms and cardiovascular disease. On the other hand, for conditions not commonly seen in private practice, such as dementia and confinement to a wheel chair, the majority of the participants perceived themselves to be somewhat prepared to prepared. However, the majority felt not prepared to somewhat prepared to treat elderly individuals that they did not commonly treat, such as bed ridden or institutionalized patients.

Table 4 shows a cross tabulation between how prepared the respondents perceived they were to treat the special needs of the elderly population clinically and if they believed more education was needed. The participants who believed more education was needed felt less prepared based on their education. The participants who believed no further education was needed felt more fully prepared. The relationship was statistically significant, although it was a relatively weak correlation.

Table 3. **Frequency of general preparedness in treating special conditions of the elderly**

	Percentage of frequency of general preparedness			
	Not prepared	Somewhat prepared	Prepared	Fully prepared
Conditions commonly seen in private practice				
Oral pathology	4.1	**32.2**	**46.2**	17.5
Affects of multiple medications	8.1	**32.6**	**42.4**	16.9
Parkinson's	6.4	**34.6**	**40.5**	18.5
Depression	6.9	**22.0**	**53.8**	17.3
High blood pressure	0.6	8.1	**55.2**	**36.0**
Diabetes	1.2	9.3	**54.1**	**35.5**
Xerostomia	2.3	12.1	**46.6**	**39.1**
Limited manual dexterity	2.3	15.6	**52.0**	**30.1**
Arthritis/chronic joint symptoms	3.5	20.8	**51.4**	**24.3**
Cardiovascular disease	2.3	15.8	**55.6**	**26.3**
Conditions not commonly seen in private practice				
Wheel chair bound patients	9.2	**36.2**	**38.5**	16.1
Dementia/ Alzheimer's	11.0	**34.9**	**39.5**	14.5
Bed ridden patients	**46.0**	**33.3**	13.8	6.9
Institutionalized patients	**33.9**	**37.9**	20.7	7.5

Bold percentages emphasize different levels of preparedness.

Table 4. **Relationship of education-based preparedness and the perception of needing more education**

Based on education, how prepared are you?	Percentage: need for more education?		
	Yes	No	Total
Not prepared			
Count	5	0	5
% need more education	3.5	0	2.9
Somewhat prepared			
Count	74	6	80
% need more education	**52.5**	18.8	46.2
Prepared			
Count	48	16	64
% need more education	**34.0**	**50.0**	37
Fully prepared			
Count	14	10	24
% need more education	9.9	**31.3**	13.9
Total			
Count	141	32	173
% need more education	100	100	100

Cramer's V = 0.322.
Pearson chi-square tests = 17.89 (d.f. = 3); *P* = 0.001.
Bold percentages emphasize perceptions of more education needed, based on general preparedness.
The '*n*' differs because some participants did not answer certain questions.

Table 5 presents the correlation of current job experience and how prepared respondents felt to treat special needs of the elderly. All variables were weakly correlated, and 11 of 14 correlations were statistically significant.

Tables 6–8 present the cross tabulations for general preparedness related to experience treating the conditions of the elderly, such as institutionalized patients, effects of multiple medications and dementia/Alzheimer's disease (from Table 5). Three respondents who had experience treating institutionalized patients on a daily basis perceived themselves to be fully prepared, but 113 respondents indicated they had no experience treating institutionalized patients and perceived themselves to be not prepared. Experience treating patients taking multiple medications did not affect respondents' perceptions of preparedness. The majority felt somewhat prepared or prepared, regardless of whether they treated these patients daily or never. Also, the majority of respondents felt somewhat prepared or prepared to treat patients with dementia/Alzheimer's disease, regardless of how often they treated these patients.

Table 9 presents the correlation of general preparedness to treat special conditions of the elderly and willingness to treat the elderly in alternative practice settings. All variables were weakly correlated, and 10 of 14 correlations were statistically significant.

Tables 10–12 present cross tabulations for preparedness in treating patients who are institutionalized, have effects of multiple medications or have dementia/Alzheimer's disease in relation to willingness to work in alternative practice settings such as nursing homes. In Table 10, as it relates to treating patients who are institutionalized, the majority believed they were not prepared and were not willing to work in alternative practice settings such as nursing homes. In Tables 11 and 12, in relation to treating the effects of multiple medications and treating patients with dementia or Alzheimer's disease, the majority of respondents believed they were somewhat prepared or prepared to treat patients with these conditions within the elderly population, but were not willing to work in alternative practice settings such as nursing homes. The more prepared they perceived themselves to be, the more willing they were to work in alternative practice settings for predominantly elderly populations.

The numbers of respondents in the tables do not indicate the total sample pool, as indicated in the note at the bottom of each table. This is a result of some respondents not answering particular questions.

Table 5. **Relationship of perceived preparedness to experience treating the following conditions**

	χ^2	d.f.	*P*-value	Cramer's V
Conditions commonly seen in private practice				
Oral pathology	25.70	12	0.006*	0.23
Affects of multiple medications	20.71	12	0.028*	0.20
Limited manual dexterity	26.42	12	0.005*	0.23
Arthritis/chronic joint symptoms	25.93	12	0.005*	0.23
High blood pressure	10.47	12	0.287	0.14
Diabetes	11.04	12	0.263	0.15
Xerostomia	45.40	12	0.001*	0.30
Parkinson's	30.96	16	0.007*	0.21
Depression	35.98	12	0.001*	0.27
Cardiovascular disease	23.17	12	0.013*	0.22
Conditions not commonly seen in private practice				
Dementia/Alzheimer's	17.98	12	0.058	0.19
Institutionalized patients	64.77	12	0.001*	0.36
Bed ridden patients	36.21	12	0.001*	0.26
Wheelchair bound patients	31.44	12	0.001*	0.25

*Statistically significant.

Table 6. **Relationship between perceived preparedness and experience treating institutionalized elderly patients**

	Experience treating institutionalized elderly patients					
	Daily	Weekly	Monthly	Annually	Never	Total
Not prepared						
Count	0	2	1	5	50	58
% experience treating	0	33.3	7.1	14.3	**44.2**	33.9
Somewhat prepared						
Count	0	1	6	22	37	66
% experience treating	0	16.7	42.9	**62.9**	32.75	38.6
Prepared						
Count	0	2	5	8	20	35
% experience treating	0	33.3	35.7	22.9	17.7	20.5
Fully prepared						
Count	3	1	2	0	6	12
% experience treating	100	16.7	14.3	0	5.3	7.0
Total						
Count	3	6	14	35	113	171
% experience treating	100.0	100.0	100.0	100.0	100.0	100.0

Cramer's V = 0.35.
Pearson Chi-square = 64.77 (d.f. = 12); $P = 0.001$.
Bold values emphasize the correlation between experience and generalized preparedness in treating conditions of the elderly.
The '*n*' differs because some participants did not answer certain questions.

Discussion

The fastest growing segment of the US population is the elderly, 65 years or older. The Baby Boomers will soon add 75 million people to this population (25). Research has indicated that oral disease rates and oral health needs are higher in low income and special needs patients, including the elderly (26). Helena Gallant, past president of the American Dental Hygienists' Association (ADHA), stated that in order to promote good overall health in the elderly, the public needs more comprehensive preventive oral care programmes (27). The dental hygiene profession should be prepared to address access to care for this population.

Table 7. **Relationship of perceived preparedness and experience treating elderly with multiple medications**

	Experience treating elderly with multiple medications					
	Daily	Weekly	Monthly	Annually	Never	Total
Not prepared						
Count	4	3	4	3	0	14
% experience treating	4.9	7.3	11.8	**30.0**	0	8.2
Somewhat prepared						
Count	22	13	15	4	2	56
% experience treating	**26.8**	**31.7**	**44.1**	**40.0**	**50.0**	32.7
Prepared						
Count	35	21	13	2	1	72
% experience treating	**42.7**	**51.2**	**38.2**	20.0	25.0	42.1
Fully prepared						
Count	21	4	2	1	1	29
% experience treating	25.6	9.8	5.9	10.0	25.0	17.0
Total						
Count	82	41	34	10	4	171
% experience treating	100.0	100.0	100.0	100.0%	100.0	100.0

Cramer's V = 0.20.
Pearson chi-square = 20.71 (d.f. = 12); $P = 0.028$.
Bold values emphasize the correlation between experience and generalized preparedness in treating conditions of the elderly.
The '*n*' differs because some participants did not answer certain questions.

Table 8. **Relationship of perceived preparedness and experience treating elderly with dementia/Alzheimer's disease**

	Experience treating elderly with dementia/Alzheimer's					
	Daily	Weekly	Monthly	Annually	Never	Total
Not prepared						
Count	0	1	4	7	6	18
% experience treating	0	5.3	6.0	12.3	27.3	10.6
Somewhat prepared						
Count	0	**6**	**26**	**20**	8	**60**
% experience treating	0	**31.6**	**38.8**	**35.1**	36.4	35.3
Prepared						
Count	3	**7**	**26**	**25**	6	**67**
% experience treating	60.0	**36.8**	**38.8**	**43.9**	27.3	39.4
Fully prepared						
Count	2	5	11	5	2	25
% experience treating	40.0	26.3	16.4	8.8	9.1	14.7
Total						
Count	5	19	**67**	**57**	22	170
% experience treating	100.0	100.0	100.0	100.0	100.0	100.0

Cramer's V = 0.19.
Pearson chi-square = 17.98 (d.f. = 12); $P = 0.058$.
Bold values emphasize the correlation between experience and generalized preparedness in treating conditions of the elderly.
The '*n*' differs because some participants did not answer certain questions.

The results of this study reveal both the dental hygienists' perceived preparedness and their willingness to treat the elderly in alternative practices settings such as nursing homes. This study cannot be generalized to the total population and represents mainly the female hygienists that are working in urban areas and in large general practice offices, with the majority having their Associate or Bachelor's degree.

The dental hygienist has the knowledge and skills to meet the preventive oral healthcare needs of the American public, including the elderly (27). However, the results of this study reveal that half of the dental hygiene professionals were not even aware of the growing elderly population. Even though approximately two-thirds of the respondents felt confident in treating the advanced needs of the medically compromised elderly patient, the vast majority of the practicing Texas dental hygienists in this study believed that further education is required to better prepare them to treat the advanced needs of elderly patients in a clinical setting. Additionally, even though they felt somewhat confident in treating the advanced needs of the elderly, they were not willing to do so in alternative practice settings such as nursing homes. The majority found practicing in nursing homes to be 'not at all appealing'.

The results of this study also show that the majority of these dental hygienists personally felt that further education was needed to better prepare them to treat the advanced needs of the medically compromised elderly patients. However, there was an equal distribution when a cross tabulation was done to compare their perception of preparedness to treat the elderly population based on their education to their belief that further

Table 9. **Relationship of perceived preparedness of special conditions of the elderly and willingness to work in alternative practice settings, such as nursing homes**

	Statistical value			
	χ^2	d.f.	*P*-value	Cramer's V
Conditions commonly seen in private practice				
Oral pathology	0.15	3	0.493	0.03
Affects of multiple medications	7.60	3	0.028*	0.21
Limited manual dexterity	9.14	3	0.014*	0.23
Arthritis/chronic joint symptoms	15.62	3	0.001*	0.30
High blood pressure	4.22	3	0.130	0.119
Diabetes	8.32	3	0.020*	0.221
Xerostomia	3.13	3	0.186	0.135
Parkinson's	4.07	4	0.199	0.154
Depression	8.93	3	0.015*	0.228
Cardiovascular disease	8.67	3	0.017*	0.226
Conditions not commonly seen in private practice				
Dementia/Alzheimer's	11.19	3	0.006*	0.26
Institutionalized patients	10.66	3	0.007*	0.249
Bed ridden patients	11.33	3	0.005*	0.257
Wheelchair bound patients	7.09	3	0.035*	0.203

*Statistically significant.

Table 10. **Relationship between perceived preparedness to treat institutionalized patients and willingness to work in alternative practice settings, such as nursing homes**

	Willingness to work in alternative practice settings		
	Yes	No	Total
Not prepared			
Count	17	42	59
% experience treating	25.4	**40.0**	34.3
Somewhat prepared			
Count	**27**	**38**	**65**
% experience treating	**40.3**	**36.2**	37.8
Prepared			
Count	13	22	35
% experience treating	19.45	21.0	20.3
Fully prepared			
Count	10	3	13
% experience treating	18.2	16.5	17.2
Total			
Count	67	105	172
% experience treating	100.0	100.0	100.0

Cramer's V = 0.249.
Pearson chi-square = 10.66 (d.f. = 3); $P = 0.007$.
Bold values emphasize the majority who are willing or not willing to work in alternative practice settings based on their perceived preparedness.
The '*n*' differs because some participants did not answer certain questions.

Table 11. **Relationship between perceived preparedness to treat affects from multiple medications and willingness to work in alternative practice settings, such as nursing homes**

	Willingness to work in alternative practice settings		
	Yes	No	Total
Not prepared			
Count	7	7	14
% experience treating	10.6	6.7	8.2
Somewhat prepared			
Count	14	41	55
% experience treating	21.2	**39.4**	32.4
Prepared			
Count	30	43	73
% experience treating	**45.5**	**41.3**	42.9
Fully prepared			
Count	15	13	28
% experience treating	**22.7**	12.5	16.5
Total			
Count	66	104	170
% experience treating	100.0	100.0	100.0

Cramer's V = 0.21.
Pearson chi-square = 7.60 (d.f. = 3); $P = 0.028$.
Bold values emphasize the majority who are willing or not willing to work in alternative practice settings based on their perceived preparedness.
The '*n*' differs because some participants did not answer certain questions.

Table 12. **Relationship of perceived preparedness to treat patients with dementia/Alzheimer's disease and willingness to work in alternative practice settings, such as nursing homes**

	Willingness to work in alternative practice settings		
	Yes	No	Total
Not prepared			
Count	6	13	19
% experience treating	9.1	12.5	11.2
Somewhat prepared			
Count	15	45	60
% experience treating	22.7	**43.3**	35.3
Prepared			
Count	30	36	66
% experience treating	**45.5**	**34.6**	38.8
Fully prepared			
Count	15	10	25
% experience treating	22.7	9.6	14.7
Total			
Count	66	104	170
% experience treating	100	100	100

Cramer's V = 0.26.
Pearson Chi-square = 11.19 (d.f. = 3); $P = 0.006$.
Bold values emphasize the majority who are willing or not willing to work in alternative practice settings based on their perceived preparedness.
The '*n*' differs because some participants did not answer certain questions.

education was needed. The vast majority of respondents who believed they were prepared to fully prepared did not feel the need for further education. On the other hand, the vast majority of participants who were prepared to only somewhat prepared felt further education was needed.

Frequency of preparedness of dental hygienists to treat medically complex conditions that are commonly and not commonly seen in dental practices, as listed in Table 3, varied according to the complexity of the medical condition. The majority of responding dental hygienists believed themselves to be prepared to treat conditions that they commonly had seen in their practices, such as the effects of multiple medications. On the other hand, they believed themselves to be only somewhat prepared to treat institutionalized patients, which is a type of patient that they do not commonly encounter in their practices.

Dental hygienists' perceptions of preparedness seem to depend on their level of experience treating patients with these various conditions. It is apparent from the results of this study that the more experience they had with certain commonly seen medical conditions, such as high blood pressure and effects of multiple medications, the more prepared they believed themselves to be. However, with situations that they do not commonly encounter, they do not believe themselves to be prepared. For example, half did not have experience treating institutionalized patients; 88% of these respondents perceived themselves not to be prepared.

Based on the hygienists' preparedness to treat special conditions of the elderly and their willingness to work in alternative practice settings such as nursing homes, the majority felt only somewhat prepared to not prepared to treat these conditions and not willing to work in alternative practice settings. Even though the majority of the participants believed they were somewhat prepared to treat special conditions of the elderly, they were unwilling to work in alternative practice settings such as nursing homes.

Not all dental hygienists need to be willing to work in alternative practice settings such as nursing homes. However, based on Table 2, the vast majority of the practicing Texas dental hygienists in this study believed further education is required to better prepare them to treat the advanced needs of the elderly patients in a clinical setting. Several goals in Healthy People 2020 (28) relate to increasing dental attendance of the elderly; decreasing untreated coronal and root caries, tooth loss and moderate to severe periodontists; and identifying oral cancer in the early stages. To meet these goals, the authors conclude that the dental hygiene profession has an obligation to educate a new generation of oral care providers that possesses not only the knowledge and skills to be able to treat the elderly population but also a positive attitude toward treating the elderly. Current services delegated to the dental hygienist needs to be expanded to adequately treat less mobile elderly patients in various settings, including private practice offices, assisted living centres, retirement homes, nursing homes and mobile vans.

There is a recognized shortage of healthcare professionals that are educated to care for older persons. Even fewer are educated to care for the dental hygiene needs of the elderly. Coleman addressed the need for advances in geriatric educational curricula for nursing and oral healthcare providers as well as collaborative interactions between nursing and dental hygiene professionals (21). Both strategies will benefit patients in long-term care facilities.

The ADHA is working to address the access to care problem for the elderly population. In 2004, the Association approved the development of an advanced dental hygiene practitioner (ADHP), and competencies were adopted for the ADHP in 2008 (24). The ADHA website states that an ADHP will be educated and licensed to provide both preventive and limited restorative services to meet identified patient needs (29). The concept of the ADHP is grounded in attainment of a higher level of education.

In Minnesota, the ADHP concept became a reality when a bill passed to create the Advanced Dental Therapist (ADT), a mid-level dental practitioner able to practice within the state (30). As of May 2011, the first class of ADTs has graduated (31). These practitioners are dental hygienists with a clinical Master's degree in ADT that prepares them to provide advanced dental hygiene services to underserved populations in the state.

Legislative changes have occurred in other states that relax supervision laws to improve access to care for the elderly population. In Texas, SB 97/HB 456 was signed by Governor Perry and went into effect on 1 September 2009. The provisions of this new law allow Texas dental hygienists to provide dental hygiene services in school-based centres, nursing homes and community health centres for a period of up to 6 months before a dental examination is required by a dentist (32). This new law is one step closer to closing the gap in the access to care problem for the elderly population.

Waldman *et al.* (33) discussed the lack of adequate preparation of oral healthcare professionals to provide care for individuals with special needs. The dental and dental hygiene professions responded to this inadequacy by adopting an accreditation standard in July 2004 that states, 'Graduates of dental schools and schools of dental hygiene must be competent in assessing the treatment needs of patients with special needs' (34). Dental and dental hygiene programmes must develop innovative approaches to prepare graduates to care for the special needs of the elderly (33). Curricular changes in response to new accreditation standards and the ADHP and other innovative workforce solutions should increase the confidence levels of dental hygienists to treat the elderly population and increase their willingness to treat the underserved elderly target population.

Practice opportunities for dental hygienists will increase in the future in relation to geriatric dentistry. Because the laws regulating the practice of dental hygiene in the USA vary by state, opportunities differ from state to state. For example, in Texas, according to Title 3, Sections 262.1515 and 262.152 of the Texas Dental Practice Act (35), accompanied by Rule 115.5 of the Rules and Regulations (36), a dental hygienist is allowed to practice in a long-term care facility and, within certain limitations, to treat patients who have not been seen previously by the dentist. Some dental hygienists are currently taking advantage of these opportunities, thus providing increased access to care for the elderly.

The results of this study are limited by research design characteristics. First of all, the survey sample was restricted to dental hygienists in Texas. Additional studies should be conducted with dental hygienists and other oral healthcare professionals nationwide and even globally. Secondly, the response rate of the survey was 35%, limiting the ability to generalize the results of this study even to other dental hygienists in Texas. A follow-up mailing would have had the potential to improve the response rate of the survey. In addition, the systematic cluster sampling method was employed to draw the sample from the population. Use of the stratified random sampling approach would have resulted in a more representative sample that would have increased the generalizability of the results. Finally, a larger sample and a greater response rate would have provided more data and more power in the application of the statistics.

Further research is needed with larger more representative samples to confirm the results of this study. In addition, research should be carried out to assess the adequacy of geriatric education in the curriculum of dental hygiene and other oral healthcare programs. Dental hygienists serving in the role of advocates are needed to propose practical solutions to

decision makers at every level that will expand the availability of community oral health programmes to accommodate Baby Boomers' potential demand for oral health care. Dental hygienists with advanced education and training will be needed to implement and evaluate the effectiveness of these new programs.

Conclusion

The majority of the participants surveyed felt somewhat prepared to treat the elderly and identified the need for further education to better prepare them to treat this population. In addition, the participants lacked full confidence in their ability to treat the elderly and their special needs, and they were unwilling to do so. This demonstrates a need for change in curriculum and/or continuing education opportunities. To increase access to care for this growing population, dental hygiene researchers and educators should focus attention on the development of oral healthcare providers' confidence and willingness to treat the elderly and to manage their special conditions.

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