

# Oral Health Status of Saskatchewan Long Term Care Residents: An Evaluation Following the Implementation of the *Better Oral Health in Long Term Care* Program



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*Oral Health Program*  
Population and Public Health

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## Executive Summary

This report concludes a 6-month evaluation of the oral health status of residents in two Saskatchewan Long Term Care (LTC) homes following the implementation of Better Oral Health in Long Term Care (BOH in LTC) Program. In addition, targeted literature reviews were completed, and recommendations were provided.

Older people are a rapidly growing proportion of the Canada's population. There is no universal definition of old age, however in Canada an individual 65 years and over is considered a senior citizen or elderly. In 2016, Saskatchewan had an estimated total population of 1,098,355, 15.52% (n= 170,430) of whom were seniors. By 2026, almost one in five people of Saskatchewan (20.7%), and by 2036, 23.3% of residents of Saskatchewan are expected to be 65 or over. In 2016, Saskatchewan had the highest percentage of people of 85 years and over. The proportion of people 85 years and older living in LTC homes increases with age. In 2016, the total number of residential-based continuing care homes in Saskatchewan was 155, with 12,718 residents (average age 83 years old, 90% seniors, and 55% individuals 85 years and above).

Given the size of the elderly in LTC homes and the extent of chronic diseases among this group, it is reasonable to conclude many need some level of support with their daily care including oral care. The number of LTC residents suffering dementia is very high; in 2015-2016, 67% of residents of residential care in Canada had dementia and 98% experienced some cognitive and/or functional impairment. The frail elderly, specifically those with dementia have to depend on nurses or caregivers for performing daily oral care.

Oral care is an integral part of personal care yet it is inadequate in LTC residents. Research shows that oral health in LTC homes is poor globally. Poor oral health among residents in LTC homes is a rising concern in Canada. A population

based study in LTC homes in Nova Scotia, Canada in 2008-2009 showed 60% of residents had soft debris covering one third or more of the tooth surface. 66% of LTC residents with natural teeth had gingivitis, and 51% had untreated coronal caries. This study also reported that 41% of residents were edentulous (without teeth) and a large section of those wore dentures. As with natural dentition, dentures provide surfaces that enable the build-up of plaque biofilms over time. Residents who wear dentures that are not cleaned daily are at high risk of developing infections such as denture stomatitis. Evidence indicates that dentures could act as a reservoir for potential respiratory pathogens in the oral cavity, thus increasing the theoretical risk of developing aspiration pneumonia.

Elderly living in LTC homes are the most vulnerable group to suffer from oral problems. These individuals are prone to poor oral health because they have reduced access to professional oral care, poor and infrequent maintenance of personal oral hygiene, and pre-existing medical conditions. Poor oral hygiene resulting from inadequate oral care causes oral conditions such as mucosal inflammation, dental caries, periodontal disease, tooth loss, and pain. Oral diseases and dysfunction impact quality of life: diminish the pleasures of eating, speaking and social interactions. The evidence also strongly supports the link between poor oral health and diseases such as diabetes, cardiovascular diseases and pneumonia. Providing oral care in LTC homes reduces the risk of aspiration pneumonia morbidity and mortality. A study showed that if the rate of pneumonia were decreased by only 10% through daily oral care, the net benefit would be over U.S. \$300 million.

In 2011, the members of the Saskatchewan Oral Health Coalition (SOHC), identified oral health care in LTC as the top priority to move forward with. The SOHC is a group whose common goal is to improve oral health of Saskatchewan residents, particularly among vulnerable populations. The SOHC

makes up of community agencies, First Nations communities, health region programs, various health professionals, and interested groups and individuals.

Since 2011, SOHC and the Saskatchewan Oral Health Professions (SOHP) have collaborated to build capacity related to oral health in LTC, and to engage the community. The SOHP is a group that represents legislated oral health professions. They are the College of Dental Surgeons of Saskatchewan, Denturists Society of Saskatchewan, Saskatchewan Dental Assistants' Association, Saskatchewan Dental Hygienists' Association, and Saskatchewan Dental Therapists Association. These groups used best practice evidence to select a strategy and resources that provided a solid foundation for the Saskatchewan Seniors' Oral Health and LTC Strategy. The goal was to find a model and resources that provided the necessary education and training for staff, family, and residents. It also included community feedback and participation. After significant research, the Better Oral Health in Residential Care model developed originally in Australia was selected as the gold standard for the Saskatchewan Seniors' Oral Health and LTC Strategy. In 2011, the SOHP and SOHC endorsed the use and adaptation of this program. With the endorsement by the SOHP and SOHC, a licensing agreement was signed between Saskatoon Health Region (SHR) and Australia. The license allowed for modifications and adaptations. From 2011-2013, SOHP representatives worked to modify the training resources to Canadian/Saskatchewan standards. In 2013, the resource was retitled Better Oral Health in Long Term Care – Best Practice Standards for Saskatchewan (BOH in LTC Program).

In early 2014, BOH in LTC Program was focus tested in SHR at the Parkridge Community Centre in SHR, a LTC home in Saskatoon. The Parkridge Community Centre pilot was used as the model for full implementation in other LTC homes in SHR. The pilot project made a transition in October of 2015 when SHR hired a dental assistant into the LTC-OHC position. The development of this position was

the result of almost seven years of work by Leslie Topola, the Manager for the Population and Public Health, Oral Health Program, SHR. Currently, there is only one LTC-OHC in the SHR, working closely with several SHR LTC homes to implement and maintain the BOH in LTC program. LTC-OHC is a registered and licensed oral health professional who facilitates the delivery of initial oral assessments, organized subsequent oral examinations and necessary hygiene and restorative treatment, daily oral hygiene for residents and oral health education.

In September 2016, the report entitled "Saskatchewan Seniors' Oral Health and Long Term Care Strategy- Best Practice Standards for Saskatchewan: Better Oral Health in Long Term Care – Best Practice Standards for Saskatchewan" - with collaboration of SOHP and SOHC- was released and two related videos were developed. The report included literature review, comprehensive resources (e.g. portfolios for educators, professionals, and staff) and 10 recommendations. In September 2016, members of SOHP, SOHC and SHR presented the report - through slides and video-to the Saskatchewan Ministry of Health - Community Care Branch. The Ministry of Health was very impressed with the presentation and level of information. The Ministry of Health was motivated and interested in keeping the momentum going on this important work. They stated they would be looking for opportunities to share the strategy/training materials with other Directors of Care in all health regions. SHR LTC Advisory Committee reviewed the report and is supportive.

In March 2017, the Manager of Population and Public Health, Oral Health Program, SHR and the LTC-OHC were invited to present the overview and progress of the BOH in LTC Program to the Ministry of Health, and the LTC Directors of Care in Saskatchewan health regions. The majority of Saskatchewan health regions have expressed interest in or implemented BOH in LTC Program.

In 2016-2017 the BOH in LTC program was fully implemented at two LTC homes in SHR. Evaluation of an oral health program is an essential function of public health. Reporting the oral health trends of the community and the effects of interventions, provides accountability for the funds spent. The evaluation was conducted to analyze the oral health status of residents of these two LTC homes and assess the effects of the implementation of BOH in LTC Program over six months.

In 2016-2017 BOH in LTC Program was fully implemented at two LTC homes (Sherbrooke Community Centre and Sunny Side Adventist Centre) in SHR by the LTC-OHC. The LTC-OHC provided educational training sessions to Managers, Registered Nurses (RNs) and Continuing Care Aides (CCAs) through a 3-hour learning module, a 3-hour hands-on session and pre and post tests. CCAs were identified by the home Manager as “oral health champions” to implement the program and train the other CCAs in their neighbourhood (unit or floor they respectively worked on). Training included training the trainer so the staff could train the other staff in the area they were working in.

Initial oral health assessment of 252 LTC residents was conducted using a colour-coded OHAT by SHR LTC-OHC /trained RN. Nine aspects of the residents' mouth (exterior of face, lips, tongue, gums, oral cleanliness, teeth, denture, saliva, and dental pain) were examined using visual approach with a mouth mirror and flashlight. Based on the results from the resident's oral health, daily oral care plan was developed through a team approach (between LTC-OHC, RN, CCA) for each resident. Then, the care plan was posted on their mirror – as a mirror cling. CCAs delivered daily oral care as to whether the residents need assistance with oral care or just reminding. Basic oral hygiene supplies were charged to each resident. RNs followed up with checking the daily oral care that CCAs provided and completed consents for referrals to a dentist. Fee-for-services dentistry was provided on-site by an oral health care team (e.g. dentist, hygienist) or at the

residents' private practice. After six months, the oral health status of residents was re-assessed.

The oral health status of residents before and after program implementation was analyzed using Wilcoxon Signed-Rank Test. The oral health status of 177 residents, 92 females (52%) and 85 males (48%) with mean age of  $76.24 \pm 17.65$  years (with 75.15% seniors and 46.33% residents 85 years and older) were analyzed over 6 months. 37.28% of the LTC residents were edentulous. Approximately one in two (47%) residents had a removable denture (upper and/or lower complete, or partial denture); among dentate residents, 27.02% had a removable denture(s) (upper and/or lower complete, or partial denture); and the majority of edentulous residents (80.30%) had a complete denture in one or both arches. 55 residents were referred to an oral health professional (e.g. dentist, denturist) for more comprehensive examination or treatment. In total, 49 staff (including Director of Care, Managers, CCAs, RNs) received training by OHC-LTC.

The OHAT scores for 6 aspects (lips, tongue, gums, and oral cleanliness, denture, and saliva) significantly improved following 6 months ( $p < 0.05$ ). Of the residents assessed, improvement was seen in the following areas: Almost one-third more residents had healthy lips, tongue, gums; 10% more residents had healthy saliva; and 20% more residents had healthy dentures. In addition, 40% more residents had a clean mouth (no food/tartar in mouth/denture).

Residents who received care under BOH in LTC Program showed an improvement in their oral health status. The result also signifies the multidisciplinary approach and the role of LTC-OHC, who works collaboratively with the LTC team, in improving the oral health care. Interdisciplinary training and collaborative efforts among the oral health professionals, other health professionals and caregivers are necessary in improving the oral health for this

elderly population, which would improve not just oral health, but overall systemic health as well, thereby improving quality of life.

We continue to recommend that an OHC be employed in each health region to facilitate the delivery of initial oral assessments, develop individual oral examinations and treatment, daily oral hygiene for residents and oral health education. This is one of the 10 recommendations that was previously developed/endorsed by SOHC and SOHP for consideration and action by the Saskatchewan Ministry of Health.

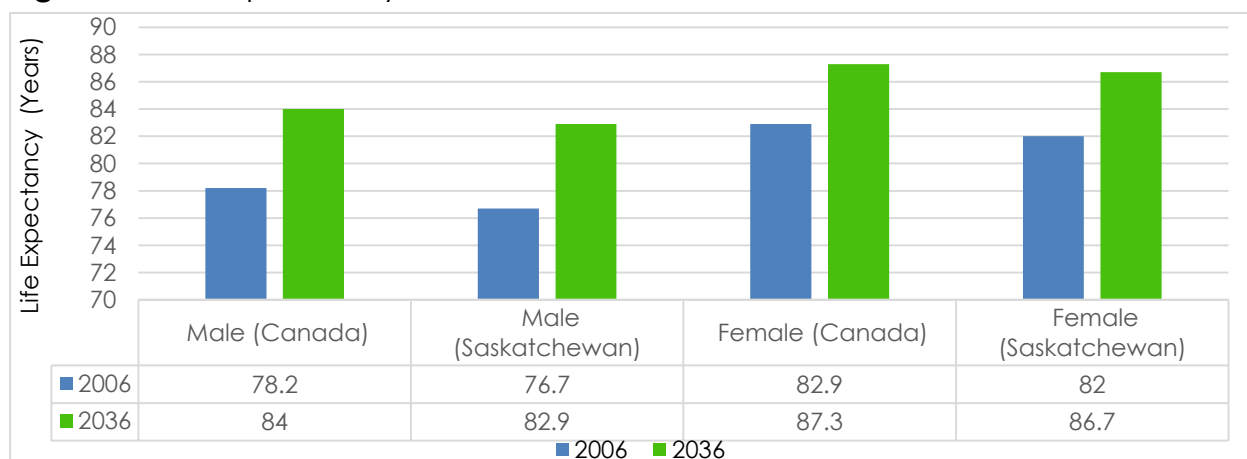
# 1 Background

## 1-1 Aging Population

Older people are a rapidly growing proportion of the Canada's population. There is no universal definition of old age, however in Canada an individual 65 years and over is considered a senior citizen or elderly (1).

Women represent the majority of older people in Canada (including Saskatchewan) since they have a longer life expectancy. This trend is expected to continue for the next several decades. According to the latest CANSIM table, Statistics Canada (2011-2013), the average life expectancy for both sexes in Saskatchewan is 80 years (compared to national average, 81.7 years); in Saskatchewan life expectancy for women is higher than men (83.8 vs. 79.6) which is comparable to the national average (82.3 vs.77.7)(2). By 2036, the life expectancy of men and women in Saskatchewan will be 82.9 and 86.7 respectively [Figure 1](3).

**Figure 1:** Life expectancy at Birth in 2006 and 2036, Canada and Saskatchewan

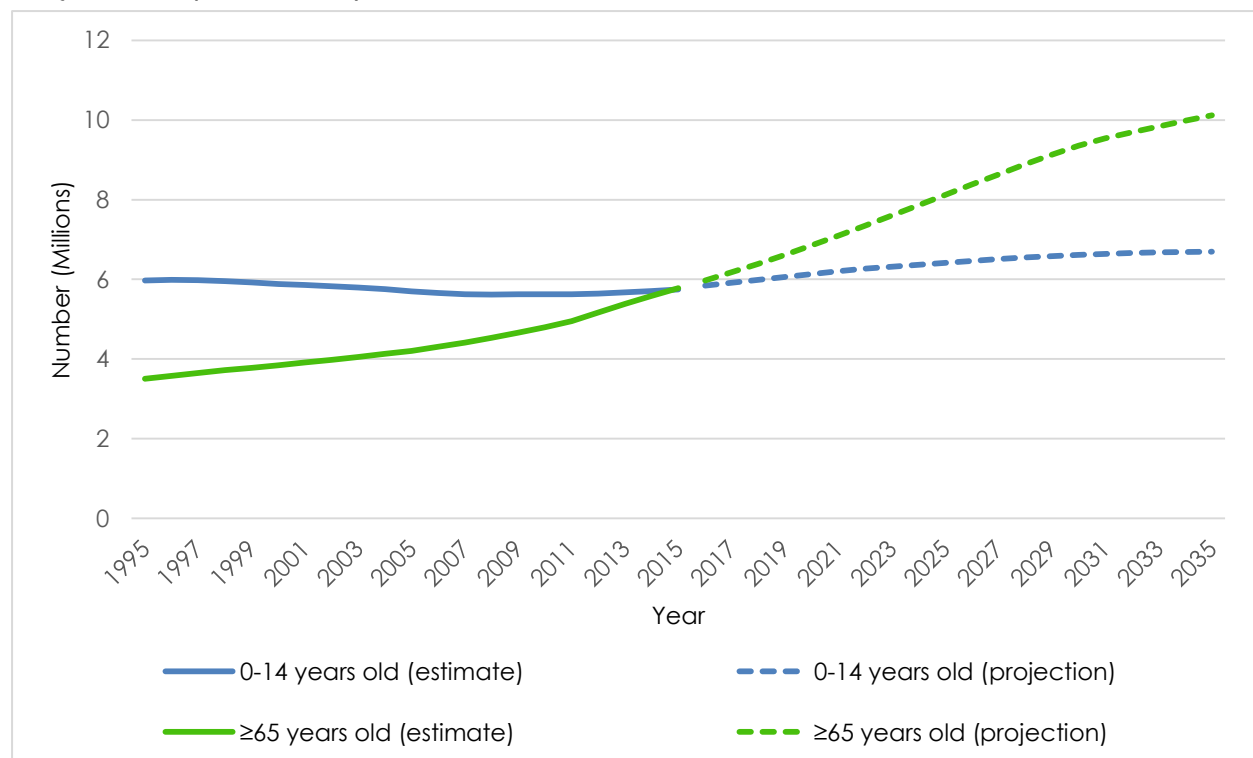


Under the medium assumption, Canadian male's life expectancy would increase from 78.2 years in 2006 to 84 years in 2036; for males in Saskatchewan, life expectancy would rise from 76.7 years to 82.9 years, an increase of 6.2 years in 30 years. Canadian female's life expectancy would rise from 82.9 years in 2006 to 87.3 years in 2036; for females in Saskatchewan, life expectancy would go up from 82 to 86.7, a gain of 4.7 years over 30 years. Life expectancy in Canadian women has been and continues to be longer than life expectancy of men. However, the gap in life expectancy between the two genders would narrow in the future(3).



Since 1981 to 2014, the number of Canadian children under 15 years of age has been higher than the number of seniors. In 2015, for the first time ever, seniors made up a larger share of Canada's population than children (4). According to the 2016 Census, the number of individuals over 65 years ( 5,935,635 ) exceeds that of children 0-14 years (5,839,570) (5). This trend will steadily continue in the coming years; that is, the number of seniors will exceed the number of children [Figure 2].

**Figure 2:** Canadian Population 0-14 Years and ≥65 Years Estimates and Projections (1995-2035)



Data for 1995 to 2015, solid lines, are population estimates. Data for 2016 to 2035, dotted line, are population projections. Since 1995 to 2014, the number of Canadian children (0-14 years old) has been higher than the number of seniors. However, the trend has reversed in 2015; where seniors outnumbered the children. The upward trend would steadily continue in the coming years and the number of seniors would exceed the number of children(4).

According to the 2016 Census, an estimated 5.935 million Canadians (16.89% of Canadians) were seniors [Figure 3] (6). The growth of this group would accelerate in the coming years. By 2036, the number of seniors would range

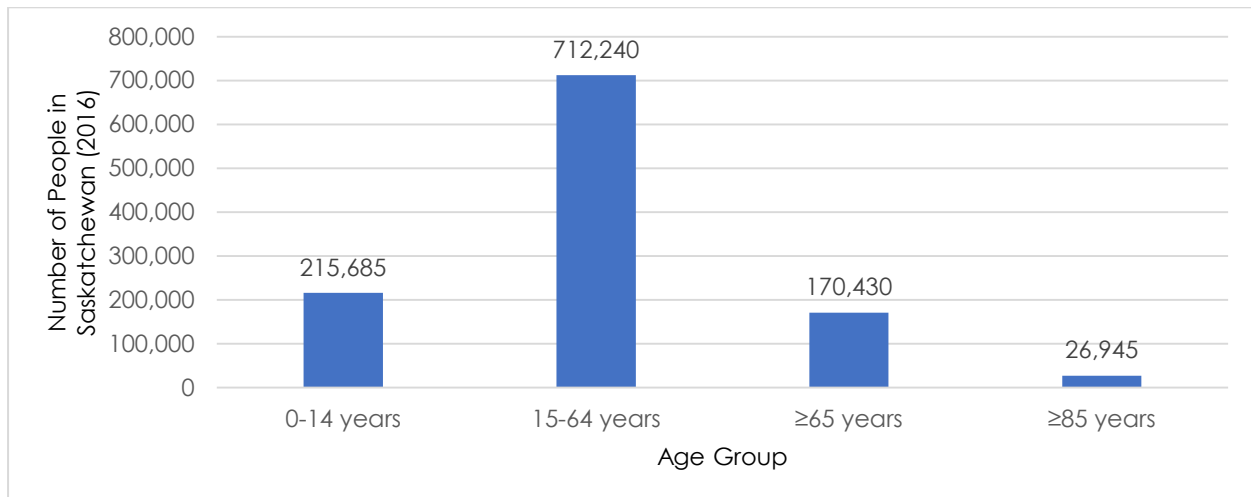
between 9.9 and 10.9 million. By 2061, this number will reach to 11.9-15.0 million (3); and by 2037, the number of Canadian over 75 years will exceed the number of seniors 65-74 years **[Figure 4]** (6).

In Canada, people age 85 years and over make up the fastest growing age group(7). In 2016, 2.2% of the Canadian population were 85 years and over, representing one out of eight seniors (13.0%) (8). The number of people 85 and older grew by 19.4% over the period from 2011 to 2016, almost four times the rate for the overall Canadian population, which grew by 5.0% during this period (8). There were almost two women for every man 85 years and older, which mostly reflects the differences in life expectancy between the two genders (8). This population will likely continue to increase rapidly in coming decades because life expectancy is increasing and also the large baby boomer cohorts (people born between 1946 and 1965) will reach age 85 starting in 2031(8). By 2051, when the youngest baby boomers reach age 85, 5.7% of the population in Canada, will likely be 85 years and older (8). The proportion of individuals age 85 years or over among the senior population will reach about one person out of four by 2051 (8).

The percentage of seniors varies across provinces. On average, the population in the Maritime provinces is considerably older than the rest of Canada **[Figure 3]**. Saskatchewan's population is aging as well and is expected to increase. In 2016, 15.52% of Saskatchewan's population were 65 years of age or older **[Figure 3, 4]** (6). By 2026, almost one in five people in Saskatchewan (20.7%), and by 2036, 23.3% of Saskatchewan people are expected to be 65 or over (3). In 2016, Saskatchewan had the highest percentage of people of 85 years and over with 2.5% (compared to national level at 2.2%)(6) **[Figure 5]**. Saskatchewan's large percentage of people 85 years and older in 2016 can be explained by its population history. In the 1920s-1930s, after large waves of immigration, Saskatchewan was the third most populous province in Canada. In

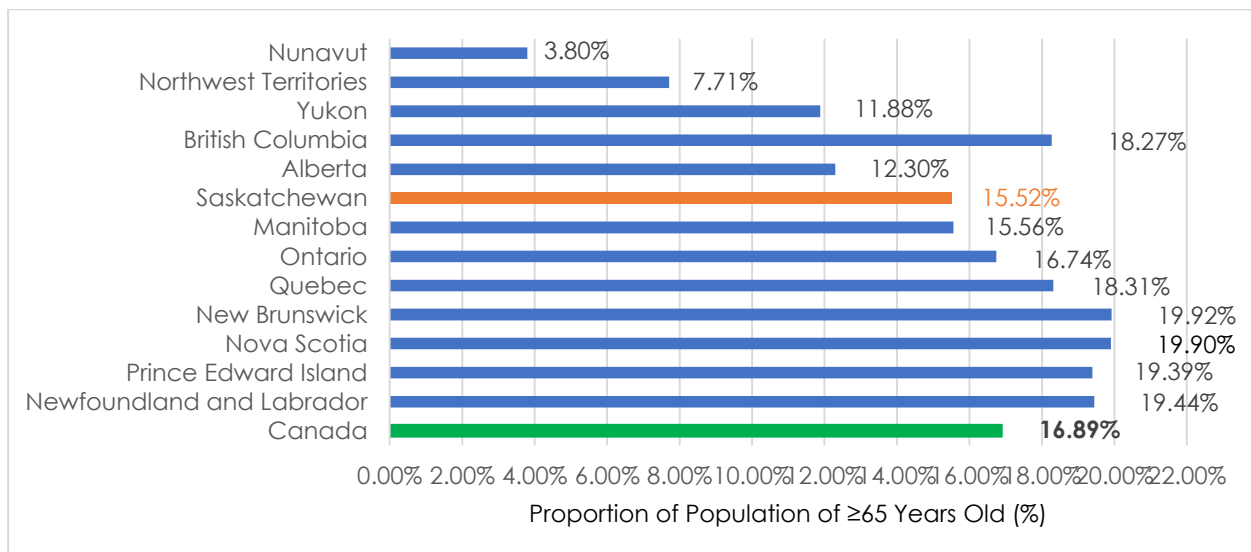
the second half of the 20th century, Saskatchewan experienced much lower rates of population growth (8).

**Figure 3:** Population by Broad Age Groups and Sex, 2016 Counts for Both Sexes, Saskatchewan, 2016 Census – 100% Data



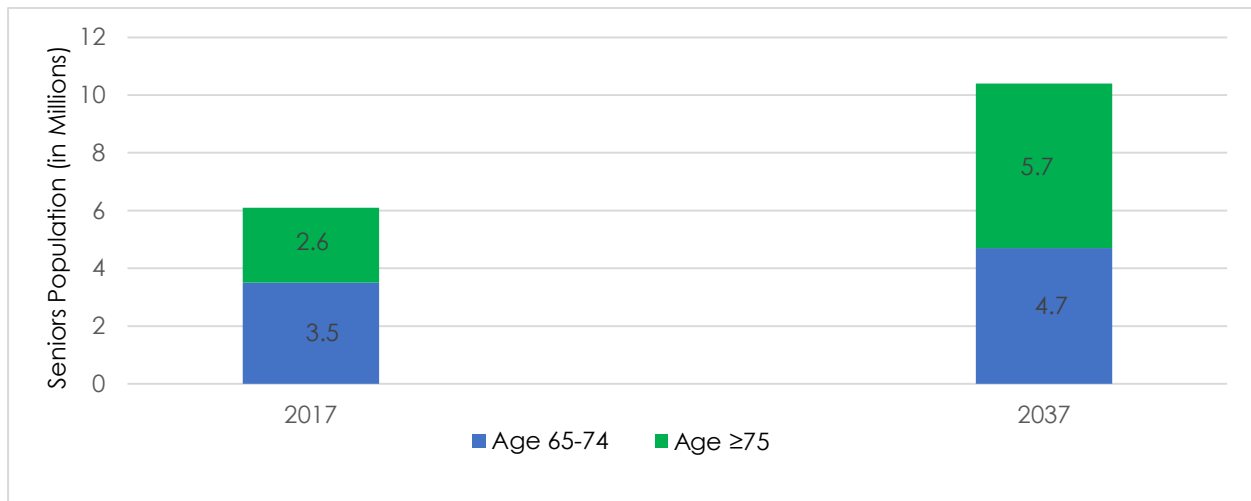
In 2016, Saskatchewan had an estimated total population of 1,098,355, 15.52% (n= 170,430) of whom were seniors.

**Figure 4:** Proportion of Population ≥65 Years, Canada, Provinces/Territories, 2016 Census



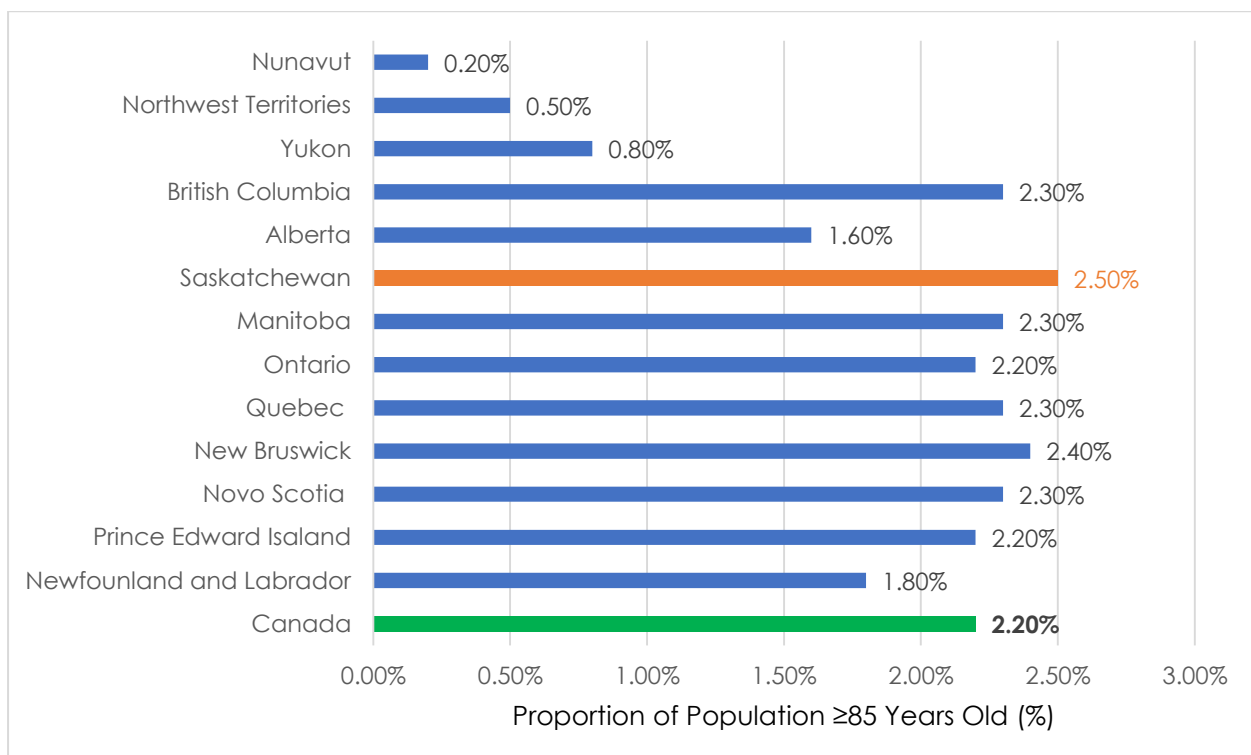
According to 2016 Census, 16.89% of Canadians were seniors. Nova Scotia had the highest percentage of seniors (19.90%). 15.52% of population in Saskatchewan were 65 years and above (6).

**Figure 5:** Seniors Population Forecast, Canada, 2017 and 2037



Source: Statistics Canada, Table 052-0005: Projected population, projection scenario M3, age and sex, as of July 1, Canada, provinces and territories, annual (persons x 1,000) (6).

**Figure 6:** Proportion of Population ≥85 Years, Canada, Provinces/Territories, 2016 Census



Source: Statistics of Canada, Census of Population, 2016 (8). In 2016, Saskatchewan had the highest percentage of population of ≥85 years (2.5%).

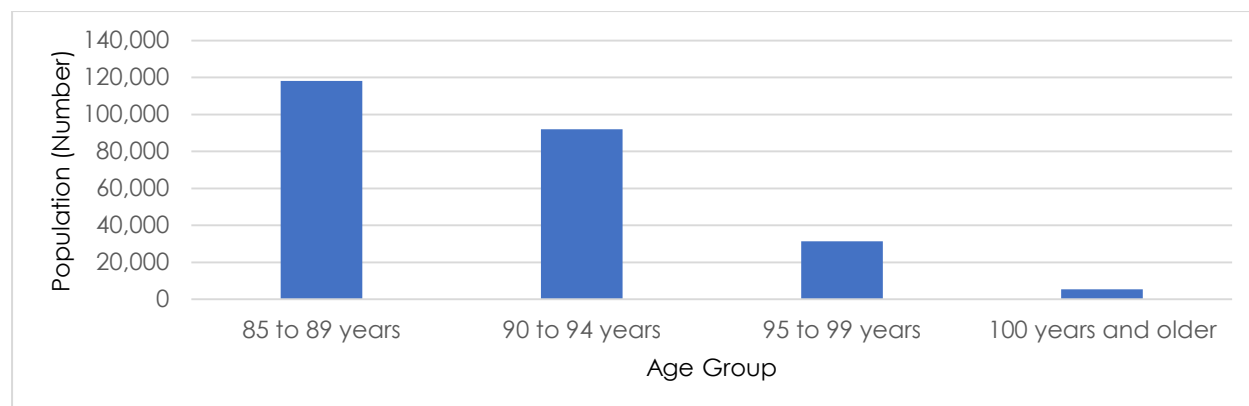
### 1-1-1 Aging Population and Continuing Care

Continuing care systems in Canada deliver a range of services and support to seniors living in various care settings, either home care (care provided in one's own home, or assisted living or supportive living) or residential care (care provided in a specialized facility that includes 24-hour nursing supervision). These services are defined as extended health care services by the Canada Health Act, therefore they can be charged for at either partial or full private rates. As a result, they do not need to have the five key features of health care which is required by Canada Health Act (i.e. be publicly administered, universal, comprehensive, accessible or portable); this contributes to wide-ranging differences in the way provinces/territories have configured, delivered and funded them. In addition, jurisdictions across Canada use different terminology to describe the services and the care settings (such as nursing home, Long Term Care (LTC) home, or LTC facility) where these services are provided (6) **[Appendix 1]**. Since 2011, the Canadian population 85 years and older living in collective dwellings (such as nursing homes, LTC homes) has grown by 23.0%, compared with an overall growth rate of 19.4% for the total population 85 years and older (8).

According to Canada Census 2016, almost 247,000 (32% = one in three) people 85 years and older were living in collective dwellings(8)**[Figure 6]**. Three-quarters of residents of collective dwellings 85 years and older were women(8). The amount of people living in collective dwellings increases rapidly as age increases, from one in four among the 84-89 age group to two in three among centenarians (i.e. 100 year old and above)(8) **[Figure 7]**. Most people 85 years and older living in collective dwellings, resided in one of three types of facilities: a residence for senior citizens, a nursing home or LTC home, or a facility offering multiple levels of care (8) **[Figure 8, 9]**. The proportion of people 85 years and older living in nursing homes increases with age (35.3% for people aged 85 to 89 vs. 52.8% for centenarians)(8) **[Figure 8]**. The latest Continuing Care Reporting

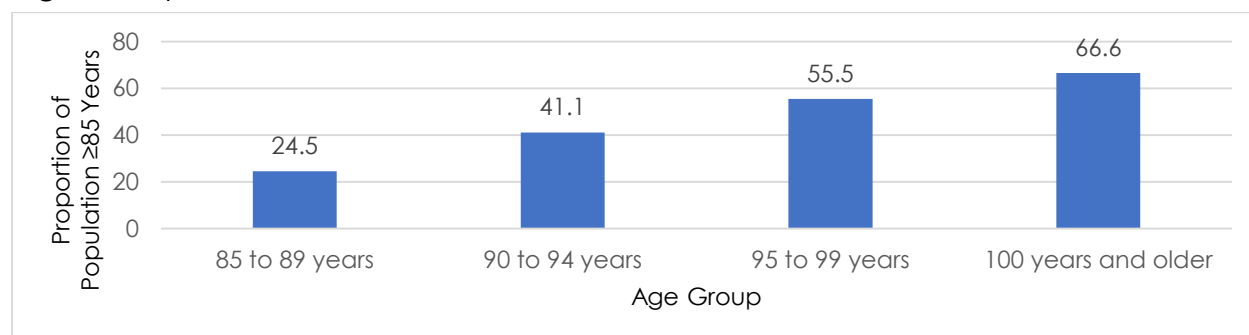
System, indicated that in 2015-2016, there were 1,342 residential care in Canada serving 205,113 residents (70% women), with an average age of 86 years old (6, 9). According to this report, the total number of residential care homes in Saskatchewan in 2015-2016 was 155 , with 12,718 residents (average age 83 years old, 90% seniors, and 55% individuals 85 years and above) (9). Canada 2016 Census reported that in 2016: 168,205 residents lived in nursing homes; the number of nursing home residents in Saskatchewan was 7,550; and the majority of the nursing home residents in Canada and Saskatchewan were seniors and women(10).

**Figure 7:** Population ≥85 Years, Living in Collective Dwellings, by Age Groups, Canada, 2016 Census



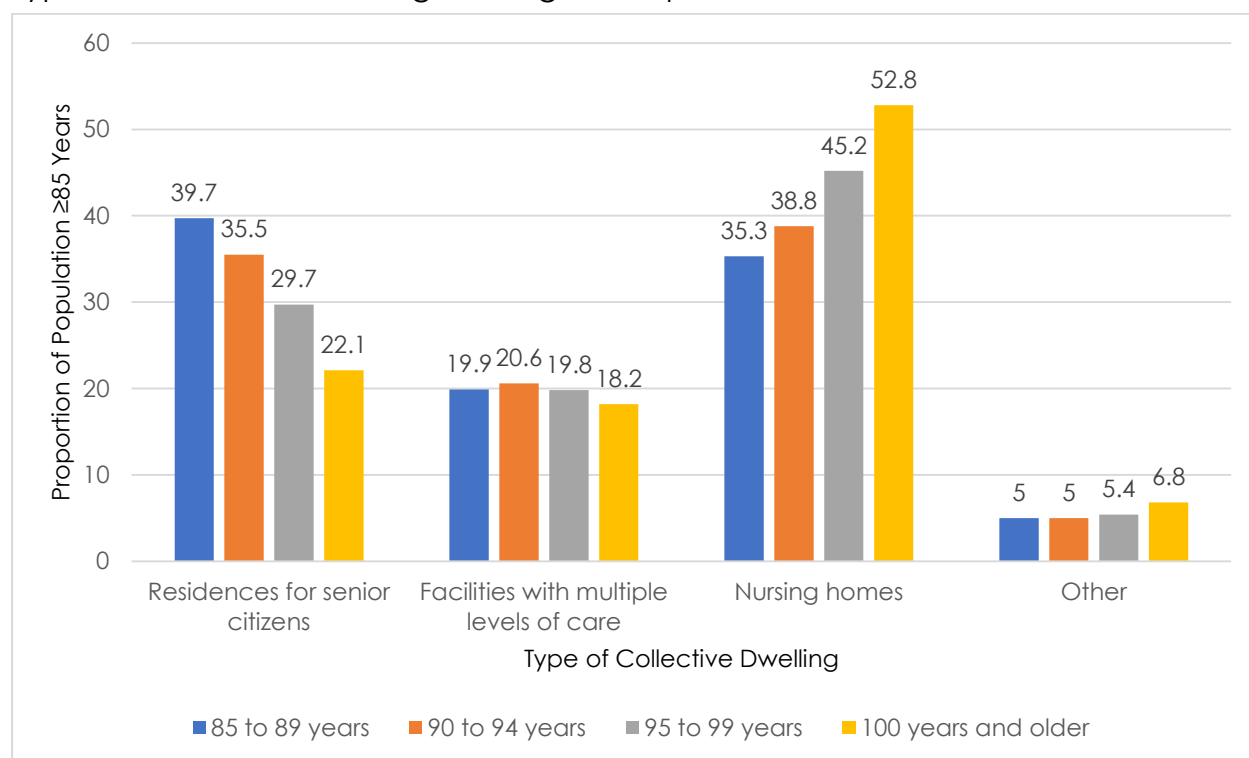
Almost half of the people 85 year and older living in collective dwellings in 2016 were 85 - 89 years old.

**Figure 8:** Proportion of Population ≥85 Years, Living in Collective Dwellings, by Age Groups, Canada, 2016 Census



Source: Statistics of Canada, Census of Population, 2016 (8). The amount of people living in collective dwellings increases rapidly as age increases, from one in four among the 85-to-89 age group to two in three among centenarians.

**Figure 9:** Proportion of Population 85 ≥Years, Living in Collective Dwellings, by Type of Collective Dwelling and Age Groups, Canada, 2016 Census



Source: Statistics of Canada, Census of Population, 2016 (8).

**Collective dwelling** refers to a dwelling of a commercial, institutional or communal nature. These include nursing homes, hospitals, staff residences, group homes, and so on.

**Nursing home and/or residence for senior citizens are** facilities for elderly residents that provide accommodations with health care services or personal support or assisted living care. These include nursing homes, residences for senior citizens, and facilities that are a mix of both a nursing home and a residence for senior citizens. These excluded facilities licensed as hospitals, and facilities that do not provide any services (which are considered private dwellings).

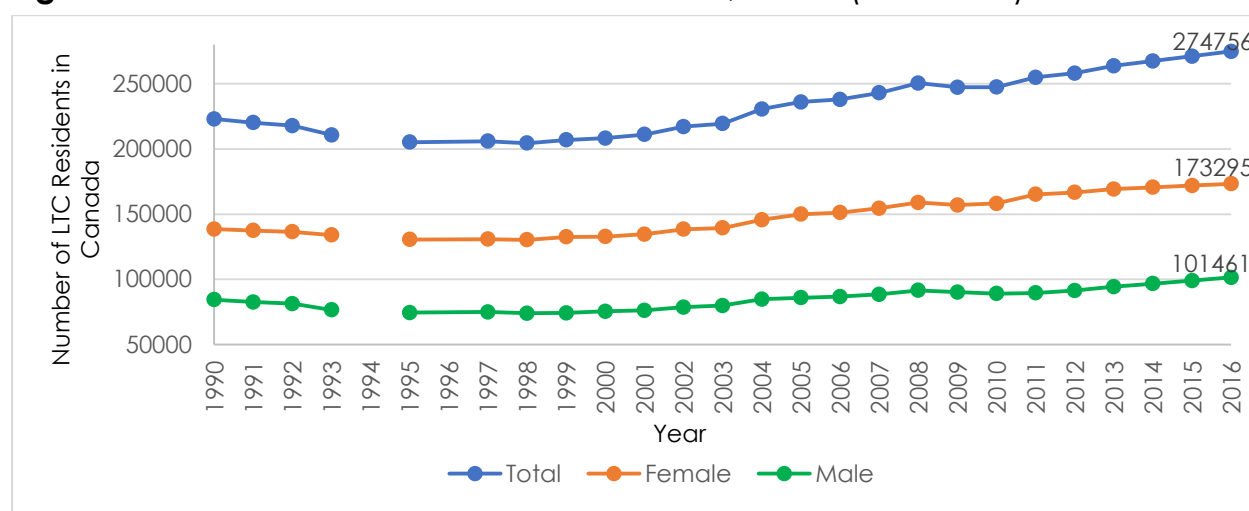
**Residential care facility such as a group home for persons with disabilities or addictions.** Generally, residential care facilities provide a level of care that is below that found in hospitals.

**Other:** Chronic and LTC hospitals, residential care facilities for the physically handicapped or for people with psychiatric disorders or developmental disabilities, and religious establishments.

The proportion of people 85 years and older living in nursing homes increases with age (35.3% for people 85 to 89 years vs. 52.8% for centenarians). In contrast, the proportion of people living in seniors' residences decreased from 39.7% to 22.1% for the same age groups. The proportion living in facilities that provide multiple levels of care remained almost stable across the different age groups, at approximately 20.0%.

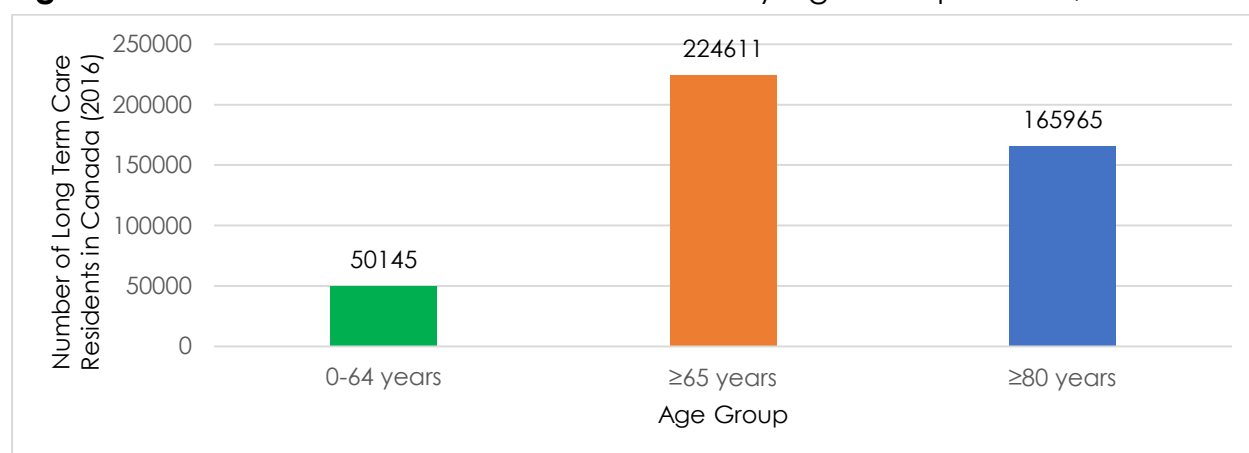
The Organisation for Economic Co-operation and Development (OECD) reported that the number of LTC residents in Canada has increased from 1990 to 2016 (11) [Figure 10, 11].

**Figure 10:** Number of LTC Residents in Canada, OECD (1990-2016)



Source: Organisation for Economic Co-operation and Development. Long-Term Care Resources and Utilisation: Long-Term Care Recipients(11).

**Figure 11:** Number of LTC Residents in Canada by Age Group in 2016, OECD



According to OECD in 2016, the proportion of residents 0-64 years old, and ≥65 years were 18.25% and 81.75% respectively. Out of all seniors, 165,965 (74%) were 80 years or over (11). This include people receiving formal (paid) long term care in institutions (other than hospitals). Types of institutions included in the data are facilities which have four beds or more and which are approved, funded or licensed by provincial/territorial departments of health and/or social services and where the principal characteristic of the predominant group of residents is aged, physically challenged, psychiatrically disabled or developmentally delayed (11).



Across Canada, the continuing care sector strives to keep pace with the growing population of seniors. In the coming years, as this population growth accelerates and seniors' care needs become increasingly complex (as a result of higher prevalence of chronic diseases, individuals maintaining their existing dentition and increased life expectancy), continuing care systems will need to further adapt (6). Given the reality of population aging in Canada, knowing more about the increased needs for health care and other services is important. Seniors contribute in many ways to society—for instance, by sharing their wisdom and acting as role models across generations. At the same time, a significant share of these population in particular those 85 years and older live with activity limitations and have particular needs related to overall health and oral health (8).

Given the size of the elderly in LTC homes and the extent of chronic diseases among this group, it is reasonable to conclude many need some level of support with their daily care including oral care. The number of LTC residents suffering dementia is very high. According to Continuing Care Reporting System, in 2015-2016, 67% of residents of residential care in Canada had dementia and 98% experienced some cognitive and/or functional impairment(6). The frail elderly specifically those with dementia have to depend on nurses or caregivers for providing their daily oral care (12).

## **1-2 Oral Health**

### **1-2-1 Definition of Oral Health**

Oral conditions are among the most prevalent Non-Communicable Diseases (NCDs) worldwide. They share common risk factors with a large number of NCDs and are affected by similar social determinants of health (see *1-2-2 Social Determinants of Health and Oral Health*)(13). For instance, excessive sugar consumption links to tooth caries, diabetes, cardiovascular disease (CVD);

tobacco use causes oral cancer, gum disease, and multiple other health problems; poverty increases the likelihood of dental caries, tooth loss, gum disease, and several other conditions). Therefore, from an aetiological perspective and in terms of prevention, oral health is general health and requires the same approaches (14). Oral health contributes significantly to overall health, well-being and quality of life, and therefore needs to be properly defined, assessed, managed and promoted (13).

The World Health Organization (WHO) defines oral health as “a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, dental caries, tooth loss and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial wellbeing” (15).

According to the FDI World Dental Federation, “oral health is multi-faceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex” (13).

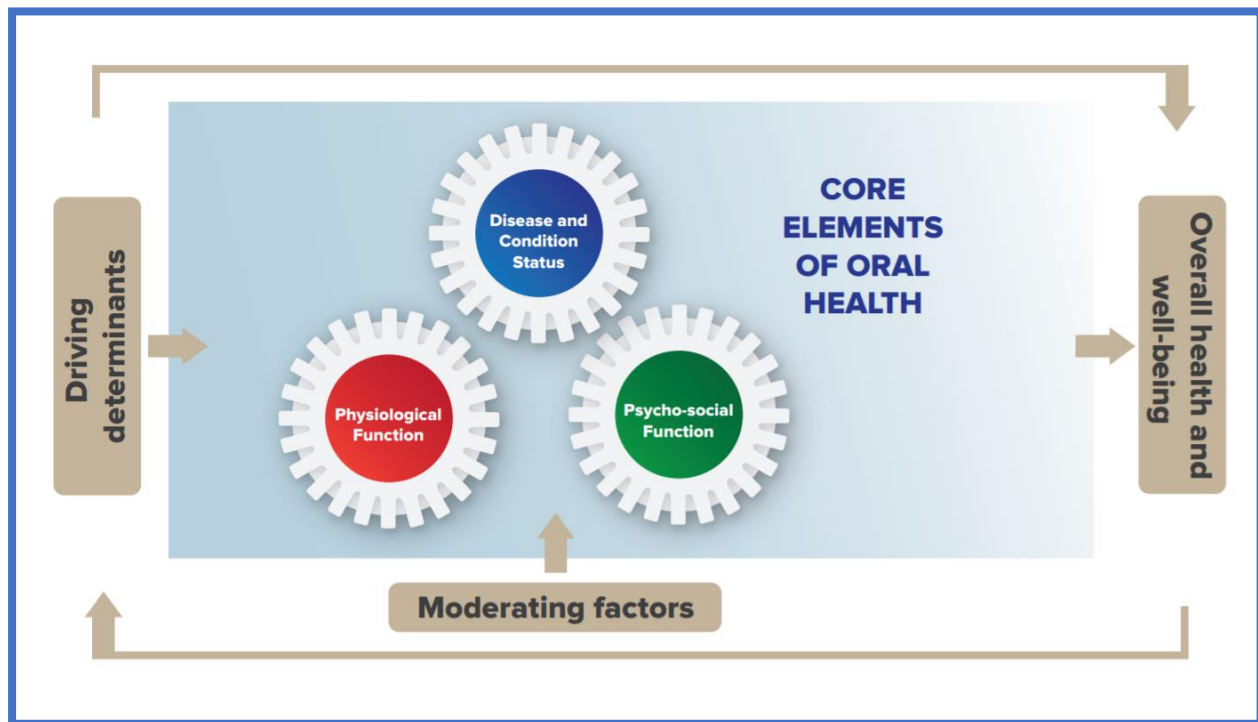
“Further attributes related to the definition state that oral health:

- is a fundamental component of health and physical and mental well-being. It exists along a continuum influenced by the values and attitudes of individuals and communities;
- reflects the physiological, social and psychological attributes that are essential to the quality of life; and
- is influenced by the individual's changing experiences, perceptions, expectations and ability to adapt to circumstances” (13).

As a compliment to their definition, a framework was developed by FDI to describe the complex interactions between the three core elements of oral

health, driving determinants, moderating and, finally, overall health and well-being (13) [Figure 12].

**Figure 12:** Framework for the Oral Health Definition - FDI



Source: Oral Health Definition-FDI (13).

Three **core elements** of oral health include: disease and condition status; physiological function and psycho-social function (13).

**Driving determinants** are elements which affect oral health(13).

**Moderating factors** are conditions which determine or affect how an individual scores their oral health (13).

The present concise definition demonstrates that oral health does not occur in isolation, but is an important component of overall health and well-being. It's intention is to raise awareness of the different dynamic dimensions of oral health and to empower populations by acknowledging how individual's values, perceptions and expectations influence oral health. The definition provides the foundation for the future development of standardized assessment measures (13).

### 1-2-2 Social Determinants of Health and Oral Health

WHO defines social determinants of health as “the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life. These forces and systems include economic policies and systems, development of agendas, social norms, social policies and political systems” (16).

The following conditions have been identified as 14 key social determinants of health (17):

1. Aboriginal Status
2. Disability
3. Early Life
4. Education
5. Employment and Working Conditions
6. Food Insecurity
7. Gender
8. Health Care Services
9. Housing
10. Income and Income Distribution
11. Race
12. Social Exclusion
13. Social Safety Network
14. Unemployment and Job Security

The social determinants of health, “the causes of causes” of diseases, influence the behaviour of people and increase the risk of diseases (16). Health equity is achieved when every person has the opportunity to attain their full health potential and nobody is disadvantaged from achieving this potential because of socially determined circumstances (18).

Health inequities are differences in health that are avoidable, unfair, and unjust. They are affected by social, economic, and external environmental conditions mainly outside the control of the individuals. Health inequalities can be simply defined as differences in health status between population groups. It is important to distinguish between health inequality and inequity. For example, differences in mobility between elderly people and younger populations can be considered as health inequality. Whereas, differences in mortality rates between people from different social classes can be regarded as health inequity where the differences may be unnecessary and avoidable as well as unjust and unfair (19).

Oral health and overall health share the same social determinants of health. Systematic reviews and meta-analyses confirm that people with higher incomes and educational levels are in better oral health. Elderly people living in communities with a larger social capital have more remaining teeth. Individuals with higher educational levels and incomes have more remaining teeth and use more dentures compared to those with lower school education levels and incomes (20).

According to the Canadian Health Measures Survey (CHMS) 2007-2009, the number of missing teeth and overall caries experience (DMFT<sup>1</sup>) were higher in adults in households with the lowest education level, while the number of sound teeth is highest in the higher education level group. Similarly, immigrants and those with lower levels of education had a higher frequency of gum disease (21).

Increasing evidence suggests that socio-economic factors might be associated with an increased risk of dental caries. A systematic review studied the relationship between dental caries in adults and socio-economic indicators

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<sup>1</sup> Decayed, Missing, Filled Teeth

(educational level, income, occupation, socio-economic status and the community index). These indicators were associated with dental caries (22). In a meta-analysis, low educational status of adults was associated with a greater risk of periodontitis. In addition, these individuals experienced a higher risk of periodontitis compared to the higher education group (Odds Ratio: 1.86 [1.66-2.10];  $p < 0.00001$ ) (23). Another meta-analysis study on elderly Chinese immigrants (a minority group in North America) showed that this group experienced a disproportionate burden of poor oral health compared to people of European origins, possibly due to different cultural beliefs and a distrust of Western oral healthcare (24).

In conclusion, a primary focus on prevention of oral diseases—including implementation of population-level interventions that address the social determinants of oral health over the life course, along with targeted treatment-focused interventions—may reduce the high prevalence of oral diseases (25).

### **1-2-3 Global Burden of Oral Conditions**

The Global Burden of Disease 2015 study, analyzed all available data of oral conditions in 195 countries to measure prevalence, incidence, and disability-adjusted life year (DALY) estimates of oral conditions from 1990 to 2015. One DALY is a year of “healthy life” lost due to either premature death or disability. Death as a direct result of oral diseases is rare, therefore DALY estimates were based on years lived with disability. According to this study, oral health has not improved globally in the last 25 years, and oral conditions remained a major public health challenge in 2015. Although the age-standardized prevalence of oral conditions remained almost stable over this period, population growth and aging have resulted in a dramatic increase in the burden of untreated oral conditions worldwide. Globally, the number of people with untreated oral conditions increased from 2.5 billion in 1990 to 3.5 billion in 2015; DALYs due to

oral conditions reached at 16.9 million DALYs (64% increase compared to 1990). Worldwide, untreated caries in permanent teeth was the most prevalent condition (age-standardized prevalence: 34%), affected 2.5 billion people. Untreated caries in permanent teeth accounted for 1.7 million DALYs (i.e. 1.7 million years of healthy lives lost to disability due to untreated caries in permanent teeth). The incidence of caries (new cases of caries) in permanent teeth was 616 million worldwide. The prevalence of total tooth loss was highest at age 75 to 79, whereas prevalence of severe periodontal disease peaked almost 2 decades earlier. Total tooth loss remained the leading cause of DALYs due to oral conditions, accounting for 7.6 million (25) **[Table 1]**.

Oral conditions contributed to more health loss than 35 of 39 categories of cancer worldwide(25). The total health loss related to oral conditions was comparable to those for hypertensive heart disease, schizophrenia, and all maternal conditions combined (25). In 2010, worldwide the direct treatment costs associated to oral conditions amounted to \$298 billion US, accounting for an average of 4.6% of global health expenditure (26). Indirect costs associated with oral conditions were estimated at \$144 billion US, this corresponds to economic losses within the range of the 10 most common global causes of death (26). The total (direct and indirect) global economic impact of oral conditions may account for more than \$442 billion US (26). It is estimated that the total cost and DALYs will continue to increase (25).

**Table 1:** Worldwide Oral Conditions Rates, 1990 and 2015

Number of prevalent cases (millions)	1990		2015	
	%	95% UI	%	95% UI
Untreated caries in permanent teeth	1,739	(1,623 to 1,845)	2,521	(2,361 to 2,680)
Severe periodontitis	307	(267 to 357)	538	(465 to 626)
Total tooth loss	157	(151 to 164)	276	(264 to 288)
All oral conditions	2,513	(2,472 to 2,551)	3,522	(3,467 to 3,575)
<b>Prevalence (%)</b>				
Untreated caries in permanent teeth	34.3	(32.2 to 36.2)	34.1	(32.0 to 36.2)
Severe periodontitis	7.4	(6.4 to 8.5)	7.4	(6.4 to 8.6)
Total tooth loss	4.3	(4.1 to 4.5)	4.1	(3.9 to 4.3)
All oral conditions	48.4	(47.6 to 49.0)	48.0	(47.3 to 48.7)
<b>Number of incident cases (millions)</b>				
Untreated caries in permanent teeth	627	(589 to 665)	616	(577 to 656)
Severe periodontitis	6	(5 to 7)	6	(5 to 6.6)
Total tooth loss	3	(3 to 3)	3	(3 to 3)
All oral conditions	764	(713 to 820)	750	(700 to 808)
<b>DALYs (thousands)</b>				
Untreated caries in permanent teeth	1,239	(551 to 2,361)	1,743	(777 to 3,315)
Severe periodontitis	2,010	(780 to 4,174)	3,518	(1,357 to 7,247)
Total tooth loss	4,334	(2,898 to 5,985)	7,625	(5,088 to 10,540)
All oral conditions	10,342	(6,228 to 15,800)	16,949	(10,278 to 26,002)

**95% UI:** 95% Uncertainty Interval

**Incident cases** are those that just developed the disease.

**Prevalent cases** are those whose disease developed before they were identified for the study. Therefore, prevalent cases include subjects who developed disease previously as well as incident cases who just developed disease.

**DALYs:** Disability-Adjusted Life Year

The estimates for untreated caries in deciduous teeth and other oral conditions not shown.

In 2015, the number of people with untreated caries in permanent teeth was 2,521 million= 25 billion; the number of people with severe periodontitis was 538 million; the number of people with tooth loss was 276 million; the number of people with untreated oral conditions was 3,522 million= 3.5 billion.

In 2015, the age- standardized prevalence of all oral conditions was 48%. This was comparable to 1990. However, population growth and aging have resulted in a dramatic increase in the burden of untreated oral conditions worldwide (25 billion in 1990 vs. 35 billion in 2015).

In 2015, the number of new cases with untreated caries in permanent teeth was 616 million.

In 2015, DALYs due to total tooth loss was 7,626 thousand= 7.6 million (i.e. 7.6 million years of healthy lives lost to disability due to tooth loss) (25).

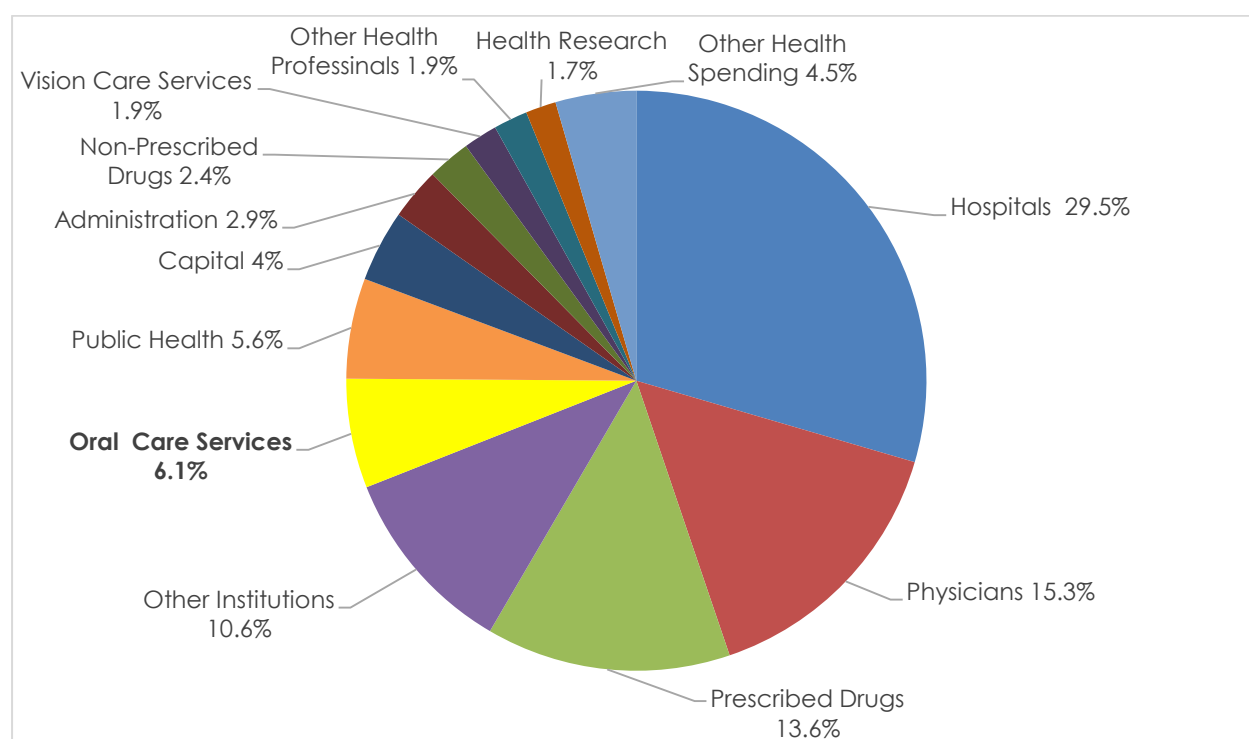
## 1-2-4 Oral Health Services in Canada

According to the National Health Expenditure Trends (1975 to 2016), in 2014- the latest year of actual expenditure data available- oral services' share of total health expenditure in Canada was 6.1% (27) **[Figure 13]**. When ranked by the



amount of public funds allocated to oral health care, Canada (with 6.1%) is close to last among OECD countries, compared to 7.9 % in the United States (another country with a low public contributions to the cost of oral care) and 79 % in Finland (a country with among the highest public care) (14). In addition, trends in the proportion of oral expenditures from public funds for 2001, 2005, and 2008, indicated that the United States and other OECD nations have increased their public share in total oral health care, while Canada's share has decreased (14).

**Figure 13:** Percentage of Total Health Expenditures by Use of Funds, Canada, 2014



Source: National Health Expenditure Database, 1975 to 2016, Canadian Institute for Health Information (27). Note that 2014 is the latest year of actual expenditure data available.

Hospitals (29.5%), drugs (16.0%) and physician services (15.3%) accounted for the largest shares of health dollars (more than 60% of total health spending) in 2014. Long Term Care (other institutions) accounted for 10.6% of the total, while allied health professionals - Oral (6.1%), Vision (1.9%), Other (1.9%) - accounted for 9.9%.

In 2014 (the latest year of actual expenditure data available) total expenditures on oral care services in Canada were estimated at almost \$13.1 billion. Of this amount, \$12.3 billion (93.8%) were private sector expenditures and only \$813

million (6.2%) were public sector expenditures. Total health care expenditures for 2014 in Canada were estimated at \$215.8 billion, meaning that oral expenditures make up about 6.1% of all health care private insurance. The increase in oral health service expenditures from 2013 to 2014 was 2.7% (28) **[Table 2]**.

2014 private-sector expenditures in health care were estimated at \$63.7 billion, with oral health services spending accounted for \$12.3 billion or one-fifth of total expenditures (29). In 2014, approximately 60% of all private oral care expenditures originated from private insurance sources and 40% directly out-of-pocket. Therefore, private health care insurance plays a crucial role in the provision of oral care in Canada (29) **[Table 2]**.

On a per capita basis, in 2014 total spending per Canadian on oral care services was estimated at \$370 compared to \$973 on drugs and \$927 on physician services (27). Private per capita spending on oral care services was estimated at \$347 and public per capita spending at \$23 (29) **[Table 2]**.

**Table 2:** 2014 Oral Care Expenditures in Canada - Current Dollars and Percentage

Expenditure	\$ or %
Total expenditures for oral care services	\$13.1 billion
<ul style="list-style-type: none"> <li>Private sector expenditures for oral care services (Private insurance + private direct out of pocket)</li> <li>Public sector expenditures for oral care services</li> </ul>	\$12.3 billion \$7.45 billion (60%)+ 4.85 billion (40%) \$813 million
<ul style="list-style-type: none"> <li>Private sector expenditures for oral care services as percentage of total oral care services expenditures</li> <li>Public sector expenditures for oral care services as percentage of total oral care services expenditures</li> </ul>	93.8% 6.2%
Total per capita spending on oral care services	\$370
<ul style="list-style-type: none"> <li>Private per capita spending on oral care services</li> <li>Public per capita spending on oral care services</li> </ul>	\$347 \$23
Total expenditures in health care	\$215.8 billion
Expenditures on oral care services as a proportion of total health care expenditures	6.1%
Increase in total health expenditures from 2013 to 2014	3.1%
Increase in total oral services expenditures from 2013 to 2014	2.7%
Private sector expenditures on oral care services as a percentage of total private sector health expenditures	19.3%
Public sector expenditures on oral care services as a percentage of total public sector health expenditures	0.5%

Source: National Health Expenditure Database, 1975 to 2016, Canadian Institute for Health Information (28, 29).

Note: 2014 is the latest year of actual expenditure data available.

See data tables A.3.1.2 (28), A.3.1.3 (28) and H (29) in the companion Excel file. See the Methodology Notes for definitions.

Oral health care in Canada is privately financed and delivered. For the most part, Canadians are responsible for financing their own oral care and in the following four ways:

- Private dental insurance (not-employment based coverage)
- Third party insurance (employment-based dental coverage)
- Out-of-pocket
- Publicly funded oral health programs or government subsidized programs (federal public, provincial public, municipal public) (30).

For the first time in approximately 40 years, has provided nationally representative clinical information on the oral health status of Canadians (age 12 years and over) (21). The oral health component of the 2007-2009 CHMS has become the gold standard for surveys in Canada (31). According to the CHMS 2007-2009, the oral health of Canadians 6-79 years of age has improved significantly over the years; yet, not everyone has enjoyed the same degree of improvement. Significant inequalities in oral health and access to care were found to be related to age, dental insurance, and income (21). The survey provided an incomplete picture of oral health in very old Canadians. It excluded people 80 years of age or older, although this age group now constitute more than 4% of the Canadian population (32). It also did not include institutional residents (21), who are generally more frail, have poor oral health, receive less oral care, and greater treatment needs when compared to the rest of the general population (33).

According to the 2007-2009 CHMS:

- 62% of Canadians have private dental insurance (usually an employee benefit),
- 32% of Canadians have no dental insurance, and
- 6% of Canadians have public insurance (21).

In Canada, income and dental insurance are the two most important determinants of oral care utilization (30).

Oral health care occupies a relatively separate position in the Canadian health system. In Canada, oral services that are financed by the federal government are available to certain populations, such as military, veterans, Royal Canadian Mounted Police, eligible Indigenous, refugees and federal prisoners (30). Most public oral health programs fall under provincial/territorial jurisdiction. These include programs administered at the regional and municipal level, as well as through accredited colleges and universities. These services are available to

targeted individuals from marginalized groups as well as those who require hospitalization for surgical-dental services (30).

While the private oral health system in Canada (which accounts for almost 94% of oral care) may provide access to good quality care for many individuals, evidence shows this system also creates substantial barriers to care for many others. Canada's most vulnerable groups include:

- Indigenous peoples
- Children
- Families with low socio-economic status
- People who living in rural and remote regions
- People with special needs such as disabilities
- People without dental insurance
- Refugees and new immigrants
- Seniors living in LTC homes or with low socio-economic status (30).

### **1-3 Oral Health and LTC Home**

It is important to note that older adults are extremely heterogeneous and there is no such person as a typical older adult. In fact, older adults can be healthy, functionally independent, frail, or functionally dependent. This dependency level in turn can influence their overall health, oral health and quality of life. Functionally independent older adults, comprise the majority of the senior population: many have some chronic medical problems such as hypertension or diabetes for which they are taking a variety of medications. These individuals can access oral care independently using their own vehicles or public transportation (if available). Frail older adults, are those who have lost some of their independence but still live in the community. They maintain a level of independence with the help of family/friends or utilize professional support services such as Meals on Wheels or home care services. These individuals can

no longer access general oral care services without the help of others. Functionally dependent older adults, are those persons who are no longer able to survive in the community independently and are either homebound or living in institutions such as LTC homes. Some of these older adults can only access oral care services if they are transported to a dentist's, otherwise the services need to be brought to them through mobile programs (34). This means that the oral health professional needs to have the will and the experience to access mobile equipment, if he or she wishes to visit the patient or the LTC home in which the senior resides. If that home has a dental facility, that is a bonus (34).

Oral care is an integral part of personal care yet it is inadequate in most LTC homes (33). Research shows that oral health in institutionalized elderly is poor globally (35-38). Even in healthy seniors, effective daily oral care is usually complicated by one or more factors such as: decreased manual dexterity; impaired visual acuity; arthritic conditions influencing grip strength and range of motion in the wrist, elbow and shoulder; reduced salivary flow rate and impaired salivary buffering capacity (secondary to a broad variety of medications and diseases); exposure of tooth roots due to gum recession and periodontal disease; and the presence of permanent and removable dental prostheses (39). Oral care for dependent older adults in LTC is a challenge which is expected to grow in importance as the Canadian ages (40). These compromised individuals are prone to poor oral health because of reduced access to professional oral care and poor maintenance of personal daily oral hygiene (12). Access to professional oral care is limited and a significant proportion of residents do not perform/receive adequate personal oral care at the recommended frequency. Residents of LTC homes in rural Nova Scotia, Canada reported decreased access to professional oral care when compared to the LTC homes in urban Nova Scotia (41).

While many LTC homes have arrangements to manage accurate oral problems requiring emergency treatment, basic preventive care measures (such as daily oral care) are often overlooked (42) . Although differences between LTC homes exist (e.g. some have protocols and others do not) almost every home provides some type of oral health care, as oral health care is part of the daily care for LTC residents. Unfortunately, the oral hygiene and the oral health care of older people in LTC homes is insufficient (43, 44). A study found that oral care was provided for only 16.4% of the residents (either by themselves or Nursing assistants); none of the residents had their teeth brushed for 2 minutes. Nursing assistants brushed for 16 seconds on average. Residents brushed longer (39 seconds) but were always prompted to stop brushing by the nursing assistants (44). According to a research in the Netherlands, 40% of institutionalized residents with natural teeth and 10% of the those with a prosthesis had food debris, plaque or tartar in their mouth (45). Another study showed that not only the oral health of the remaining teeth was poor, but the majority of denture-wearing LTC home residents (95%) wore unhygienic dentures. Among denture wearers, 82% were unable to independently clean their dentures; staff cleaned dentures for 64%. Among dentate residents (average number of teeth 11.6), 75% were unable to clean their teeth effectively, yet none received regular assistance (46). These finding indicate that care is not in compliance with the available guidelines and protocols, and stresses the importance of a clear evidence-based implementation strategy to improve oral health care (45). Many studies have shown that elderly people require professional oral hygiene care as well as individual instruction on personal oral hygiene (12, 47, 48). As noted in the 2007-2009 CHMS, the number of decayed and missing teeth, and the prevalence of periodontal diseases increases with age (21). This emphasizes the need for regular professional oral care and for appropriate strategies to address the future needs of this growing population of Canadians.

"Oral health in long term care is often overlooked but hair care and foot care are areas that are not overlooked as they are visible to everyone eyes...I have seen mouths of residents who while they were healthy, took very good care of their oral health, paying and receiving thousands of dollars of dental work completed and then after entering long term care, developing decay all around that extensive dental work and ending up losing their teeth. Why has this happened? Because no one was assisting them with basic oral care of brushing and flossing. One resident once told me *no one had ever explained to him why he should brush my teeth.*"

Kerrie Krieg, SHR LTC-OHC

Overall, the oral health status of residents in LTC homes is poor (33) and those with dementia experience even higher rates of oral disease (49). The number of LTC residents suffering from dementia is very high; according to Continuing Care Reporting System, in 2015-2016, 67% of residents of residential care in Canada had dementia and 98% experienced some degree of cognitive and/or functional impairment(6). The frail elderly, specifically those with dementia have to depend on nurses or caregivers for performing daily oral care which often gets overlooked (12).

Poor oral hygiene resulting from inadequate mouth care causes oral conditions such as mucosal inflammation, dental caries, and periodontal disease. Tooth loss, pain, and poorly functioning dentures result in problems chewing which is linked to poor nutrition. Oral diseases and dysfunction impact quality of life. They diminish the pleasures of eating, speaking and social interactions. Evidence demonstrating links between oral disease and systemic conditions such as diabetes, CVD, and respiratory infections continues to emerge (33).

Common oral health conditions occurring in the seniors, including residents in LTC homes, are **[Table 3]:**

- Dental caries (tooth decay)
- Edentulism (tooth loss)
- Oral candidiasis (fungal infection)



- Oral pre-cancerous/cancerous lesions
- Periodontal disease
- Xerostomia (dry mouth)

### 1-3-1 Dental Caries (Tooth Decay)

Dental plaque consists of a biofilm (sticky mass of bacteria) and sugar that constantly grow on the tooth surface. If the plaque is not mechanically removed at least every 24 hours, it can cause dental caries, periodontal diseases among other things. Dental caries is a multifactorial disease and caused by the interaction of cavity-causing bacteria in dental plaque (*Streptococcus Mutans* and *Lactobacillus*) and sugars from the diet. Dental caries is a cumulative result of consecutive cycles of demineralization (loss of minerals in the enamel) and remineralization at the interface between the biofilm and the tooth surface. The bacteria metabolize the sugars for energy, which cause an acidic environment on the teeth and result in the demineralisation of enamel. However, once the plaque has been neutralized by saliva, the mineralized area may return to the enamel surface- a process called remineralization. The capacity for remineralization is limited, and continuous exposure to sugar can lead to enamel mineral loss and cavity formation (50). The DMFT index is a key measure of caries experience in dental epidemiology which has been used for 75 years. The DMFT is defined as the total number of permanent teeth that are Decayed (D), Missing (M), or Filled (F) in an individual. The scores per individual can range from 0 to 28-32, depending on whether the third molars are included in the scoring (51).

Dental caries leads to tooth loss, difficulty eating, and decreased quality of life (50). Root caries prevalence and the number of restored teeth is greatest in the elderly population (52). Older adults are at higher risk for dental caries than younger adults due to age-related salivary changes, side effects of medications, exposure of root surfaces through gum recession, the presence of

partial dentures, and changes in cognition and dexterity(52). The incidence of caries will continue to rise as the absolute numbers of elders grow with each future generation(53).

LTC home residents have a high rate of dental caries (36, 54) mostly as a result of poor oral hygiene, excessive sugar consumption, medications that cause dry mouth and lack of oral treatment services. A British Columbia study in nursing homes, showed 58% of elderly residents were in need of oral treatment; and two-thirds (67%) of the need was due to dental caries and periodontal problems(54) .

The Oral Health of our Aging Population (TOHAP) Study, a cross-sectional observational survey of the oral health status of Nova Scotians age 45 and older conducted in 22 communities (45- 64 years and  $\geq 65$ ) and 31 LTC homes ( $\geq 45$ ) across Nova Scotia, Canada in 2008-2009. The study used the same methodology in the 2007-2009 CHMS (41). According to 2008-2009 TOHAP study in Nova Scotia , 23% of adults  $\geq 65$  years, who lived independently in the community, had untreated dental caries that required fillings; in LTC homes, 35% of residents had untreated dental caries (41).

Dental caries is divided into coronal caries and root caries. Coronal caries are cavities in the visible part of the tooth (crown), whereas, root caries, are tooth cavities that locate on the roots of the teeth.

### **1-3-1-1 Coronal Caries**

The 2007-2009 CHMS reported that:

- Almost all individuals 60–79 years had at least a DMFT score of 1 (excluding wisdom teeth).
- The individuals 60–79 years had the highest average DMFT score (15.7, consisting of D = 0.4, M = 5.6, and F = 9.7) (21).

According to 2008-2009 TOHAP in Nova Scotia, Canada:

Among LTC dentate residents, 51% had untreated coronal caries (41); the average DMFT score was 23.6 (55) .

In 39 LTC hospitals in the Vancouver area, Canada, 78.6% of residents had at least one carious lesion; 50.4% had coronal caries; the average DMFT was 26.6; and each resident , on average, had 3.8 carious teeth (56).

### **1-3-1-2 Root Caries**

The last half-century has seen considerable improvements for oral health. Unlike previous generations, more and more older adults are maintaining their natural teeth into old age (33). However, root caries has become an increasing dental concern because people are living longer and keeping their teeth longer as opposed to earlier times. As people grow older, their gums recede and root surfaces become exposed, making the root more susceptible to caries. Almost half of all individuals 75 and above have experienced root caries (57). The incidence of root caries in the seniors is associated with a number of medical conditions and greater age (58). Root caries is more difficult to detect and is much more difficult to treat (21).

The 2007-2009 CHMS reported that:

- 43.3% of Canadians 60-79 years had at least 1 or more filled or teeth with root caries.
- More than a tenth (11%) of 60-79 year old adults had untreated root caries(21).

The prevalence of root caries among LTC residents is even higher (53, 59). In Nova Scotia, Canada among LTC dentate residents, 44% had untreated root caries (55) . In Vancouver, Canada the proportion of LTC hospital residents with root caries was 68.8% (56).

The number of Canadians with root caries is expected to increase by 50% from 2001 to 2021; the majority of those affected by this root caries are expected to have no dental insurance coverage. Dental insurance has become a major factor influencing Canadian dental visits. Over the next few years, the uninsured retired Canadian will represent approximately 25% of Canadians. More than one third of these retirees will most likely have root caries and would require oral care services (60).

Root caries is a major cause of tooth loss in the elderly, and tooth loss is the most significant negative impact on oral health-related quality of life for the this population (57).The need for improved preventive measures and treatment strategies for this population is acute (57). As the world population ages, the requirement for cost-effective methods of treating chronic disease conditions, including oral diseases, increases. Fluoride Varnish (61), Atraumatic restorative treatment (ART)(115) and Silver Diamine Fluoride 38% (SDF) (62) can be useful and cost-effective alternatives for frail and fearful elderly who might not access oral treatment routinely.

### **Silver Diamine Fluoride (SDF)**

Silver diamine fluoride (SDF) has been used for caries management (arrest and prevention) in Japan for over 80 years(63). It received approval by the United States Food and Drug Administration in 2014 (63). On February 2, 2017, SDF was approved by Health Canada under the brand name Advantage Arrest (natural product number: 80075746)(64).

38% SDF is a colourless topical agent that at pH 10 contains 24.4-28.8% (weight/volume) silver and 5.0-5.9% fluoride (63). Silver acts as an antibacterial agent and fluoride reacts with hydroxyapatite and forms calcium fluoride which acts as a reservoir for fluoride when pH drops and promotes remineralization(63). Its disadvantages include staining caries and decalcified enamel black,

permanent staining of hard surfaces, temporary staining of skin/gums and mucosal irritation ( if they come into contact with SDF) (65).

SDF has been proven effective for caries prevention/arrest in children. However, limited studies on effectiveness of SDF in the management of caries in older adults are available. A recent systematic review on 9 randomized clinical trials on children 3-9 years or adults 60-89 years indicated that SDF is a safe, effective and efficient treatment for dental caries across the age spectrum (63). SDF is a relatively inexpensive treatment alternative compared to conventional restorative treatments and ART. Biannual application of SDF is compatible to ART but 20 times less expensive (63). A 2017 systematic review with three randomized clinical trials, supports the effectiveness of SDF in root caries prevention and arrest in older adults (62). According to a randomized control study of 21 senior homes over a 3-year period, yearly application of 38% SDF can prevent the development of new root caries in elderly (66). Three case studies in 2016, showed that both SDF and silver fluoride followed by stannous fluoride, can arrest and prevent caries in the elderly. Using silver fluoride followed by stannous fluoride does not cause mucosal irritation in that it can be applied more frequently over a wider area without causing discomfort. These rapid and inexpensive techniques work well to treat frail elders and dementia patients with challenging behaviours (53). A controlled clinical trial on 227 elderly who were followed for 2 years showed that annual application of SDF together with biannual oral health education was effective in preventing new root caries and arresting root caries among community-dwelling elderly individuals (67).

Lower rates of caries arrest by SDF are seen in elderly (67). Saliva may play a role in arresting dental caries by SDF. Elderly individuals tend to have less functional/abundant saliva, which explains their higher dental caries rate (63).

At the University of California, San Francisco, SDF is indicated for patients with extreme caries risk, populations with little access to care and individuals who

cannot tolerate conventional care such as patients who are too frail to be treated conventionally (63).

### **Atraumatic Restorative Treatment (ART)**

ART is a dental caries treatment procedure which usually uses manual excavation of soft, demineralized dental caries, followed by restoration of the tooth with an adhesive material, usually Glass Ionomer cement. Glass Ionomer is the material of choice for ART as it bonds to tooth structure, releases fluoride (stimulates remineralisation), and can be used easily. This technique is often used in young children, clients with special health care needs or when use of traditional dental restorations are not feasible (116).

A Randomized Clinical Trial (RCT) suggested that ART could be suitable for dentate patients in LTC homes or house-bound elderly since it was more cost-effective alternative compared to conventional restorations after one year (115). This study was conducted in 82 elderly individuals who received 260 restorations (128 ART and 132 conventional restorations); 91.1% of the restorations were on one surface only. Treatment costs were measured based on treatment time, labour and materials. Effectiveness was measured using percentage of restorations that survived one year. After one year, the restoration survival percentages in ART and conventional restorations were 91.1% and 97.7% respectively. The average cost for ART was less than conventional restorations (€16.86 vs €28.71). This resulted in a cost-effectiveness ratio of 0.18 (ART) and 0.29 (conventional treatment). When the cost of a hygienist to provide ART was measured, the resulting ratio was 0.14, which indicated ART was a more cost-effective alternative compared to conventional treatment, especially using alternative workforce such as hygienists (115).

### **1-3-2 Edentulism (Tooth Loss)**

Edentulism is prevalent among older people worldwide. According to the Global Burden Study 2015: the prevalence of total tooth loss was highest at age

75 to 79, and total tooth loss remained the leading cause of DALYs due to oral conditions, accounting for 7.6 million (25). Tooth loss is the most significant negative impact on oral health-related quality of life for the elderly (57). Presence of at least 20 natural teeth is considered a functional dentition(68). Extensive tooth loss reduces chewing ability and influences food choice. For example, edentulous people tend to avoid dietary fiber and prefer foods rich in cholesterol and saturated fats (68). A study reported that having fewer than 9 teeth had more impact on health-related quality of life than having allergy, cancer or hypertension. Reduced dentition without replacement of missing teeth by prosthodontics decreases the physical index of quality of life to the same extent as kidney diseases or cancer (69).

In some industrialized countries, including Canada, as people age, they tend to keep their teeth much longer than in the past (21). While previously most elderly individuals could expect to replace all of their natural teeth with dentures, today most Canadians retain their natural teeth for a lifetime (21). In 1972, approximately 50% of Canadians above 60 years old were edentulous, whereas in 2009, almost 22% had no natural teeth (70) **[Figure 14]**. The 2006 British Columbia Dental Association Adult Dental Health Survey shows that since 1986 there has been a substantial decrease (nearly 40%) in the average number of missing teeth within the 66-85 age group (42). Decline in the edentulous Canadian population parallels the use of fluoride and improved access to oral care over the past decades (21).

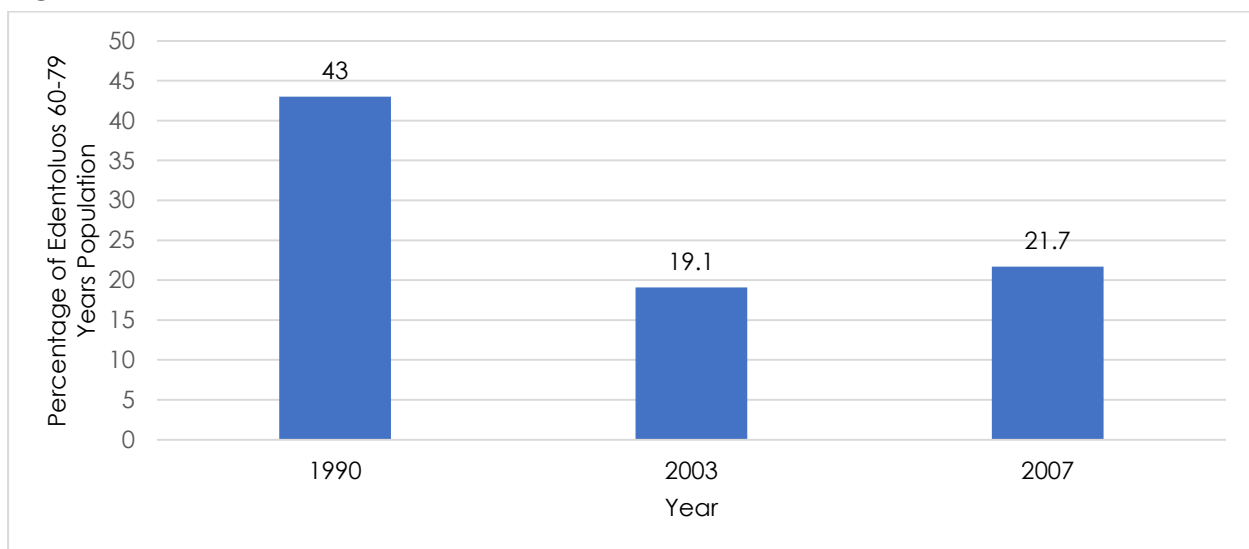
The 2007-2009 CHMS reported that:

- 21.7% of Canadians age 60 to 79 years had no natural teeth.
- 42.2% of Canadians age 60 to 79 years had inadequate dentition (fewer than 21 teeth).
- The highest rate of edentulism found in age group 60 to 79 years (22%) (21).

According to 2008-2009 TOHAP study in Nova Scotia, Canada:

- 15.7% of individuals  $\geq 65$  years live in community were edentulous.
- 41% of LTC residents were edentulous, 24% had teeth in only one arch, therefore, almost two-thirds of LTC residents were either edentulous or had teeth in one arch. Only 35% of LTC residents had teeth in both the upper and lower arches (41).

**Figure 14:** Proportion of 60-79 Years Edentulous Canadian



Sources: 1990 Health Promotion Survey (43%); 2003 Canadian Community Health Survey (19.1%); 2009 Canadian Health Measures Survey, 2007 to 2009 (21.7%) (70).

Canadians seniors tend to retain their natural teeth throughout their life compared to the past. According to the 2007-2009 CHMS, almost 22% of Canadian population age 69-79 years old have no natural teeth.

### 1-3-2-1 Denture Stomatitis and Other Mucosal Lesions

Denture stomatitis is a common oral mucosal lesion where inflammation and redness of the oral mucosa occurs under dentures. The most common fungal infection associated with denture stomatitis is *Candida Albicans*. The prevalence of denture stomatitis is most commonly associated with poor denture hygiene and the presence of denture plaque (68). The condition is more likely to develop when the denture is constantly left in the mouth, instead of removing it before sleep or for a few hours during the day (68). Other risk



factors include using defective/ unsuitable dentures, infrequent dental visits, tobacco and alcohol consumption (68).

As with the natural dentition, dentures enable the build-up of plaque biofilms over time. Increased surface roughness of the denture, enhances adhesion of microorganisms and facilitates plaque regrowth. This makes it important to minimize the denture roughness by using nonabrasive cleansing regimens. Denture brushes and antibacterial denture cleanser denture will reduce build-up of plaque (71).

Other major denture-related conditions include denture hyperplasia and traumatic ulcers (68). Denture-induced hyperplasia is a reactive soft tissue lesion arising from excessive and chronic mechanical pressure on the vestibular<sup>2</sup> oral mucosa. The standard treatment approach towards reducing denture-induced hyperplasia is surgery, which can be challenging in the elderly (72). Poorly fitting or unretentive dentures can lead to traumatic ulcer formation (mouth sore) which is tissue irritation or ulceration of the oral mucosa due to excessive movement of denture. Traumatic ulcers on gums can also be caused by overextended denture or food trapped between the oral mucosa and the denture(73).

The 2007-2009 CHMS reported that:

- Among edentulous 60-79 year old individuals, 93.5% wore complete dentures (upper and lower arches).
- Among adults 60-79 year old, 20% had one or more oral soft tissue lesions, including 9.1% denture stomatitis, 3.2% traumatic or other ulcers.
- Soft tissue lesions were significantly higher among the edentulous adults (40.9%) compared to the dentate adults (9.6%).

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<sup>2</sup> The vestibule is the area between the teeth, lips and cheeks.

- Soft tissue lesions were significantly more common among 60-79 years old (20.0%) compared to the youngest adults (5.6%) (21).

According to 2008-2009 TOHAP study in Nova Scotia, Canada:

- 5% of adults  $\geq 65$  years, who live independently in the community have dentures that need repair. An additional 19% of those  $\geq 65$  years have dentures that are non-retentive or unstable and might benefit from denture reline or replacement.
- In LTC homes, 2% of residents have dentures that need repair and an additional 32% have unstable or non-retentive dentures that might benefit from denture reline or replacement to improve fit (41).
- In LTC homes, 41% of residents had some mucosal abnormality. Most of the dentures in lower jaw were non-retentive (59%) and almost half were unstable (49%) (55).

According to the pilot study 2007-2008 in two LTC homes in Saskatchewan, 38-54% of the residents had faulty dentures (74).

### 1-3-3 Oral Candidiasis

Candidiasis of the mouth, is a fungal infection *Candida* (typically *Candida Albicans*) accumulates in the mouth. *Candida* is a normal oral flora in the mouth, but sometimes it can overgrow and cause symptoms. Certain conditions increase the risk of overgrowth in older persons. These conditions include local factors (e.g. dry mouth, denture irritation, tobacco use, steroid inhaler use); and systemic factors (e.g. diabetes, immunodeficiencies, antibiotic use, chemotherapy, radiation therapy, nutritional deficiencies) (75).

Oral Candidiasis can manifest in different ways: oral thrush, angular cheilitis, and denture stomatitis. Oral thrush (pseudomembranous candidiasis) is

characterized by white patches/plaques on the tongue, buccal<sup>3</sup> mucosa and other oral mucous membranes that can be wiped off. Oral thrush can spread to the gums or tonsils, the back of throat, or roof of the mouth. Although oral thrush can affect anyone, it's more likely to occur in babies and elderly as they have reduced immunity; in individuals with compromised immune systems; or in people who take certain medications. Oral thrush is a minor problem in healthy individuals, but in people with compromised immune system, symptoms may be more severe and difficult to control (75).

Angular cheilitis (also known as perleche) is identified by red scaling fissures at the angles (corners) of the mouth. Saliva can accumulate and get trapped at the angles of the lips. As the saliva dries, it leads to cracking of the skin. Individuals affected with angular cheilitis may lick their lips in an attempt to soothe further irritation. This excess saliva creates a warm environment for fungus like *Candida* or *Staphylococcus* bacteria to grow. A chronic moist environment for microbial growth at the oral angles, and sagging of tissues allow collection of saliva- contribute to the development of angular cheilitis. Angular cheilitis can occur in individuals who wear poor fitting dentures or chronic denture usage. Due to attrition of the teeth due to prolonged usage, the vertical dimension is decreased which results in deep folds of skin at the corners of the mouth and collection of saliva in these areas. This lesion can be controlled with replacing a new denture to modify the face vertical dimension, and improve the angular cheilitis lesions (76).

In individuals who wear dentures, candidiasis can lead to red lesions under dentures called denture stomatitis (see 1-3-2 *Edentulism*) (68).

Another common condition in the elderly is coated tongue (white tongue). White tongue is the result of enlargement of the finger-like projections (papillae)

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<sup>3</sup> Buccal relates to the cheek. Buccal mucosa refers to inner cheeks.

on the tongue dorsal<sup>4</sup> surface. The appearance of a white coating is caused by debris, bacteria or fungi, and dead cells getting trapped between the enlarged and sometimes inflamed papillae. Some causes of this condition include poor oral hygiene, dry mouth, and use of certain medications, such as prolonged use of antibiotics that may lead to an oral yeast infection (77).

### **1-3-4 Oral Pre-cancerous /Cancerous Lesions**

Precancerous oral lesions consist of a group of conditions which have the potential to develop into oral cancer. Oral leukoplakia (white patches), oral erythroplakia (red patches), and oral submucous fibrosis are among the most common oral lesions with high transformation potential into oral cancer (78).

Oral cancer includes the oral cavity (lips, tongue, gums, salivary glands, floor/roof of the mouth, tonsils) and pharynx (side and back of the throat). Oral cancer is a malignant tumor and can metastasize (spread) to other parts of the body. Precancerous lesions and early oral cancer can be present without any symptoms. Some of the manifestations include lump/growth in the oral soft tissues, a feeling that something is caught in the throat, difficulty chewing /swallowing, numbness of the tongue or other areas of the mouth, excessive salivation, persistent pain in the mouth, an ulcer that has a red velvety appearance in the mouth that does not heal, loose teeth, or swelling of the jaw that causes dentures to no longer fit (79). The known risk factors include age (elderly), gender (male), ethnicity (Asian), tobacco, alcohol, diet (low in vegetable/fruit), betel/areca nut consumption, sun exposure, and Human Papilloma Virus (HPV) infection. Hispanic and Black people are at higher risk compared to Caucasian individuals (80-82).

Globally, there are an estimated 529,000 new cases of oral cancers each year, and more than 300,000 deaths (83). According to the most recent Canadian

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<sup>4</sup> Dorsal relates to the upper side or back of an organ.

Cancer Statistics by Canadian Cancer Society, the incidence (i.e. number of new cases) of oral cancer in 2017 is estimated at 12 per 100,000. Incidence rate is slightly lower in Saskatchewan (15 per 100,000 and 6 per 100,000 in males and females respectively) compared to the Canadian average (17 per 100,000 and 7 per 100,000 in males and females respectively). It is projected that in 2017, there will be 4650 new cases of oral cancer (3200 men, 1450 women). In Saskatchewan, 115 new cases of oral cancer (80 men, 35 women) will be detected. Canadian males are more likely to develop oral cancer than females in the lifetime. In Canada, oral cancer is the 13<sup>th</sup> most common cause of cancer death in males (2% of all male cancer deaths) and the 17<sup>th</sup> most common cause of cancer death in females (1% of all female cancer deaths) (84). The death rate for oral cancer is higher than that of other cancers which we hear about more often such as thyroid cancer, laryngeal cancer, Hodgkin's lymphoma, and testis cancer (84).

Lifetime probability of developing oral cancer in Canadian men and women is 1.5% and 0.7% respectively. In other words, in Canada, 1 in 68 males and 1 in 136 females are expected to develop oral cancer in their lifetime (84).

Currently in Canada, the five-year survival rate for oral cancer is much lower (68% and 60% in women and men respectively) than the most common cancers, that is breast cancer and prostate cancer (84). Mortality rates for oral cancers decreased by 1.3% per year for females and 2.0% per year for males between 1992 and 2012. Although the age-standardized mortality rate continues to decline, the actual number of oral cancer deaths continues to rise due to the growth and aging of the population (84). This has implications for health policy and resource planning. Oral cancer rates increase with age. The rate increases rapidly after age 50 and peaks between ages 60 and 70. Diagnosing oral cancer at an early stage significantly increases 5-year survival

rates. With early detection and timely treatment of pre-cancerous lesions, the transformation into cancers could be significantly reduced (78).

Since cancer is an age-dependent disease, the number of elderly individuals annually diagnosed with cancers is anticipated to increase within the following decades (84). Oral cancer screening can detect early, localized lesions which are associated with an improved prognosis. Five-year survival rate is 3 times greater in patients with localized oral cancer than those whose cancer has spread to other parts of the body (85). Oral cancer is particularly dangerous since 1) in its early stages it may not be noticed by the patient as it might not cause pain or symptoms, and 2) because it has a high risk of producing second, primary tumors. This means that patients who survive the first oral cancer, have up to a 20 times higher risk of developing a second oral cancer. This increased risk factor can last for 5 to 10 years after the first occurrence(86). As a result, there is a need for continued strengthening of cancer prevention and early detection to decrease the future incidence of cancer as well as improving survival rate (84). Oral care professionals can play a significant role in early detection of oral cancer.

### **1-3-5 Periodontal Disease**

The periodontium is the structure that surrounds and supports a tooth and maintains its position in the dentition. It consist of the cementum, gums, alveolar bone, and periodontal ligament. This structure is subject to disease. Periodontal disease is as bacteria-induced, chronic inflammatory diseases in the periodontium. The bacteria destroy the structures supporting the dentition. Periodontal disease increases the risk of root caries and further tooth loss. The two most common forms of periodontal disease are gingivitis and periodontitis (87).

### **1-3-5-1 Gingivitis**

Gingivitis is an inflammation of the gums in the absence of clinical attachment loss. It is the initial reversible stage of gum disease. Plaque-induced gingivitis begins as plaque biofilm accumulates on and around the teeth and gums. It can manifest as redness, tenderness, swelling of the gum tissues and bleeding upon brushing (87). Bad breath due to poor oral hygiene and bleeding gums can lead to isolation of an individual from society. Gingivitis is localized to the soft tissues surrounding the teeth and can readily be reversed with daily oral care (brushing and flossing) (21).

According to the 2007-2009 CHMS:

- Among dentate 60-79 year old adults, prevalence of gingivitis was 22.5% (21).

2008-2009 TOHAP in Nova Scotia, Canada reported that:

- 66% of LTC residents with natural teeth had gingivitis.
- 60% of LTC residents had soft debris covering one third or more of the tooth surface. This indicates a need for assistance in self-care to remove debris to help prevent caries and gum diseases.
- 44% of LTC residents were toothbrushing less than twice each day and 83% were flossing<sup>5</sup> less than once each day. This indicates a need for assistance in self-care to help prevent additional dental caries and avoid further destruction of the supporting gum and bone (41).

### **1-3-5-2 Periodontitis**

When gingivitis is not treated, it can advance to periodontitis which is an inflammatory disease affecting the periodontium. It is characterized by loss of connective tissue attachment and alveolar bone. The primary cause of

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<sup>5</sup> Brushing twice a day and flossing once a day are recommended to prevent oral disease.

periodontitis is bacterial plaque. Unlike gingivitis, it results in irreversible damage to the periodontium (87).

In healthy young adults, the attachment is found at the cemento-enamel junction (CEJ). It is junction where the enamel covering the crown and the cementum covering the root meet. Healthy individuals are those with loss of attachment (LOA) of 3 mm or less (21). In periodontitis, gums pull away from the teeth and form spaces (i.e. pockets) that become infected. Periodontitis is defined as at least one periodontal pocket with a probing depth<sup>6</sup> of 4 mm or more and a LOA<sup>7</sup> at the same site of 3 mm or more(21). Pockets of  $\geq 6$  mm are of concern and require the attention of an oral health professional (21). Clinically, pocket depths can be reduced by meticulous home care and professional treatment, but LOA is largely irreversible (21).

The body's immune system fights the bacteria as the plaque spreads and grows below the gum line. Bacterial toxins and the body's natural response to infection begin to break down the periodontium. If not treated, the alveolar bones, gums, and tissue that support the teeth are destroyed. Signs of periodontitis include tooth mobility, bad breath, bleeding gum and chewing difficulty (87). Persistent presence of periodontal disease is associated with systematic conditions such as CVD (88), diabetes (20, 89), and pneumonia (90). It's reported that diseases such as CVD, diabetes mellitus and respiratory disease are associated with a higher severity of periodontal disease (92).

The National Health and Nutrition Examination Survey (NHANES) 2009-2010, an important source of information on oral health in the United States reported that

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<sup>6</sup> Probing depth is a measure of gum disease. A probing depth of 4 or 5mm indicates moderate disease and a probing depth of 6mm+ indicates severe disease.

<sup>7</sup> LOA measures the effect of periodontal disease on the bone supporting the teeth. A LOA of 4-5mm indicates moderate disease while a LOA of 6mm or more indicates severe periodontal disease.



64% of adults 65 years and older had either moderate or severe periodontitis (91).

The 2007-2009 CHMS reported that:

- Among dentate 60-79 year old adults, 23.6% had periodontal pocket depth 4-5mm, 7.1% had pocket depth of > 5mm, and 7.2% had pocket depth of  $\geq 6$ mm.
- Among dentate 60-79 year old adults, 14.8% had LOA $\geq 6$ mm(21).
- Deeper pocketing ( $\geq 6$  mm) was more prevalent in 60-79 years old (7.2%) than the national average of 4.1%.
- Among 60-79 years old, 14.8% had LOA $\geq 6$  mm. This was more prevalent than the national average of 6% (21).

According to 2008-2009 TOHAP in Nova Scotia, Canada:

- 36% of LTC residents had probing depth of  $\geq 4$ mm.
- 67% of LTC residents and 71% of community residents  $\geq 65$  years with natural teeth had LOA $\geq 4$ mm (41).
- 55% of LTC residents had teeth with calculus<sup>8</sup> covering 1/3rd or more of the tooth surface. This indicates a need for professional debridement therapy to remove the hard debris to help prevent further periodontal disease (41).

### **1-3-6 Xerostomia (Dry Mouth)**

Xerostomia (dryness in the mouth), is caused by reduction of saliva production and associated with reduced salivary flow or a change in the composition of saliva. Saliva flow rate may be reduced in elderly individuals due to gradual physiological deterioration, medications and various medical conditions (e.g. chemotherapy, radiotherapy). Xerostomia is the most common adverse drug-

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<sup>8</sup> If dental plaque is not removed by proper brushing and flossing, it can harden into calculus. Calculus is a mature plaque, or a plaque that has not been removed in 24 hours.

related effect in the oral cavity and has been associated with over 500 medications(92).

Saliva has natural cleansing effects, reduces the incidence and severity of caries by buffering acids created by cavity-causing bacteria, and providing calcium and phosphate to aid the remineralization process of enamel (93). Saliva also contains antibodies which help prevent gum ulcers(68).

Xerostomia is a risk factor for oral disease. With reduced salivary flow rates, people are at higher risk for the development of both root caries and dental erosion (94). In addition individuals with dry mouth, experience soreness, dryness of the mucosa and lips, candidiasis, bad breath, difficulty eating and swallowing, choking, and difficulty in wearing dentures (68). Loss of the natural cleansing effect of saliva increases the oral bacterial load, which predisposes a frail person to conditions such as aspiration pneumonia and coronary artery disease(95). People with dry mouth and tooth loss might have reduced masticatory ability and avoid certain food. Malnutrition may reduce immunity against infection (96). The most common complaints of individuals suffering from xerostomia include generalized oral discomfort, difficulty speaking, impaired ability to speak and change in taste). Dry mouth significantly impacts quality of life (93). Quality of life related to oral health is important in dentistry to measure the impact of oral health on patient's quality of life. Oral Health Related Quality of Life (OHRQoL) is defined as an individual's assessment of how functional factors, social factors, psychological factors, and experience of pain/discomfort in relation to oral concerns affect their well-being (97). In a study on elderly 65-95 years old, OHRQoL showed a higher level of xerostomia was significantly associated with a poorer quality of life (97).

People 65 years and older are at greatest risk of developing xerostomia(92). Elderly living in LTC homes are the most vulnerable group to suffer from oral

problems. In addition, these people are often polymedicated, that causes xerostomia (97).

According to 2008-2009 TOHAP study in Nova Scotia, Canada:

- Persistent dry mouth was the most commonly reported problem in both community residents  $\geq 65$  years (22%) and LTC residents (36%).
- 55% of LTC residents were taking one or more medications known to contribute to symptoms of xerostomia (41).

Oral lubricants can alleviate oral discomfort and moisten the oral mucosa. The Biotène product range, (e.g. toothpaste, mouthrinse, gel, liquid, spray and chewing gum) has been the most well known and recommended in Australia. In addition to the LP3 enzyme protein system, further antimicrobial activity is achieved through the addition of fluoride and xylitol (a non-cariogenic sugar) to selected products. The Biotène formulation has shown efficacy in reducing symptoms associated with xerostomia(93). A 2017 clinical randomized study in medication-induced xerostomia showed Biotène mouthwash effectively improves oral health and xerostomia-related quality of life (98) **[Appendix 2 ]**.

**Table 3:** Oral Health Problems in Canadians ≥60 Years

	1970-1972 NCS (≥60 years old)	2007-2009 CHMS (60-79 years old)
Percentage of edentulous elderly	Male=49.5% Female= 55.7%	21.7%
Percentage of elderly with 28 teeth	-	8.6%
Percentage of elderly with <21 teeth	-	42.2%
Average number of tooth present		19.43
Percentage of edentulous elderly with complete denture	-	93.5%
Percentage of edentulous elderly with at least one implant*	-	4.1%
Percentage of dentate elderly wearing dentures or fixed bridges	-	12.6%
Percentage of elderly with coronal caries (DMFT >0)	Male= 91.3% Female= 92.3%	100%
Average DMFT (coronal caries)	Male= 20.6 Female= 21.5	15.67
Percentage of elderly with ≥1 untreated coronal caries	-	16%
Percentage of elderly with ≥1 root decayed or filled teeth (RDFT ≥1)	-	43.3%
Average RDFT (root caries)	-	1.56
Percentage of RDFT teeth that are decayed among dentate elderly* (RDT/RDFT)	-	18.4%
Percentage of RDFT teeth that are filled among dentate elderly (RFT/RDFT)	-	81.6%
Percentage of elderly with soft tissue lesions	-	20% (9.1% denture stomatitis)
Percentage of elderly needing any kind of oral treatment	-	42.8% (7.8% surgery*, 17.2% restorations, 12.9% prosthodontics)
Percentage of dentate elderly with gingivitis **	-	22.5%
Percentage of dentate elderly with at least one periodontal pocket >5mm**	-	7.1%
Average of periodontal pocket depth among elderly with at least one pocket ≥ 4 mm	-	5.1mm
Average LOA among elderly with LOA of at least ≥ 4 mm	-	5.31mm
Percentage of elderly with persistent pain ***	-	7%

**NCS:** Nutrition Canada Survey; **CHMS:** Canadian Health Measures Survey.

**DMFT:** The average number of Decayed (D), Missing (M), Filled (F) Teeth (T)

**LOA:** Loss of Attachment

**RDFT:** The average number of Root Decayed (RD) or Filled (F) Teeth (T)

**RDT:** RDFT teeth that are decayed; **RFT:** RDFT teeth that are filled

\*Interpret with caution (due to high sampling variability).

\*\* According to the community periodontal index of treatment needs (CPITN) scores.

\*\*\* These responses could be an underestimation of the true prevalence, as elderly tend not to report oral pain (21).

## **1-4 Relationship Between Oral Health and Overall Health**

Oral health problems can have negative impacts on the quality of life of individuals. Poor oral health has many social/psychological consequences such as avoidance of close relationships or social situations, fear of rejection, embarrassment and shame, impaired learning, sleeping, eating, avoidance of smiling, and problems with speech. People with poor oral health also suffer from reduced dignity, self-respect, employability, all of which have major health implications (14).

There is also a strong association between oral disease and systematic conditions such as CVD (88), diabetes (20, 89), and pneumonia (90). These conditions might be aggravated in residents who live in LTC homes (99). In this section the link between oral health and systemic conditions will be discussed.

### **1-4-1 Oral Health and CVD**

Since 1989, when it was reported that oral health was associated with acute myocardial infarction, links between the two have attracted much attention (20). Although many reports acknowledge the association between periodontal disease and CVD, currently the causal relationship is still unclear. In 2009, the journal editorial board of the American Heart Association and the American Academy of Periodontology announced that “no causal relationship has been established between periodontal disease and heart disease”(20). However, there have also been many studies that support the association. A meta-analysis with seven cohort studies concluded periodontal disease is an independent risk factor or risk marker for coronary heart disease: two groups of diseases share many risk factors (such as smoking, genetics, stress and increasing age) which could independently lead to periodontal disease and CVD (100). According to another meta-analysis with nine cohort studies, relative risk of CVD in individuals with periodontal disease increased, when individuals are limited to those 65 years or younger(88) .

Some studies indicated that infectious bacteria associated with periodontal disease such as *Streptococcus Sanguis* might directly contribute to platelet aggregation and the development of thrombi, which could contribute to an acute myocardial infarction(101). Another mechanism that could link periodontal and CVD suggested that the cellular sources of the main inflammatory mediators are very similar. Three notable mediators that lead to tissue destruction and disease are Interleukin-1 (IL-1), Tumour Necrosis Factor alpha (TNF- $\alpha$ ), and Matrix Metalloproteinases (MMPs). Both IL-1 and TNF- $\alpha$  are pro-inflammatory cytokines and are involved with inflammation and connective tissue breakdown that can limit repair of the periodontium and myocardium. MMPs degrade the periodontal connective tissue, specifically, collagen, which ultimately leads to tooth loss. Similarly, in atherosclerosis, these enzymes degrade the connective tissue, which may lead to a myocardial infarction (102).

Bacteria from periodontal pockets can enter the bloodstream during activities such as chewing, tooth brushing and flossing. These bacteria induce the production of acute-phase proteins like C-reactive protein (CRP). CRP levels in individuals with periodontitis are higher compared to those of healthy people. Chronically elevated CRP levels in people with periodontitis exacerbate inflammatory processes in atherosclerotic plaques. These plaques are considered unstable and prone to rupture, with increased risk for CVD and stroke (103).

Conversely, improvements in periodontal disease will lead to better control of CVD. A meta-analysis reported a considerable reduction in CRP levels in patients with periodontitis 2 to 6 months following periodontal therapy (104).

#### **1-4-2 Oral Health and Diabetes**

Diabetes is a NCD that occurs when the body is either unable to sufficiently produce or properly use insulin. Insulin, a hormone released in the pancreas,

allows the sugar to enter cells and use it as an energy source. Type 1 and type 2 diabetes are the most common forms of the disease. Type 1 diabetes, is an autoimmune disease in which the body's immune system attacks and destroys the insulin-producing cells of the pancreas. It typically occurs in people under the age of 40. Type 2 diabetes, is a metabolic disorder that occurs when the pancreas does not produce enough insulin and when the body does not properly use the insulin it makes. It typically arises in adults over the age of 40. Diabetes leads to consistently high blood sugar levels (hyperglycemia) which over time can damage blood vessels, nerves, and organs such as the eyes, heart, kidneys resulting in serious complications and, ultimately, death. Diabetes is regarded as a major disease that directly impacts quality of life (20). In Canada, 11million people (29%) are affected with diabetes including those affected with prediabetic stages. Treatment cost of diabetes to health-care system are estimated at \$3.4 billion(105).

Increasing evidence suggests a bi-directional link between diabetes and oral diseases, particularly periodontal disease (20, 89). Periodontitis is considered as the sixth complication of diabetes (106). A recent systematic review in 2570 diabetic patients demonstrated that the prevalence of oral mucosal disorders in individuals with diabetes mellitus is statistically higher than that in non-diabetic individuals. The most frequent disorders in the oral cavity included denture stomatitis and tongue alterations (such as coated tongue and fissured tongue or migratory glossitis). This prevalence ranged from 45–88% in type 2 diabetic patients (vs. 38.3–45% in control group) and from 44.7% in type 1 diabetic patients to 25% in control group. This increased prevalence of oral disorders in diabetic groups might be as result of an inadequate metabolic control of diabetes or a slow healing process (107).

Glycaemic control is a key issue in the care of people with diabetes mellitus. Some studies have suggested a bidirectional relationship between glycaemic

control and periodontal disease. A systematic review concluded that periodontal therapy in diabetic individuals could help improve glycemic control and the subsequent management of diabetes. The authors recommended that periodontal therapy should be part of routine diabetes management (89).

Regarding the association between dental caries and diabetes, it has been observed that high viscosity (high albumin level) and glucose concentrations in the saliva of diabetic individuals have impacts on the increase in dental caries development (108). Attachment loss of periodontal tissue in patients with diabetes is large. This could increase exposure of the root surface, and subsequently, increase root surface caries (109). Evidence also supports the relationship between dental caries and glycemic control in diabetic individuals. According to a cohort study in type 1 diabetic children, the individuals with high caries risk at onset showed sevenfold increased of impaired glycemic control after 3 years compared to the group with low caries risk (110).

In summary, oral health professionals have an important role in contributing to early detection of diabetes and the improvement of glycemic control. This could underscore the need to further promote medical-dental collaboration in the future (20). Dentists could contribute to the improvement and control of diabetes by working collaboratively with physicians (20).

### **1-4-3 Oral Health and Malnutrition**

Poor oral health has negative impacts on nutritional status. There is an independent association between oral health status and malnutrition in LTC home residents. Malnutrition is a complex and multi-factorial problem in the elderly- it can be caused by reduced intake of food. Loss of appetite is likely the most common cause of reduced food intake and results from physical problems, impaired taste perception, mental health issues, intake of certain drugs, and treatments (such as chemotherapy and radiotherapy). On the other



hand, aging is associated with problems in oral health such as loss of teeth, dry mouth, dental caries, periodontal diseases, painful mucosal disorders, and decreased chewing ability. These all in turn can lead to malnutrition (111).

As discussed earlier, periodontal disease, as many other lifestyle related diseases, is a multifactorial disease and increases with age. Periodontal disease is associated with risk factors for NCDs such as life style habits (20). In a 2 year follow-up study targeting elderly individuals, the risk of periodontal disease progression was lower in those with a high dietary intake of antioxidants (such as  $\beta$ -carotene, vitamin C, and vitamin E) (112). Another study in elderly people showed that the periodontitis risk was lower in those with high calcium intake amounts (in dairy products as a whole, milk, and lactic acid bacteria in yogurt). Yogurt, which contains several lactic acid bacteria with probiotic action, prevents the growth of periodontal pathogens. The amounts of consumption of mentioned dairy products were negatively associated with periodontitis (113). According to a follow-up study in men 65 years and older, those with a high dietary intake of fiber from food and fruits had a low risk of periodontitis progression and tooth loss (114). Vitamins and calcium represent nutrients associated with periodontal disease. Vitamin D plays a role in maintaining calcium concentrations. Deficiency in vitamin D disrupts calcium deposition in bones and increases the likelihood of the development of bone-related diseases including the alveolar bone that supports teeth. Therefore, vitamin D deficiency may result in the progression of periodontal disease and tooth loss. Vitamin C is involved in the synthesis of collagen fibers, an important component of periodontal tissue. Therefore, vitamin C deficiency impairs collagen synthesis, which may contribute to periodontal disease(20).

Elderly in LTC homes are a high-risk population for weight loss and poor nutrition. A structured and multidisciplinary approach, focusing on the nutritional risk factors may be necessary to achieve benefits. A recent prospective study

analysed the effects of oral health and nutrition (aiming at improvement of oral functions, and self-improvement of eating habits to prevent malnutrition) on frail elderly. This 28-month follow-up study showed that the program is effective in preventing incident disability and, consequently, saving care costs per survival period (115).

The 2007-2009 CHMS reported that:

- The highest levels of food avoidance were found among the edentulous adults (25.5%).
- Among 60-79 year old adults, almost 13% reported avoiding foods because of problems with their mouth.
- Among 60-79 year old adults without natural teeth, nearly a quarter (23%) reported that they avoided certain foods because of oral problems (21).

#### **1-4-4 Oral Health and Pneumonia**

Pneumonia, an inflammatory disease of the lung parenchyma, often starts by the introduction of bacteria or viruses into the lower airway. The initiation of pneumonia depends on the aspiration of infectious agents from nearby sites, including the oral and nasal cavities. This disease is particularly common in the elderly (116). One specific form of pneumonia, aspiration pneumonia, is thought to be caused by organisms that inhabit the oropharynx, and aspiration of oropharyngeal secretions has been suggested as the mechanism by which these bacteria reach the lower airway (116). It is recognized that dental plaque could be a source of these bacteria, especially in individuals with periodontal disease (117).

Pneumonia can be classified based on the location of the origin of the infectious agents (i.e. from the community vs. from within the institution such as hospitals or LTC homes)(116). Pneumonia occurring in LTC homes/ nursing homes is referred to Nursing Home Acquired Pneumonia (NHAP) (118). NAHP is the most

common infection affecting nursing home/LTC residents (118) and accounts for 13-48% of all infections in nursing homes(119). Pneumonia, is also considered the leading cause of death among LTC residents (117, 119, 120). A prospective cohort study in 613 elderly residents of 5 nursing homes reported that 18% developed pneumonia(121). The incidence of pneumonia requiring hospitalisation is higher in elderly nursing home residents than community-dwelling elderly individuals (99, 122). A British Columbia study also reported LTC residents had disproportionately higher rates of hospitalization for pneumonia (122). Analysis of 5,160 patients from the Community-Acquired Pneumonia Organization database in Europe, Latin America, and the United States showed that the most common pathogens identified in NHAP included *Streptococcus Pneumoniae* (31%), *Staphylococcus* species (31%), and *Pseudomonas Aeruginosa* (7%). Thirty-day hospital mortality was 2.3 times higher among individuals with NHAP than among those with community-acquired pneumonia) (42% vs 18%) (120). These finding may be due to the particular characteristics of LTC residents, since they tend to be older, to have greater functional impairment, to have dependence upon caregivers, inadequate oral care, increased comorbidities and polypharmacy, and difficulty with swallowing (121, 123, 124).

The evidence strongly supports the link between poor oral health and pneumonia (95, 125). It has widely recognized that oral care can prevent aspiration pneumonia in the seniors (126, 127). The available scientific evidence suggests that mechanical oral hygiene reduces the incidence of pneumonia in elderly (128). Other studies suggested that the use of chemical agents including oral antiseptics can improve pneumonia occurrence. In 2016, the Cochrane Library study conducted meta-analysis with 18 RCTs (2451 participants) and demonstrated that oral hygiene care using Chlorhexidine antiseptic, reduced

the risk of Ventilator Associated Pneumonia (VAP)<sup>9</sup> from 25% to about 19% (RR 0.74, 95% CI 0.61 to 0.89,  $p = 0.002$ )(126). Another meta-analysis with 17 RCTs reported that occurrence of VAP, 0.60 times (95% CI, 0.47-0.77) decreased with using Chlorhexidine(129). Further research demonstrated similar conclusion that VAP occurrence 0.72 (95% CI, 0.55-0.94) times reduced with use of Chlorhexidine (130). A systematic review concluded that intensified oral hygiene measures given by oral care professionals could prevent approximately one in 10 cases of death from aspiration pneumonia in elderly in hospitals or LTC homes (131). There is also another systematic review in progress assessing effects of oral care measures for preventing pneumonia in LTC residents (48). According to a research in 11 nursing homes in Japan, the risk of pneumonia in LTC homes followed up for 2 years was significantly decreased in patients receiving oral care. Patients' teeth were cleaned using toothbrush by nurses or caregivers after each meal. In some cases, swabbing with oral antiseptic, Povidone Iodine was used additionally. Professional oral care was also provided by dentists or dental hygienists once a week. In patients receiving oral care, the mortality due to pneumonia was about half of that in patients not receiving oral care (40% vs. 80%). The study also suggested that oral care was more effective in decreasing mortality due to pneumonia than were medical treatments for pneumonia. In older edentate patients, pneumonia, fever, and death from pneumonia were observed as often in dentate patients. In addition, an oral care in edentate patients produced benefits similar to those in dentate ones (117).

In edentulous patients, dentures could serve as a similar reservoir as teeth for oral and respiratory bacterial colonization if not cleaned adequately on a daily basis (116). Recent studies have found a relationship between denture plaque and pulmonary infection, particularly in seniors. One hundred and thirty patients' dentures were assessed for the presence of respiratory pathogens by

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<sup>9</sup> Ventilator Associated Pneumonia (VAP) is defined as pneumonia developing in persons who have received mechanical ventilation for at least 48 hours.

quantitative polymerase chain reaction (qPCR). Of the dentures, 64.6% were colonized by known respiratory pathogens. *Pseudomonas Aeruginosa* was identified as the most abundant species followed by *Streptococcus Pneumoniae* and *Streptococcus Aureus* in terms of overall proportion of denture plaque. The findings suggested that dentures could act as a reservoir for potential respiratory pathogens in the oral cavity, thus increasing the theoretical risk of developing aspiration pneumonia (127). A 3- year follow up study in Japan indicated that denture wearing during sleep doubles the risk of pneumonia in very old individuals. Also, those who wore dentures during sleep were more likely to have gum inflammation, tongue and denture plaque and positive culture for *Candida Albicans*. This study suggested potential implications of oral hygiene programs for pneumonia prevention in the community (132). Implementation of routine denture hygiene practices could help decrease the risk of respiratory infection among the elderly individuals (127).

In conclusion, control of oral biofilm formation through oral hygiene regimens reduces the numbers of potential respiratory pathogens in the oral secretions (20, 133), and therefore reduces the number of microbes that can be aspirated into the lower airway. This in turn reduces the morbidity and mortality from Aspiration Pneumonia. The advantage of the above-mentioned findings is that this risk factor- inadequate oral care in frail elderly hospital patients and LTC residents- can be modified easily by a simple and straightforward oral hygiene regimen (116, 132, 134).

### **1-5 Barriers to Oral Care in Elderly**

Below are several challenges in oral health delivery for seniors:

- Behavioural barriers
- Financial barriers
- Inadequate access to oral care services
- Lack of public health surveillance

- Regulatory and legislative barriers
- Staff barriers

### **1-5-1 Behavioural Barriers**

Individuals generally seek oral care for problems that cause pain or discomfort (135). In addition, there are some individuals who believe that tooth loss is an inevitable consequence of aging and delay treatment until they lose their remaining natural teeth and receive complete dentures(136). 12% of the elderly population suffers from anxiety in relation to dentistry(137), another barrier that prevents this population from seeking treatment (138).

### **1-5-2 Financial Barriers**

Seniors, with fixed incomes, may have inadequate funds for oral care and other non-insured health care (30). Residents of LTC homes typically have very limited disposable income(31).

Income and possession of dental insurance are strong determinants of oral health status, access to care, and oral care service utilization (30). The inequitable situation is even more noticeable for seniors, especially if they have lost insurance coverage after retirement (30). Uninsured and low to middle income people, including the elderly, tend to avoid dental visits because of the financial cost despite many oral problems (21). People with low incomes typically seek only emergency care (93). Utilization of oral care services decreases with increasing age(135). The seniors face inequity in oral health care, especially within a fee-for-service system(139) and the aging of the Canadian population will exacerbate the problem of inequity (96).

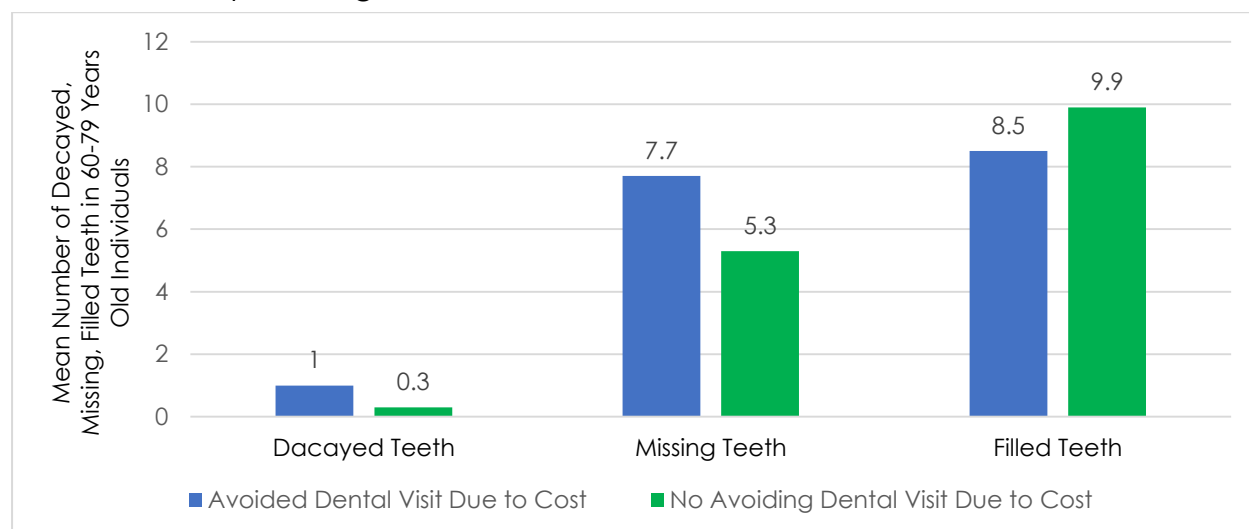
The 2007-2009 CHMS reported that:

- Approximately six million Canadians avoid visiting the dentist every year because of the cost; people without dental insurance of any kind (public or private) do not visit the dentist regularly and avoid oral health care due

to the costs; low- to middle-income people, including older adults, tend to avoid dental visits because of the financial cost.

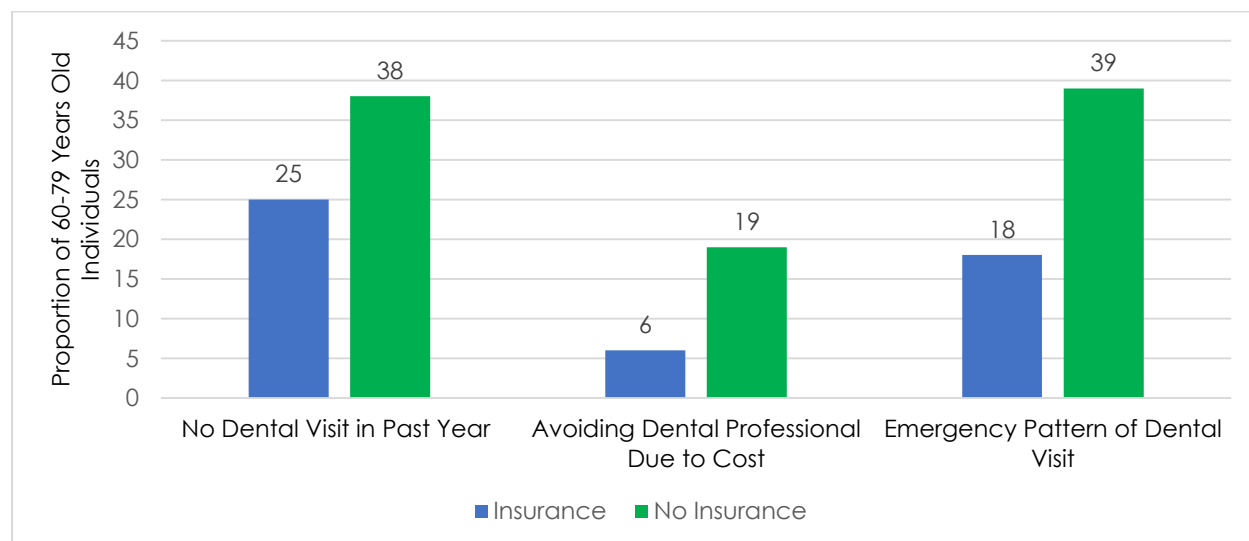
- Canadians 60 to 79 years have access issues, primarily because of a lack of dental insurance in retirement years.
- Among the 60 to 79 years old people, 13% avoided visiting an oral health professional within the last year and even more (16%) declined treatment because of the cost.
- Among the 60 to 79 years old people, 40% of high incomes; 73% of middle incomes; and 68% of low incomes have no dental insurance.
- Among 60 to 79 years old people, 7% of high incomes; 24% of middle incomes; and 24% of low incomes avoid dentist because of cost.
- Half (53.2%) of 60 to 79 years old people had no insurance, 38.6% were privately insured.
- 60 to 79 year old people report having no insurance (53%) much more frequently than younger groups.
- Among 60 to 79 years old people, those avoiding the dentist due to cost having an average number of decayed teeth three times that of those elderly people attending a dentist regularly, and over two more missing teeth than that of regular attenders(21) **[Figure 15 and 16].**

**Figure 15:** Dental Status and Avoidance of Dental Visit Due to Cost Among 60-79 Years Old People Living in Canada - 2007-2009 CHMS



Mean number of decayed teeth and missing teeth in individuals 60-79 years old avoid dental visit due to cost is higher than those do not avoid visit because of cost. Whereas, the mean filled teeth is higher in those who not avoid dental visit (21).

**Figure 16:** Insurance and Access to Oral Care Among 60-79 Years People Living in Canada - 2007-2009 CHMS



Proportion of individuals 60-79 years old with no insurance who have not made a dental visit in the past year; avoided oral health professional due to cost; and dental emergency visits is lower than those with insurance (21).

According to a 2012 report using 2005 Canadian Community Health Survey, in more than 40,000 Ontarian people 12 years and above, seniors reported



significantly poorer access to oral care compared to other age groups. They were the least likely to be insured (36.1%) and to have visited a dentist in the past year (58.6%) (140). In addition, 40% of the elderly in Ontario made dental visits only in emergencies(140).

According to 2008-2009 TOHAP study in Nova Scotia, Canada:

- 32% of individuals  $\geq 65$  years lived in community had dental insurance. This declined to 17% of those living in LTC homes.
- 63% of Nova Scotians  $\geq 65$  years visited an oral health professional at least once a year. This rate declined to 25% of those living in LTC homes (41).

Financial barriers to accessing oral care in LTC residents has been identified in several studies (36, 37). According to a 5-year follow up study in British Columbia, although the expenditure on oral treatment per resident was low, only 60% of residents consented to receive care (36).

### **1-5-3 Inadequate Access to Oral Care Services**

Lack of professional oral service for LTC residents is common in Canada and also other countries (55). It is difficult for LTC residents to access adequate oral care because oral services are mostly limited to emergency care within Canadian LTC homes (36). Many LTC homes lack space for a dental clinic, and not all private dental clinics are wheelchair accessible or meet the demands of providing care to patients with dementia (96). In a Canadian study, only 25% of LTC residents in Nova Scotia reported having regular oral care; 42% reported their last visit to an oral health professional was more than 5 years ago(55) .

### **1-5-4 Lack of Data and Public Health Surveillance**

Another challenge in oral health delivery is a lack of data reporting number of LTC residents who are actually getting care, what percentage of care homes

have regular care contracts, and relative performance of different models (141).

WHO defines public health surveillance as “the ongoing systematic collection, analysis, and interpretation of outcome-specific data for planning, implementation, and evaluation of public health practice”(142). Surveillance activities would detect and monitor oral diseases in LTC residents, assess the impact of interventions, and assist in the management of disease.

### **1-5-5 Regulatory and Legislative Barriers**

Standard of care for provision of dentistry in LTC homes usually does not exist (141). Although differences between LTC homes exist (e.g. some have protocols and others do not) almost every home gives some kind of oral health care, since oral health care is part of the daily care for LTC residents. Nevertheless, the oral hygiene and the oral health care of older people in LTC homes is insufficient. In some LTC homes, oral care for dependent residents include the use of sponge swabs (Toothette® ) and liquid mouth rinse(143). A swab can not remove plaque as effectively as a toothbrush(144). Lemon glycerin swabs as mouth cleanser have been used in nursing homes more than 70 years. They are ineffective and harmful. Lemon decreases the oral pH to 2-4, which can decalcify teeth, increase the risk of dental caries, cause pain and irritate the soft tissues of the oral cavity (43). Despite the fact that tooth brushing is the gold standard of good oral care, a study found that none of the residents had their teeth brushed for 2 minutes and the average time spent by nursing assistants for brushing teeth for LTC residents was only 16.2 seconds per session (44). Residents brushed longer (39 seconds) but were always prompted to stop brushing by the nursing assistants (44). This indicates that care is not in compliance with the available guidelines and protocols, and stresses the importance of a clear evidence-based implementation strategy to improve oral health care (45). In the United States, state policy and regulations have evolved under the federal

mandate to provide oral care. However, these lack 1) evidence-based guidance for meeting the growing LTC population's oral needs and 2) support for the complexities involved in delivery of safe and high-quality oral care (141).

In addition, according to a recent report in the United States, configuration of dental workforce and types of care available to LTC home residents vary according to policy environment of the state. Workforce configuration enabled by scope of practice legislation (in particular for oral hygiene), regulation regarding mobile or tele-health dentistry, and availability of geriatric training for oral health staff impact access to care and the quality of care received by vulnerable individuals (141). Despite the fact that some states require training for LTC staff on oral health care for geriatric population, LTC staff rarely have the depth of knowledge needed to provide daily oral care in a way that is safe for themselves, and safe for residents. The low priority given to oral health in regulations around LTC homes results in a normalization of no or minimal oral care for residents who refuse care or are viewed as not cooperative (141).

In Canada, none of the provinces and territories have a legislative requirement for an oral screening and care plans for new residents in a LTC home, however Ontario has an 'offer' of an annual oral health assessment, and Prince Edward conducts annual dental screenings(145). Oral public health is inconsistent across Canada; each government (federal, provincial, territorial) determines programs and services available to their residents (116). Alberta (the only province), Nunavut, and Northwest Territories have oral health programs for seniors to help low-income seniors with the rising costs of oral care **[Table 4]**.

#### **1-5-6 Staff Barriers**

Provision of oral care to residents in LTC homes is different and more challenging than provision of oral care to clients in other environments (141). The 10 most common systemic diseases in the aging population that impact oral health care are: arthritis; cognitive impairment, Alzheimer disease; chronic obstructive

pulmonary disease; diabetes; head and neck cancer; ischemic heart disease; hypertension; mental health; osteoporosis; Parkinson disease; and stroke. In some of these diseases, the person's dexterity for oral hygiene is reduced. In some, lack of cooperation can make it difficult for oral treatment. Many of these disease requires particular managements before, during or after oral treatments (146).

Frail and cognitively impaired residents require considerably greater resources from providers including: specific supplies; additional staff to support resident's positioning and movement; extra medications to keep the resident comfortable and reduce infection risk; extra time to manage resident behaviour; and increased treatment time to allow the provider to adopt the correct ergonomic posture. Additionally, the treatment protocols for frail residents vary from those for younger or less frail clients. According to a recent U.S. report, states greatly ignore such differences in LTC home regulations, and reimbursement opportunities (141).

In a Canadian study on dentist perceptions of providing care in LTC homes, lack of financial rewards was a main barrier identified (147). Dentists are discouraged from providing geriatric services when insurance payments for oral services are less than the usual dental fees (148). The North Dakota Dental Association in 2015, conducted a survey on barriers to providing oral care in LTC settings. Of the 37 dentists providing care for LTC residents in the state, only 15 responded to the survey. Oral health care services provided in LTC homes rely heavily on the volunteer work of the dental team. Dentists indicated that the most significant barrier to providing oral health care services for LTC residents included availability of suitable treatment space and equipment in the LTC homes. They also stated reimbursement and cost were the major barriers of the expansion of services (149). A survey in Vancouver, Canada showed that 80% of dentists had never treated a patient in a LTC home. About two-thirds of respondents

expressed no interest in offering services to elderly residents. Dentists who attended LTC homes reported they were uncomfortable about the limited options as well as the inadequate space and equipment available(150).

Delivery of oral care to LTC residents requires complex, collaborative, interprofessional team work. All aspects of oral care - daily oral care, oral health assessment, identification of need for professional care, informed consent acquisition, ensuring reimbursement eligibility, organization and accessibility of oral health care professionals - require coordination among multiple care providers and their administrative infrastructures. This effort must involve several health care domains that do not traditionally overlap (141). Management of frail elderly patients with multiple comorbidities usually requires collaboration with other health care professionals (e.g. care aides, dieticians, nurses, physicians, social workers and speech language pathologists). Unfortunately, these Interprofessional educational programs are often missing from the curricula of health care professions due to limitation of time /resources, and low perception of the significance of this aspect of career development (151). However, some studies found that after two to five hours of training, nurses and physicians were able to perform oral screenings with a similar accuracy to that of dentists, and these screenings were suitable for the purposes of referral for a complete evaluation by a dentist(14).

Geriatric training in dental schools is not tracked or required. According to a recent report in the United States with the exception of Registered Dental Hygienist in Alternative Practice, who are specifically trained in geriatric client issues as part of their coursework had no formal geriatric or special need training (141). In Canada, educational institutions are being challenged to develop the necessary competencies for oral service providers who may be required to treat seniors in settings outside the private office. In addition, there is a shortage of faculty qualified in this area(31).

High staff turnover rate in LTC homes is another significant problem, with rates ranging from 55% to 75% for nurses and care aides, and sometimes 100% for care aides alone. Collaborative systems between LTC homes and oral health professionals are challenged by LTC staff turnover, as this result in loss of productivity and poor quality of care (152).

Other barriers to oral care include low priority to provide oral care in nurses, lack of oral health equipment / materials, clients who are uncooperative (44, 153-155), resistant behaviours by residents (156), perceived lack of time (157), a perceived unpleasantness of cleaning mouth(157) , a perception of oral care as invasive to the dignity and privacy of residents (158).

## **1-6 Policy and Position Statements on Seniors' Oral Health, Canada**

The position of Canadian Dental Association (CDA), National Coordinating Group on Access to Care, Canadian Oral Health Roundtable (COHR), Canadian Oral Health Framework (COHF) 2013-2018 on senior's oral health will be discussed in this section.

### **1-6-1 Canadian Dental Association (CDA)**

The Canadian Dental Association (CDA) supports a baseline standard that all LTC homes provide daily oral care supported by access to dentists each year. The CDA states that the minimum oral care requirements for all residents in LTC homes in Canada should include:

- Oral health assessment by an appropriately trained and licensed/registered health professional upon admission and every year thereafter;
- Starting as soon as possible after admission, a referral process to a dentist (for examination, diagnosis and treatment planning);
- A daily oral care plan that is implemented by appropriately trained staff;

- Suitable infrastructure to support the appropriate delivery of needed care by the oral health care team (159).

The CDA and the provincial dental associations are working with government and others to develop strategies that include:

- Developing mandatory oral health standards in LTC homes for daily oral care and annual access to professional care;
- Educating seniors on the importance of maintaining good oral health;
- Educating caregivers and families on the importance of oral health;
- Supporting collaboration among health care providers to promote oral health as part of overall health;
- Supporting tax-based dental benefits for seniors in LTC homes and seniors with low income;
- Supporting LTC homes to allocate space with the appropriate dental equipment to provide preventive, restorative, and surgical care on site (160).

### **1-6-2 National Coordinating Group on Access to Care**

The CDA uses the National Coordinating Group on Access to Care to focus on issues experienced by seniors (30). The National Coordinating Group on Access to Care created an advocacy toolkit which can be used by dentists who advocate for improving oral conditions for seniors in LTC homes. The kit consists of sample draft legislation, a guide to conducting political meetings, a sample op-ed for newspapers and leave-behind documents for meetings. In the following years, the group plans on leveraging that work by collaborating with other stakeholders on seniors' issues. They will particularly focus on working with LTC homes to improve their oral health standards (30).

### **1-6-3 Canadian Oral Health Roundtable (COHR)**

The Canadian Oral Health Roundtable (COHR) is a group of oral health care providers, the dental industry, dental academia, dental insurance carriers, government, special interest groups and related health professionals such as nurses, pharmacists and physicians. The group agrees on the urgent need to address the oral health needs of vulnerable groups including seniors. They have highlighted three specific priorities including oral health standards in LTC homes. The COHR has recommended minimum oral care requirements for all LTC residents, including regular oral health assessments, a referral process to a dentist for examination and a daily oral care plan implemented by staff (30).

### **1-6-4 Canadian Oral Health Framework (COHF) 2013-2018**

The Canadian Oral Health Framework 2013-18 (COHF) is the second national oral health framework produced by the federal, provincial and territorial Dental Working Group with the focus on priority groups including seniors (31).

One of the goals of COHF is to ensure adequate access to oral health care, and to achieve this for seniors COHF recommends that to:

- Increase the number of individuals 60-79 years visiting an oral health professional in the fiscal year (baseline 68.4% vs. target 75%).
- provide screenings, preventive services, referrals for treatment (and possibly treatment services) in LTC homes to serve residents and seniors in the community;
- reimburse preventive and treatment services for LTC residents;
- promote standards, regulations and legislation for publicly-financed LTC homes to:
  - ensure daily oral care and access to professional oral care;
  - provide health room(s) that could be used to deliver oral services;
  - oral health assessment and care plan be part of the program planning



- for new residents; and
- recruit and hire an oral health professional staff member.
- have (provincial/territorial) legislation requiring oral screening of new residents upon entry into a LTC home, as well as ongoing oral health care plans(31).

## **1-7 Importance of Oral Care in Elderly**

### **1-7-1 Health Impact**

While oral diseases (including dental caries and periodontal disease) in all age groups are highly preventable, considerable emphasis should be placed on prevention strategies. This should include highlighting the importance of an appropriate diet (minimal consumption of dietary carbohydrates, particularly between meals), providing client-specific oral hygiene techniques (brushing, flossing, fluoride toothpastes), the prescription of additional fluoride to increase tooth resistance to dental caries (e.g. fluoride rinses, fluoride gel, fluoride varnish), and antibacterial agents (e.g. povidone iodine, chlorhexidine, and cetylpyridinium chloride)(68).

Tooth brushing is the gold standard of good oral care (44) and its effectiveness enhances using fluoride toothpaste. Fluoride plays an important role in prevention of dental caries in all age groups. Fluoride interferes with the process of dental caries in different ways. Fluoride inhibits the function of some enzymes which are essential to the bacteria's ability to produce acid; in addition, the presence of fluoride in plaque and saliva encourages tooth remineralization and enhances the strength of the tooth enamel and its ability to resist acid attack (61). Fluoride toothpastes are available in different fluoride level: high strength fluoride toothpaste (5000 ppm fluoride) to standard strength toothpaste (1000 ppm to 1450 ppm fluoride). A recent two year follow-up study showed that, using fluoride toothpaste in elderly people (twice daily for two minutes) slowed down the rates of progression of both coronal and root caries (58).

According to three well-controlled RCTs, fluoride varnish at 22,600 ppm fluoride (Duraphat varnish) was more effective in caries control in LTC elderly residents compared with normal adult strength toothpaste (1000 ppm to 1450 ppm). There is good evidence that 5% sodium fluoride varnish (26,000 ppm) applied professionally, is effective at reducing caries in an elderly population in LTC homes (61, 161). According to a study both fluoride varnish (26,000 ppm) and 5000 ppm fluoride toothpastes were equally effective at controlling root caries than brushing with 1450 ppm fluoride toothpaste alone in elderly population (61). However, with concerns regarding potential fluoride toxicity due to low body mass, uncertainty over level of supervision to avoid ingestion, and the quantity of daily fluid intake consumed as tea, the use of lower fluoride paste is recommended in elderly population, rather than high strength one (161).

Mouthwashes and oral moisturizers are frequently used in addition to tooth brushes. Povidone iodine, chlorhexidine gluconate or benzethonium chloride are frequently used as ingredients in mouthwashes due to their bactericidal effects. Povidone iodine and chlorhexidine serve as potent bactericidal agents of mouthwash (162), but might not be appropriate for elderly in nursing homes, because these chemicals can cause anaphylactic shock in older adults (163). Chlorhexidine (Peridex™) is an effective antibacterial agent. At low concentration it reduces the growth of bacteria (bacteriostatic), whereas, at high concentrations it kills bacteria (bactericidal) and is used to treat oral infections. Chlorhexidine can cause brown discoloration on teeth/dentures. Moreover, chlorhexidine can interact with fluoride, particularly with the toothpaste containing sodium lauryl sulphate; the latter reduces the antibacterial effect of chlorhexidine. It is recommended they be used at separate times (164). Because this chemical has the ability to cause anaphylactic shock in older adults, it might not be appropriate for use in nursing homes (163). In contrast, cetylpyridinium chloride is safe to use, and would be appropriate for elderly in nursing homes (165). Perivex (cetylpyridinium chloride

0.05% in glycerine) is a non-foaming antibacterial gel. Its antibacterial agent, cetylpyridinium chloride, provides protection against dental plaque and gingivitis. Glycerin, helps lubricate the oral cavity, which is particularly valuable for individuals who do not receive nutrition by mouth and those with dry mouth. Because of its gel form, there is a lower risk for aspiration than foaming toothpastes. Therefore, it is highly recommended for use for residents at risk of choking (165).

The dorsum (back) of the tongue and dentures are sources of oral microbes, and effective cleaning might efficiently reduce the number of oral microbes and reduce the risk of aspiration pneumonia(166). The oral hygiene of elderly who require nursing care is generally poor. It is characterized by a dry mouth and tongue coated with keratinized epithelial tissue and residual food (167). The use of mouth moisturizer is important to increase the impact of oral cleaning, because it is difficult to remove plaque and food debris on dry soft tissue. Oral moisturizers frequently contain glycerin, hyaluronic acid or lactoferrin, which serve as antibacterial agents because of their moisturizing effects (162). The two main types of oral moisturizers are liquids and gels. It's been shown that gels with low transpiration maintained moisture for a longer time compared with the liquid type with high transpiration (162). According to a 2017 study, the combination of mechanical cleaning of the dorsum of the tongue (using brush), the use of a mouthwash, and the application of a mouth moisturizing gel effectively decreased the number of bacteria on the tongue surface and increased the moisture level of the tongue surface of elderly who required nursing care (162). The authors concluded that when moisture levels are sufficiently high, new adherence of microbes might be prevented due to retention of the moisturizing gel on the papillae of the tongue (162).

Oral lubricants can alleviate oral discomfort and moisten the oral mucosa. The Biotène product range, (e.g. toothpaste, mouth rinse, gel, liquid, spray and

chewing gum) has been the most well-known and recommended in Australia. In addition to the LP3 enzyme protein system, further antimicrobial activity is achieved through the addition of fluoride and xylitol (a non-cariogenic sugar) to selected products. The Biotène formulation has shown efficacy in reducing symptoms associated with xerostomia(93), improving oral health and xerostomia-related quality of life (98).

Residents who wear dentures are at high risk of developing infections such as denture stomatitis. Dentures should not be worn overnight. This will give the oral structures a chance to recover from the stress having a denture in all day. Dentures are required to be restored in a sealed container of water when not in the mouth. Brushing with mild soap and water is an effective way to clean dentures. Toothpastes should not be used to clean dentures because they are abrasive and may scratch the denture and become a source of infections. Weekly disinfection of dentures (with sodium hypochlorite solution, or chlorhexidine) is recommended (168). Sodium hypochlorite solution at 0.5% and immersion in 0.12% or 2.0% chlorhexidine, are effective methods in controlling plaque biofilm. They can be used in conjunction with denture brushing to preventively maintain the oral health of denture wearers (169). Daily use of Polident® 3 minute, an enzymatic peroxide-based denture cleanser improves denture hygiene by reducing total microorganisms and total streptococci from dentures. A study showed by immersing removable partial dentures for 3 minutes in Polident® (once a day for 15 days) total streptococci was reduced, However, no reduction in the population of *Candida Spp.* was observed (170).

Improvement in oral health status of LTC residents with daily oral care and/or treatment has been documented in several follow-up studies (54, 171). According to a Canadian study, 3 weeks after intervention, all patients in the chronic care unit showed substantial improvements in the status of their oral cavity. The quality improvement intervention involved discontinuing routine use

of sponge swabs and introducing a twice-daily oral hygiene protocol (performed by staff) using Perivex, two soft, small-headed toothbrushes with large rubberized handles (one to be used for propping), and one End Tuft toothbrush for cleaning between the teeth (143). Among the LTC residents in British Columbia, Canada who received oral treatment of some form over the 5 years, CODE (an index of Clinical Oral Disorders in Elders) showed a significant improvement (36). According to 6-year prospective cohort study on Japanese LTC residents, the number of teeth needing extraction decreased in the individuals who received oral treatment, and increased in the untreated residents. In addition, denture status was better in the treated individuals than in the untreated residents (171). Another 6-month follow-up study reported the denture hygiene in LTC home residents were significantly improved by supervised implementation of an oral health guideline (172).

The key factor in having good oral health is daily oral hygiene care (172). In addition, oral hygiene is necessary to maintain quality of life(43). Evidence shows that that oral treatment has a marked effect on their self-perceived oral health of older adults. Locker in a 3-year longitudinal study reported that benefits of treatment included self-reported improvements in the ability to chew food, to maintain a nutritious diet, to be free of pain, to socialize, and to function successfully in daily life. The study suggests that improvements in the oral health of older adults depend upon access to comprehensive oral treatments (173).

The relationship between oral health and systemic health, particularly aspiration pneumonia is well documented (53). Strong evidence shows oral care have a significant impact on systemic health (131).The findings of a systematic review concluded that there is strong evidence that mechanical oral hygiene decreases occurrence, progression, and mortality risk from pneumonia (range of absolute risk reductions from 6.6% to 11.7%) in LTC homes and Intensive Care Units (ICU). The study concluded that intensified oral hygiene measures

delivered by oral care professionals could prevent approximately one in 10 cases of death from aspiration pneumonia in elderly in hospitals or LTC homes (131). Implementation of routine denture hygiene practices could help decrease the risk of respiratory infection among the elderly individuals (127).

A systematic review concluded that periodontal therapy in diabetic individuals could help improve glycemic control and the subsequent management of diabetes. The authors recommended that periodontal therapy should be part of routine diabetes management (89). Some studies suggested that improvements in periodontal disease will lead to better control of CVD (104). A case control study concluded that successful periodontal treatment in individuals with periodontitis resulted in a significant improvement in flow-mediated dilation of the brachial artery and reductions in inflammatory biomarkers (174). A nationally representative survey in Scotland demonstrated that individuals who reported poor oral hygiene (never/rarely brushed their teeth) had a 1.7 fold increased risk of a CVD event and higher concentrations of CRP, an inflammatory marker (175). Periodontitis might add to the inflammatory burden of the individual and may lead to increased levels of CVD risk based on serum CRP concentrations. A study found that participants with severe periodontal disease who responded to non-surgical periodontal treatment were four times more likely to reduce their CVD risk category (176).

In summary, daily oral care and basic professional oral services for seniors in LTC homes can reduce dental plaque, enhance the overall health and quality of life, improve the success of treatment, reduce the need for invasive/complex /costly treatment, reduce the progression of oral disease (42), reduce morbidity and mortality associated with aspiration pneumonia(131).

#### **1-7-1-1 Impact of Dental Coverage**

Given the challenges of oral treatments for seniors, the main focus should be on prevention of oral disease. Prevention of dental caries among elderly in the LTC

homes is far more cost-effective than the provision of oral treatment(177). All low-income seniors require a basic preventive dental plan. Funding for residents in LTC homes is a starting point(42). Establishing a basic preventive dental coverage plan for LTC residents will provide the following benefits:

- Improve access to basic oral care.
- Ensure timely access to oral care services and early diagnosis to prevent oral disease.
- A preventive approach to care can eliminate more complex and costly treatment in the future.
- Ease the ability to obtain consent, which can be withheld purely due to the cost of care.
- Increase the number of oral health professionals willing to deliver treatment in LTC homes.
- Support residents' health (42).

The British Columbia Dental Association's Report on Seniors' Oral Health in 2008 estimated that it would cost \$2.5 million to create a dental plan for seniors in LTC homes (178). According to data provided by the Ministry of Housing and Social Development in 2008, and based on anticipated program uptake, it is estimated that a low-income senior dental plan for British Columbia would be approximately \$24 million. This would support access to emergency services, basic dental care and denture services. On average, the cost per senior is \$311.71 for emergency care, \$328.66 for basic care, and \$585.07 for denture services. If coverage was provided to only LTC residents, the cost would be almost \$6 million or \$212.82 per resident. Most seniors covered would be treated in dental offices at rates similar to other clients. LTC home residents would be eligible for palliative care-type services at higher fees which would adequately compensate providers for the loss in productivity in providing care in LTC. Therefore, if dental coverage was extended to both low-income seniors groups

(including all residents in LTC homes), the total annual cost is estimated to be \$26.5 million (178).

Wyatt in a Canadian LTC five-year follow-up study showed that the average cost per resident for oral care, excluding examinations, was \$449 in the first year increasing to \$521 in the second year, then declining to \$319 by the end of the study (36). It seem that once the initial demand for oral treatment had been satisfied, the need for ongoing care was reduced(36).

### **1-7-2 Economic Impact**

Aspiration pneumonia which is common in LTC homes leads to great suffering and high treatment cost. In the United States, the treatment cost for each patient has been estimated to vary from \$5,800 to \$20,000 (144). The United States spends almost \$6.5 billion each year to treat patients who suffer from pneumonia (179). Yonyama et al showed the relatively low cost interventions in oral hygiene could decrease some of the higher outcomes of aspiration pneumonia (180). In 2002, there were 19,000 nursing homes in the United States, if each nursing home employed a nurse aide to provide daily oral hygiene care and was paid (with benefit) \$25,000 a year, the total cost would be below \$500 million. If the rate of pneumonia were decreased by only %10 through this intervention, the saving would be \$800 million each year, with the net benefit over \$300 million (180).

Another study showed that the Bedside Oral Exam and the Barrow Oral Care Protocol reduced VAP in ICU patients and was a cost effective method. The Bedside Oral Exam guided individualised oral care with contemporary supplies (such as a tongue scraper, electric toothbrush, non-foaming toothpaste and oral moisturisers). Following introduction of the new supplies, the average monthly cost in 2012 was \$1453.00, a savings of 65%. This initiative was also associated with a 50% reduction in VAP, improved staff satisfaction and reported compliance with oral hygiene (181).



A 2017 study on cost effectiveness (Euro/ DALY) of oral health care (using Monte-Carlo microsimulations) in nursing homes was conducted. Non-professional oral health care was less costly (€3024) but also less effective (0.89 DALYs) than professional oral health care (€10249, 0.55 DALYs). For all presumed payers, professional oral health care was cost-effective, and its cost-effectiveness was higher in underweight, smokers or pulmonary disease patients. Given that professional oral health care, prevents nursing-home-acquired pneumonia and its related mortality, the oral care effectiveness would result in an expected net value of 47 million Euro per year (182).

## **1-8 Oral Service Delivery Model for LTC Residents**

Oral care for LTC residents is traditionally provided at fixed dental clinics, however alternative models for delivering oral care has been designed and tested as for many of these vulnerable individuals whose access to fixed dental clinics is an obstacle. Currently, oral care is delivered through a wide range of models from traditional transport to fully mobile and telehealth models, for LTC residents. These oral service delivery models include:

- Domiciliary oral care
- Eligibility and enrollment model (e.g. referrals, care coordination)
- Mobile-portable model
- Outreach and education model
- Virtual model= teledentistry (e.g. telehealth)

### **1-8-1 Domiciliary Oral Care**

Domiciliary oral care is defined as the provision of oral care in a setting where a person resides permanently or temporarily, as opposed to care delivered in a fixed dental clinic or a mobile dental unit. A recent cost analysis and cost effectiveness analysis in Sweden showed that domiciliary oral care for elderly in

LTC homes is less costly and more cost-effective compared to care at fixed clinics (183).

### **1-8-2 Eligibility and Enrollment Model (e.g. Referrals, Care Coordination)**

Enrollment programs provide enrollment assistance. For example, Medicaid outreach workers, enroll eligible individuals into Medicaid. The Medicaid outreach worker also coordinates with local offices to secure applications and renewal forms ahead of dental visits. Some programs offer referral services. For instance, they refer individuals to a dental home and make arrangement with local dentists to provide oral care services at a reduced cost (184).

### **1-8-3 Mobile-Portable Model**

Mobile clinics are engineered to facilitate a wide range of oral services (e.g. fillings, extractions). These can reach across geographic and socio-economic boundaries and potentially increase access to care and improve overall health outcomes (184).

### **1-8-4 Outreach and Education Model**

Outreach program is a systematic attempt to provide services to particular sections of a community. It targets a population to generate awareness and access oral health care services. The program links individuals to oral health educational/ treatment services (185). One example is the Halton Oral Health Outreach (HOHO) Program in Ontario, Canada (186)(see 1-10-3 Ontario).

### **1-8-5 Virtual Model= Teledentistry (e.g. Telehealth)**

Virtual model leverages telehealth technology to provide comprehensive diagnostic, preventive, and early intervention services to otherwise hard-to-reach individuals. Oral health professionals (such as dental assistants/hygienists) gather diagnostic records, communicate with remote dentists to create a treatment plan using a telehealth system. They treat clients with basic oral

health needs, and refer individuals with more complex needs to dentists in the same geographic area (187).

The Pacific Center for Special Care at the University of the Pacific, Arthur A. Dugoni School of Dentistry in California, has created a new oral health delivery system, the Virtual Dental Home model for patients who might not otherwise be able to access care in a traditional dental office. This model of care has been in operation since 2010 in California (188). Virtual Dental Home Health Workforce Pilot Project, started over the last several years. The project now continues as a permanent program as a result of new legislation. There is increasing demand for this model as the success of the current demonstration is being recognized. Administrators of LTC homes are among those communicating with the Pacific and requesting support/guidance for implementation of a Virtual Dental Home program in their communities (189). As of March 2016, 15 different communities in California (including nursing homes) have implemented this model. Several states have followed California's lead and adopted California's laws and regulations related to the use of teledentistry. In addition, programs in Colorado, Hawaii, and Oregon are also in the process of implementing this model (187).

This model of care uses a cloud-based Electronic Health Record (EHR). The system allows records to be collected in one location and reviewed in a separate place. The Virtual Dental Home is a community-based oral health delivery system in which people receive preventive services and early intervention procedures. The system utilizes telehealth technology to link oral health professionals in the community with dentists in dental offices/clinics (188).

The Pacific uses Registered Dental Hygienists in Alternative Practice (RDHAP), dental hygienist working in public health programs and registered dental assistants. The oral health professionals provide services within their scope of

practice that include client education, triage, case management, preventive measures, and Interim Therapeutic Restorations (ITR). When more complex oral treatment is needed, the Virtual Dental Home connects patients with dentists in the area. Equipped with portable imaging equipment and an internet-based dental record system, allied oral health professionals collect electronic dental records (such as X-rays, photographs, charts of dental findings, and dental and medical histories) and upload the information to a website where they are reviewed by the collaborating dentist. The dentist, who is not at the community site, reviews the client's information and creates an individualized treatment plan based on the client's specific needs. After the dentist reviews the electronic dental records, and if he/she determines that the client needs treatment beyond the scope of what can be delivered in the community site, the allied oral health professionals refer patients to dental offices. In some cases the dentist might come to the community site to provide restorations or other services using portable equipment (188).

The economic analysis showed that ongoing and targeted preventive oral care could result in savings for California's MediCal<sup>10</sup> program. The findings suggested that MediCal could save \$0.20 per resident visit in a skilled nursing home (e.g. each time a resident receives care from the Virtual Dental Home, the MediCal program would experience a fiscal benefit that exceeds the costs of providing the service). The Virtual Dental Home model of care offers a low-cost method to improve oral health outcomes for these vulnerable populations (190). The virtual model improves access to care and requires less time per visit than traditional dental office setting. The cost of delivering services (including diagnostic, preventive, early intervention oral care services, education during case management) is about one-third the cost of delivering the same services in a traditional model (187).

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<sup>10</sup> The California Medical Assistance Program (MediCal) is California's Medicaid program serving low-income individuals.

## 1-9 Seniors' Oral Health Programs/Services in the United States

In this section, several seniors' oral programs in the United States will be discussed **[Appendix 3]**.

### 1-9-1 California

There are several programs available in California for seniors, including Apple Tree Dental Program, Dientes Community Dental, and Tooth Mobile.

Minnesota and California Apple Tree Dental Programs provide services at regional clinics, called Centers for Dental Health, which also serve as care coordination centers for on-site delivery system. On-site care is provided year-round at over 130 community sites including LTC homes throughout Minnesota and California. The innovative on-site services are delivered using customized mobile dental offices at several community sites within an hour radius of each Center for Dental Health. On-site care programs operate alongside Centers for Dental Health to create numerous dental access points. A cloud-based EHR plays a key role in care coordination among all sites and community partners. To date, Apple Tree has provided over one million oral visits and screenings, equating over \$188 million. A notable portion of this care was provided to nursing home residents and other older individuals. Apple Tree's nonprofit status and delivery model keep expenses low. Due to the collaborative practices (i.e. shared spaces and shared staffing) the model leverages community resources and transportation barriers (184).

Dientes Community Dental delivers affordable oral services to vulnerable populations of all ages in Santa Cruz County, California. The program operates mobile services that visit facilities such as skilled nursing homes. The program was initially started by a small group of local private dentists who provided care to underserved populations. The dentists provided services at three different

locations until 2003, when they consolidated into one clinic. Since then, the program has expanded services to additional clinics and dental centers (191).

Tooth Mobile is a mobile oral health program that offers services throughout California. Currently, the program has three mobile dental units that travel across the state. The units are staffed by a dental team who speak Cantonese, English, French, Russian, Tagalog, and Vietnamese, therefore providing inclusive oral healthcare for all (192).

### **1-9-2 Colorado**

Senior Mobile Dental in Colorado is focused on providing oral health services to older adults. In 2007, the organization started providing oral hygiene services to community facilities using the mobile model. In 2013, the program expanded its staff /services and added on-site full oral care. Dentists and registered dental hygienists provide debridement, X-rays, fillings, periodontal treatment, extractions, and denture services. In 2015, Senior Mobile Dental began their teledentistry program to improve access to care for underserved populations; additionally, it partnered with On-Site Care in Minnesota to provide oral services to nursing home contracts. The program provided \$689,100 worth of oral care services to 1,345 individuals that year. The organization also collects data on the demographics, number of older adults treated, medical history, number of appointments/ services provided, and program revenue/expenses. Furthermore, it provides documentation to surveyors in the state (193).

### **1-9-3 Connecticut**

Across the Smiles Northeast Mobile Dental Program was established in 2002 and operates in northeastern Connecticut. Mobile dental units travel to settings such as nursing homes to provide services including emergency care, basic care, comprehensive care, referrals, and client education (194).

#### **1-9-4 Indiana**

The Community-Based Oral Health Program for Senior Citizens in Indiana focuses on older adults (ages 55 and older), and who have not been to the dentist in a year. The program aims to improve access to care among older individuals through education and support. The program promotes education through individual screening, local media, and events. It also supports clients by arranging dental appointments and offering transportation services (195).

#### **1-9-5 Iowa**

In Iowa, the I-Smile Silver Program was established in 2014. It has pilot projects in two counties, with one program coordinator per county to support the local systems. It provides services such as referrals and client/ caregiver education. The program targets older adults (60 years and above), and provides education for nursing homes, caregivers, and the Medicaid Elderly Waiver program (196).

#### **1-9-6 Massachusetts**

Commonwealth Mobile Oral Health Services (CMOHS), a company in Massachusetts, provides a model of portable oral care to those who experience barriers accessing oral care. This comprehensive model offers diagnosis, prevention, therapeutic treatment, and education. Additionally, CMOHS provides full case management and a referral network to local dentists for follow-up treatment. CMOHS currently provides services at more 300 sites in the state focusing on children's oral health. It recently added sites to specifically serve older adults. This award-winning program also collects data on demographics, medical/dental history, current condition, client satisfaction, number of clients/appointments, services delivered, revenue, and expenses (197).

#### **1-9-7 Michigan**

Michigan offers two programs for seniors including Elderly Oral Health Care Consulting, Inc and Hygienist Recommended.

Elderly Oral Health Care Consulting, Inc. in Michigan, targets low-income older adults, individuals with disabilities, and children. This organization primarily offers oral health education to nursing homes. In addition , it runs a mobile service to provide basic services in nursing homes for Medicaid beneficiaries (198).

Hygienist Recommended, in Oakland County, Michigan offers mobile oral services all over the state to treat individuals in settings such as residential care. The program provides services to individuals of all ages, those with special needs or disabilities. Services include basic care, comprehensive care, referrals, and patient/caregiver education (199).

#### **1-9-8 Minnesota**

California and Minnesota Apple Tree Dental Program offer oral services to several community centers such as LTC homes (184)(see *Apple Tree Dental Program in 1-9-1 California section*).

#### **1-9-9 Missouri**

Missouri's Elks Dental Care Program was established to serve children and adults with developmental and mental disabilities. The program collects data on demographics, medical history, number of individuals treated/ appointments, services provided, and program revenue and expenses. Two mobile dental units serve 24 locations throughout the state, with each unit providing care in the western or eastern region of Missouri. Each visit usually last three weeks and is based on demand and time of year. The dentist completes any service that can be done under local anesthetic. For services that require sedation, dentists provide referrals to local hospitals (200).

#### **1-9-10 Montana**

Public Health Dental Hygienists (Limited Access Permit), targets many populations, including low-income people and individuals with disabilities. Dental hygienists with permits in the state of Montana can work in a variety of public health settings, such as nursing homes, and may work without a



supervising dentist. Services include screenings, preventive services, scaling/root planing, and client/caregiver education (201).

### **1-9-11 Ohio**

Smiles for Seniors, ran from 2005 to 2016 in Columbus, Ohio. It was an educational program for caregivers of older adults and those who had lost their dependence and mobility. The program offered free materials on daily oral health maintenance as well as common oral issues and needs. In addition, dentists visited nursing homes and adult day care facilities to deliver educational presentations (202).

### **1-9-12 Oklahoma**

Dentist for the Disabled and Elderly in Need of Treatment, Inc. (D-DENT), a nonprofit organization in Oklahoma City, Oklahoma, works with specific populations including low-income older elderly (60 years and older) without insurance. D-DENT provides free of charge services (screenings and client /caregiver education) in a variety of settings such as senior centers. The program also connects individuals to dentists for the provision of comprehensive services (203).

### **1-9-13 Texas**

The Geriatric Dental Group of South Texas, located in San Antonio, provides emergency care, basic care, and comprehensive care for older adults and individuals with complex medical conditions in nursing homes. The program's dentists and dental hygienists provide bedside services in nursing homes using portable equipment. The dental team also performs complex procedures in a wheelchair-accessible dental office (204).

### **1-9-14 Washington, District of Columbia**

Individualized, Dedicated & Committed, Inc. (IDC), is based in Washington, District of Columbia and treats individuals of all ages. The dentists travel to offices, homes, prisons, nursing homes, and other assisted living facilities to

provide services, including 24/7 emergency services, basic care, comprehensive care, and caregiver education. The system also coordinates care among an individual's other dentists and physicians (205).

## 1-10 Seniors' Oral Health Programs/Services in Canada

Across Canada, several provinces/territories have established standard oral health assessment protocols or guidelines governing the oral care of residents in LTC homes; or offer some oral care services to the residents through certain programs and initiatives. Alberta (the only province), Nunavut, and Northwest Territories have oral health programs for seniors to help low-income seniors with the rising costs of oral care (145). None of the provinces have a legislative requirement for an oral screening and care plans for new residents of a LTC, however Ontario has an 'offer' of an annual oral health assessment, and Prince Edward conducts annual oral screenings(145) [Table 4 ].

**Table 4:** Public Oral Programs for Seniors, Province/ Territory, Canada

Province/Territory	Public Oral Program	Eligible Group	Service (s)
<b>Alberta</b>	Dental Assistance Program for Seniors	Individuals >65years meeting income thresholds; up to a program maximum of \$5,000 per person every five years, depending on income, partial or maximum coverage	Some diagnostic, restorative, endodontic, periodontal, prosthodontic, and oral surgery services (145)
<b>British Columbia</b>	Preventive Dental Health Service	Vulnerable populations including seniors in residential care	Preventive services such as dental screening and education (145)
<b>Nunavut</b>	Seniors Extended Health Benefits	Individuals >60yrs and not eligible for other private or public coverage; \$1000 annual maximum	Emergency, diagnostic, restorative, endodontic, periodontal, prosthodontic, oral surgery services (145)
<b>North Territories</b>	Extended Health Benefits (EHB) Seniors Dental Plan	Individuals >60 years and non-Native or Métis	Emergency, diagnostic, restorative, endodontic, periodontal, prosthodontics, oral surgery services (145)
<b>Prince Edward</b>	Long Term Care Facilities Dental Program	LTC home residents	Dental screening (145)

### 1-10-1 Alberta

Public oral care program in Alberta is known for its commitment to seniors' oral health(145). The Alberta government provides the Dental and Optical Assistance for Seniors programs to low to moderate- income seniors with financial assistance. The Dental Assistance Program for Seniors can provide dental coverage up to a maximum of \$5,000 every five years (206). Some procedures offered include examinations, X-rays, scaling, fillings, trauma/pain control, extractions, root canals, procedures relating to gum disease, full and partial basic dentures (207).

Addressing the oral health needs of Albertans has become more provincially focused with the appointment of the Provincial Dental Public Health Officer and Provincial Oral Health Manager for the Alberta Health Services in 2009. The establishment of these provincial leadership roles led to the Provincial Oral Health Action Plan 2010 framework which recommended standardized, evidence-based prevention and treatment services for children, low income individuals, and seniors across the province to address oral health inequities. Alberta Oral Health Action Plan (2016) updated the existing initiatives and established health promotion; prevention; treatment; and research and surveillance initiatives to meet population (including seniors') needs. The need to support oral health for seniors residing in continuing care facilities remains a focus in 2016 Alberta Oral Health Action Plan. A training program for health care workers to deliver this care is available provincially (208). Alberta Health Services have conducted several pilots projects (to train the staff) to increase capacity of LTC homes to support oral health of residents. They work collaboratively with Zones to expand the modes for training and encourage the LTC homes and health care workers to participate.

The Alberta Dental Association and College has purchased two mobile dental clinics to help increase LTC residents' access to oral health care. A 12-metre

mobile clinic with three dental chairs is used to provide fee-for-service oral services on-site by a team of dental assistants, dental hygienists and dentists (30).

### **1-10-2 British Columbia**

The University of British Columbia (UBC) Elders' Link with Dental Education, Research and Service (ELDERS) group was formed in 1998 to address the oral needs of older adults, but with a particular focus on those who are frail and in hospital. ELDERS group from UBC is a multidisciplinary team of dentists, dental specialists, dental hygienists, social workers, sociologists, geriatricians and statisticians(54). The UBC Geriatric Dentistry Program started in 2002. Currently, the program operates in 27 LTC facilities with a dental team (dentists, dental hygienists, certified dental assistants) and is supported by a specialized team of administrative personnel at the UBC. The program is committed to oral services, education and research (209).

The goal of the program is to provide access to comprehensive oral services (including annual oral health assessment, and treatment as needed). The model of care is based on fee-for-service delivery of oral care. Mobile dental equipment is used to provide oral examinations and basic oral care at bedside. More complex treatments are provided at clinics within the hospitals or at the UBC dental clinic(209).

The Geriatric Dentistry Program educates LTC hospital residents and their families, hospital nursing staff, dental students, and dentists. A dental hygienist provides training to nurses and care aides to provide daily oral hygiene and to recognize mouth conditions. UBC General Practice Residents and dental hygiene students participate in clinical care (209). Dental hygienists recommend oral hygiene products and monitor the provision of daily mouth care for LTC residents (209).

The Geriatric Dentistry Program also include research activities. Researchers at the UBC Faculty of Dentistry were one of the first to document the distribution of oral health problems in LTC homes, and to explore ways of managing the oral problems. Graduate students as well as visiting scientists to UBC are using information collected by the program to learn more about the oral needs LTC residents(209).

The British Columbia Dental Association - in conjunction with the UBC-completed a project that demonstrated the value of having an oral health trained coordinator working with LTC facilities to improve the oral health status of frail seniors. The pilot results will be used in British Columbia Dental Association's continuing advocacy efforts to improve access to care for seniors, including a dental plan for low income seniors. In addition, the British Columbia Dental Association runs the semi-annual Your Dental Health public education campaign to raise awareness on regular oral exams (30).

### **1-10-3 Ontario**

All LTC homes in Ontario are governed by one piece of legislation: The Long Term Care Homes Act, 2007. According to the Section 34 – Oral Care, every resident must receive oral care that includes: 1- twice daily mouth care and cleaning of dentures, 2 - physical assistance to clean their own teeth if required, 3 - assistance, if required, to insert dentures prior to meals and at any other time as requested by the resident or required by the resident's plan of care, and 4 - an 'offer' of an annual oral assessment or other preventive oral care services (210).

Toronto Public Health provides free basic oral services to the eligible individuals 65 years and older at Toronto Public Health dental clinics. The service includes emergency oral care, examinations, X-rays, debridement, fillings, extractions, and some root canal treatments. Full or partial dentures are also covered but

clients should pay the full laboratory cost for dentures/denture repair. In addition, Toronto Public Health, provides some services to LTC homes. These include screening, debridement and identification of dentures (denture labelling), demonstrations on brushing techniques for residents and/or their caregivers, and educational workshops for caregivers and/or independent seniors on the importance of good oral health. These on-site oral screenings are organized by the LTC homes, and not all LTC homes offer this program. The screenings are conducted by a hygienist. As a follow-up, a Toronto Public Health dentist visits the LTC home for further oral assessment and minor denture adjustments if required (211).

The Halton Oral Health Outreach (HOHO) Program, a multi-partner project, was developed to help adults with special needs and elderly persons access oral health care services in the Region of Halton, Ontario. The program provides educational information to seniors, and provides educational information and support to professional and family caregivers on how to assist individuals with their daily oral care needs. These include PowerPoint presentations and oral health Webinars for seniors and caregivers in partnership with Seniors Health Knowledge Network (SHKN). HOHO also links these individuals to oral treatment services in the region. Financial assistance is offered to qualifying individuals to pay for the cost of oral treatment. The program also maintains a database of those oral health professionals who are willing to provide services to the clients in their offices or other settings (186).

The Region of Peel, Ontario offers Seniors' Dental Program which provides basic oral care services (including debridement, fillings, dentures) at no cost to low income seniors who qualify, such as those with no dental insurance (212).

#### **1-10-4 New Brunswick**

The New Brunswick Dental Society fosters the implementation of health treatment rooms in LTC homes across the province. These treatment rooms are

equipped with dental equipment (mostly donated) and provides a space where a local dentist and/or hygienist can provide oral health care on a regular basis (30).

#### **1-10-5 Newfoundland and Labrador**

The Newfoundland and Labrador Dental Association is currently lobbying with the provincial government to open dental clinics in LTC homes (30).

#### **1-10-6 Nova Scotia**

The Nova Scotia Dental Association issues an annual provincial oral health report to the public and government highlighting one aspect of oral health and providing recommendations for improvement (30). The 2015 report focused on seniors' oral health (213).

The Nova Scotia Dental Association also created two public awareness and education websites. In 2003, HealthyTeeth.org, an award winning website, was launched focusing directly on children's oral health. In 2014, the association added additional content to established website, HealthyTeeth.org plus+, focusing on oral care information to seniors and their caregivers (214).

The Oral Care in Continuing Care Settings project developed, implemented and evaluated a comprehensive daily oral care program in three LTC homes and an adult day hospital in rural Nova Scotia. The project team developed comprehensive, hands-on educational resources to assist with daily oral care. This resource package was titled "Brushing Up on Mouth Care Program" and includes: an instruction manual, five education videos, oral care toolkits, assessment and care planning tools, and facilitator guide (215).

#### **1-10-7 Saskatchewan**

The Saskatchewan Oral Health Professions (SOHP), Saskatchewan Oral Health Coalition (SOHC), the Saskatoon Health Region (SHR), Dentists, and some LTC homes have established partnerships for the provision of oral care to the residents of LTC homes. The following section outlines the steps the province has

taken to improve the oral health of LTC residents and the development of Better Oral Health in Long Term Care Program: Best Practice Standards for Saskatchewan.



## 2 Better Oral Health in Long Term Care: Best Practice Standards for Saskatchewan



## 2-1 Program Background

In 2007-2008, two pilot projects began in Saskatoon and Regina to provide clinical oral health services to consenting residents at LTC homes. In the SHR, in partnership with the University of Saskatchewan, College of Dentistry and a private practice dentist, Dr. Raju Bhargava and his team, implemented an oral health pilot project. In Regina, in partnership with the College of Dental Surgeons of Saskatchewan, University of Saskatchewan, College of Dentistry, and a private practice dentist, Dr. Maureen Lefebvre and her team conducted a pilot in Santa Maria LTC home.

In both cities, the LTC residents received free oral health assessments. Any additional treatment required was paid for by the resident or their families who had consented to the treatment.

In Regina, Dr. Maureen Lefebvre conducted the pilot project in the Santa Maria LTC home. Oral treatment was provided on site in a dental operatory for residents. The Santa Maria Seniors Oral Services (SOS) Program originated in 2007 as a pilot project and continues today with the dedication of Dr. Lefebvre and Dr. Reed to improve the oral health of their LTC residents.

In Saskatoon, Dr. Raju Bhargava and his team implemented an oral health pilot project at St. Anne's Home and Saskatoon Convalescent Home. Portable equipment was used to provide oral treatment. At the end of the pilot he has continued to offer oral treatment within these homes utilizing a private practice delivery model.

A 2007 survey of staff, residents, and residents' families involved in the pilot showed that:

- 35% of residents were experiencing problems with their teeth/gums;
- 69% of residents only accessed oral care when there were problems (mobility was the main reason);

- 88% of LTC staff visited a dentist in the past year while 67% of family members of residents visited a dentist in the past year;
- 64% of residents perform their own daily care; and
- The main reasons LTC staff do not provide daily oral care to residents are uncooperative residents and not enough time.

This pilot was instrumental in demonstrating the need for oral health treatment services in LTC homes, on-site oral health professional coordination of services/staff/residents, and basic daily oral care for residents. A positive outcome of the 2007-2008 pilot was a second pilot in 2011 that focused on the use of using an Oral Health Coordinator (OHC) at two SHR LTC homes – Parkridge Community Centre and Sherbrooke Community Centre. This was called the Oral Health LTC Initiative. It was supported with a \$20,000 Community Wellness Grant from the SHR. A registered dental assistant was employed in partnership with the University of Saskatchewan, College of Dentistry. The OHC assisted LTC staff and residents to access oral care at each site. The College of Dentistry-General Dental Residency Program, delegated dentists from the program to provide treatment for residents who consented. All initial assessments were free of charge to encourage residents to participate.

While this second pilot project was under way in 2010-2011, the SOHC<sup>11</sup> was formed. In 2011, the members of SOHC identified oral health care in LTC as the top priority to move forward with. The SOHC common goal is to improve oral health of Saskatchewan residents, particularly among vulnerable populations. They are:

- Community agencies
- First Nations communities
- Health region programs

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<sup>11</sup> The Saskatchewan Oral Health Coalition was originally the Saskatoon Oral Health Coalition until 2012.

- Health professionals
- Interested groups and individuals
- Oral health professionals
- Provincial and national government representatives.

One outcome of the SOHC was the partnership involved in securing the SHR's Community Wellness Grant for the OHC. As a result of the SOHC working with the community related to oral health in LTC homes, the SOHP began to develop standardized recommendations.

The SOHP is a group that represents legislated oral health professions:

- College of Dental Surgeons of Saskatchewan
- Denturists Society of Saskatchewan
- Saskatchewan Dental Assistants' Association
- Saskatchewan Dental Hygienists' Association
- Saskatchewan Dental Therapists Association

Since 2011, SOHP and SOHC have collaborated to build capacity related to oral health in LTC, and to engage the community. Best practice evidence was used to select a strategy and resources that provided a solid foundation for the Saskatchewan Seniors' Oral Health and LTC Strategy. The goal was to find a model and resources that provided the necessary education and training for staff, family, and residents. It also included community feedback and participation.

After significant research, the Better Oral Health in Residential Care model developed originally in Australia (168), was selected as the gold standard for the Saskatchewan Seniors' Oral Health and LTC Strategy. The Better Oral Health in Residential Care is Australia's national program. In 2011, the SOHP and SOHC endorsed the use and adaptation of this program. With the endorsement by the SOHP and SOHC, a licensing agreement was signed between SHR and

Australia. The license allowed for Saskatchewan adaptations. During 2011-2013, SOHP representatives worked to modify the training resources to Canadian/Saskatchewan standards. In 2013, the resource was retitled Better Oral Health in Long Term Care – Best Practice Standards for Saskatchewan (BOH in LTC Program).

The work of the project was to translate evidence-based oral health research into daily practice.

The change in practice was to ensure:

- LTC home staff understand and appreciate the relationship between oral health and general health and the impact this has on residents' quality of life and wellbeing;
- a primary oral health approach is used to improve residents' comfort, wellbeing and quality of life; and
- maintaining residents' oral health as a multidisciplinary responsibility.

Simple key messages were formulated to reinforce the change processes:

- A healthy mouth will improve overall health and wellbeing—good oral health is essential for overall health.
- Six of the best ways to maintain a healthy mouth and protect your residents' oral health are:
  1. Brush morning and night
  2. Fluoride toothpaste on teeth
  3. Soft toothbrush on gums, tongue and teeth
  4. Antibacterial product daily as required
  5. Keep the mouth moist
  6. Reduce the frequency and amount of sugar
- It takes a team approach to maintain a healthy mouth—Work together to protect your residents' oral health.

The framework for implementing changes in oral health practice was based on a preventive daily oral hygiene care regimen, taking into account the influence of residents' responsive behaviours and palliative care considerations on the delivery of oral care.

In early 2014, BOH in LTC Program was focus tested in SHR at Parkridge Centre, a LTC home in Saskatoon, in two of their neighbourhoods. The Parkridge Centre pilot was used as the model for full implementation in other LTC homes in SHR. The pilot project made a transition in October of 2015 when SHR hired a dental assistant into the LTC-OHC position. The development of this position was the result of almost seven years of work by Leslie Topola, the Manager for the Population and Public Health, Oral Health Program, SHR. Currently, there is only one LTC-OHC in the SHR, working closely with several SHR LTC homes to implement and maintain BOH in LTC Program.

In September 2016, the report entitled *"Saskatchewan Seniors' Oral Health and Long Term Care Strategy- Best Practice Standards for Saskatchewan: Better Oral Health in Long Term Care – Best Practice Standards for Saskatchewan"* (74)- with collaboration of SOHP, and SOHC- was released and two related videos were developed. The report included a literature review, comprehensive resources (e.g. comprehensive portfolios for educators, professionals, and staff) and 10 recommendations. In September 2016, members of SOHP, SOHC and SHR presented the report -through slides and video-to the Saskatchewan Ministry of Health, Community Care Branch. The Ministry of Health was very impressed with the presentation and level of information. The Ministry of Health was motivated in keeping the momentum going on this valuable and important work. They stated they would be looking for opportunities to share the strategy/training materials with Directors of Care in all health regions. SHR LTC Advisory Committee has reviewed the report and is supportive.

LTC- OHC has audited and provided trainer refreshers for staff at the Parkridge Centre. In 2016, LTC-OHC implemented BOH in LTC Program at two LTC homes in SHR including Sherbrooke Community Centre and Sunny Side Adventist Centre (see 3-1 *Methods and Materials*). In February 2017, Saskatchewan's only LTC-OHC, did an interview with CBC radio on oral health care in LTC homes in Saskatchewan and called on the Ministry of Health to hire more LTC-OHCs. In March 2017, the Manager of Population and Public Health, Oral Health Program, SHR and the LTC-OHC were invited to present the overview and progress of the BOH in LTC Program to the Ministry of Health, and the LTC Directors of Care in Saskatchewan health regions. There was a focus on the importance of a minimum of one LTC-OHC, who is a registered and licensed oral health professional, in each health region to facilitate the delivery of initial oral assessments, oral examinations and treatment, daily oral hygiene care for residents and oral health education. Health regions expressed interest in the program and were provided with the program resources if they decided to implement the program.

All of the work to date has contributed to the BOH in LTC Program. It has been a community development and capacity building project from the onset. Partners and stakeholders have been supportive of the need to improve oral health in LTC homes.

The benefits of this partnership approach are:

- Collaborative development of the BOH in LTC, education, training program and resource portfolios
- Sustainability and general adaptability of the project
- Integration of oral health care
- Policy development initiatives, for instance, oral health assessment on admission to LTC home
- Comprehensive dissemination of standardized information

- Consideration of reorienting oral care service delivery for residents in LTC home

## 2-2 Recommendations

The SOHP and SOHC have developed and endorsed the following recommendations for consideration and action by the Saskatchewan Ministry of Health. The recommendations are that:

1. The Saskatchewan Government, Ministry of Health, endorse the *Saskatchewan Seniors' Oral Health and LTC Strategy* developed by SOHP collaboratively with SOHC and Seniors Health and Continuing Care in the Saskatoon Health Region.
2. An OHC, who is a registered and licensed oral health professional, should be employed in each health region to facilitate the delivery of initial oral assessments, oral examinations and treatment, daily oral hygiene for residents and oral health education. The OHC will work collaboratively with the LTC, multi-disciplinary team to improve the oral and overall health of residents.
3. Upon entry into a LTC home, an initial oral assessment must be completed by a registered and licensed oral health professional, through the general and medical consent provided by the LTC home.
  - 3.1 Oral assessments should be routinely performed every 6 months thereafter, by an oral health professional or a health care professional trained in oral health assessments.
  - 3.2 Non-oral health professionals performing oral health assessments or care will receive appropriate training developed by the SOHP.
  - 3.3 Training will be provided by oral health professionals.
4. Initial oral assessments will include:
  - 4.1 Personal client record\*, including consent for oral examination
  - 4.2 Review of medical and dental history
  - 4.3 Complete examination of the oral cavity, which includes:
    - 4.3.1 Assessment of hard and soft tissues
    - 4.3.2 Assessment of oral hygiene care
    - 4.3.3 Oral cancer screening
    - 4.3.4 Denture assessment

\*Note: Implementation of a Saskatchewan electronic health record should include an oral health record.



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- 5.** Oral Health Care Policies and Procedures for LTC and Personal Care Homes\* are standardized and implemented based on best practice for optimal oral and overall health for residents in LTC in Saskatchewan. Policies should ensure that every LTC resident has the right and access to the following oral health care services:

- 5.1** An individualized oral health care plan
- 5.2** Basic oral hygiene supplies
- 5.3** Daily oral hygiene
- 5.4** Access to professional oral health services
- 5.5** Oral health record included within the health record
- 5.6** Dental recommendations/orders are followed

\*Note: As per Section 23 of the current Personal Care Home Regulation (1996), each resident receive an oral examination, as necessary.

- 6.** Treatment needs based on the oral examination, may be provided by dentists, denturists, dental hygienists, dental therapists and/or dental assistants. Residents may access oral health services through their personal oral health professional or through oral health services as available through the LTC home. Oral examinations require:

- 6.1** Consent for oral examination
- 6.2** Treatment plan and progress notes
- 6.3** Estimate and consent for financial responsibility
- 6.4** Consent for treatment

- 7.** The Saskatchewan Seniors' Oral Health and LTC Strategy is incorporated into post-secondary educational health training programs, orientation, and continuing professional development (i.e. for care aides, nurses, physicians, etc.).

- 8.** The standard for new LTC homes includes provision for a treatment room suitable for a variety of health professionals including access to portable dental equipment to facilitate oral treatment.

- 9.** Surveillance, evaluation and continuous quality improvement be performed on an ongoing basis to demonstrate improved health and oral health status outcomes.

- 10.** The Saskatchewan government establish a safety net program to increase access to oral health services for low income seniors (similar to Ministry of Health Supplementary Health/Family Health Benefits or Alberta's Dental Assistance for Seniors Program through which low income seniors are eligible for up to \$5000 every 5 years for those aged 65 and older).

## 2-3 Primary Oral Health Care Framework for Residents in LTC Home

Based on the principles of the Ottawa Charter<sup>12</sup> (216) the following primary oral health care framework for residents in LTC homes is recommended.

### ❖ **Build Healthy Public Policy**

- Saskatchewan Ministry of Health endorsement of oral health standards
- LTC home oral health policies and procedure
- Regular oral health assessment
- Oral health screening on admission to LTC home
- Resources for oral hygiene and oral health treatment
- Networks between LTC homes and oral health professionals

### ❖ **Create Supportive Environments**

- Multidisciplinary involvement
- Incorporation of oral health team into the LTC environment
- Access to oral hygiene care tools
- Addressing issues of nutrition, medication oral adverse effects and swallowing problems

### ❖ **Develop Personal Skills**

- Constant theoretical and practical oral health education, training and support for LTC staff
- Addressing issues of a residents' dementia, and responsive behaviours and communication problems

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<sup>12</sup> Ottawa Charter was launched by the WHO in 1986 at the first international conference for health promotion.

#### ❖ **Re-orient Health Services**

- Use of oral health team in LTC homes
- Increased access to portable dental equipment
- Provision of a range of oral health treatments
- Availability of room for oral health treatments in the LTC homes
- Focus on primary oral care strategies

#### ❖ **Strengthen Community Actions**

- Advocacy from community groups
- Distribution of oral health information to community groups



## 2-4 Resources-Adaptation

The resources that are implemented in the BOH in LTC adopted from the Australian Better Oral Health in Residential Care. These include a suite of three portfolios (Educators, Professional, and Staff), Oral Health Assessment Tool (OHAT), Oral Health Care Plan (OHCP), posters, and pamphlets, brochures (74).

### 2-4-1 Educators' Portfolio

This is for delivery of the education and training program.



- This portfolio is the training guide used by the OHC/oral health professional who trains staff.
- Contains detailed information on oral health, common oral conditions that are prevalent in older adults in LTC home, instructions on oral hygiene procedures, presentation tips and facilitator notes.

## 2-4-2 Professional Portfolio

This is for oral health professionals, physicians and other health professionals.



- This portfolio contains detailed information on oral health problems faced by residents, Oral Health Assessment Tool (OHAT), Oral Health Care Planning guidelines and dental referral protocol.

## 2-4-3 Staff Portfolio

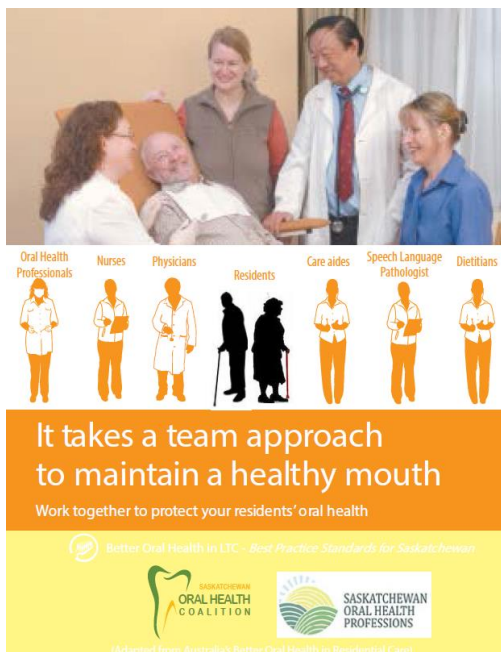
This is for care aides and nurses.



- This is given to every LTC staff member who attends educational sessions and training. It is a self-learning tool.
- Contains detailed information on oral health, common oral conditions that are prevalent in older adults in residential care, instructions on oral hygiene procedures.

## 2-4-4 Posters and Pamphlets

These posters contain the information on relationship between oral health and general health, daily oral hygiene care and a team approach to resident's daily oral care **[Appendix 4]**.



## Six of the best ways to maintain a healthy mouth



Clean your mouth every morning and every night.



Use a soft toothbrush to brush your teeth and to clean your gums and tongue.

If you require help, a care giver may sometimes use an extra toothbrush, so that they can see inside your mouth.

Replace your toothbrush with a new one with the change of seasons (every three months).

If you wear dentures clean them by brushing with a denture brush using soap and water. Rinse well. Disinfect dentures once a week. Dentures should have your name on them.



Keep your mouth moist by sipping water.

A lip moisturiser may be helpful.

Try to reduce the amount of sugary drinks, juices and coffee you drink.



Use only a pea-sized amount of fluoride toothpaste to protect your teeth.

Spit - do not rinse after brushing so the fluoride can soak into your teeth.



If you wear dentures take your dentures out overnight to rest your gums. Soak your cleaned dentures in a container with cold water.



Cut down on sugary foods and beverages, particularly between meals.

## A healthy mouth will improve overall health and well-being

When your mouth is not clean, germs from the mouth may enter the airways and cause chest infections such as pneumonia.

The same blood that goes through infected gums also goes through the rest of the body.

This may cause infections far away from the mouth and may increase the risk of having a heart attack or even a stroke.

When oral health is poor, it can lead to:

- bad breath
- bleeding gums
- dental pain and infection
- inability to eat
- low self-esteem
- poor/impaired speech
- tooth decay
- change in behavior when pain or infection is present

Simple daily mouth care and regular checks will help protect you



Good Oral Health is essential for Overall Health

(Adapted from Australia's Better Oral Health in Residential Care)

### 2-4-5 Oral Health Assessment Tool (OHAT)

The Oral Health Assessment Tool (OHAT) utilized in this project is modified from the OHAT developed by Chalmers in 2004. In this modified colour-coded OHAT **[Appendix 5]**, the following aspects of the residents' mouth can be examined. They are divided into 9 categories:

- Exterior of face
- Lips
- Tongue
- Gum and tissues
- Oral cleanliness
- Teeth
- Denture(s)
- Saliva
- Dental pain

Each of these nine categories is graded as Healthy (green), Changes (yellow), or Unhealthy (red). If any one of the categories was assessed as 'unhealthy', the resident is to be referred to an oral health professional for a detailed oral examination. If the resident is assessed as 'healthy' or 'changes', the oral condition should be managed by the caregiver using the Oral Health Care Plan (which is individualized for each resident).

Additional referrals to other health professionals may be required.



## Better Oral Health in Long Term Care – Best Practice Standards for Saskatchewan

### Oral Health Assessment Tool (OHAT)

**Resident:** ☐ is independent    ☐ needs reminding    ☐ needs supervision    ☐ needs full assistance

- |                                                     |                                              |                                                              |                                            |
|-----------------------------------------------------|----------------------------------------------|--------------------------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> not able to open mouth     | <input type="checkbox"/> grinding or chewing | <input type="checkbox"/> head faces down                     | <input type="checkbox"/> refuses treatment |
| <input type="checkbox"/> has responsive behaviour   | <input type="checkbox"/> bites               | <input type="checkbox"/> excessive head movement             |                                            |
| <input type="checkbox"/> not able to rinse and spit | <input type="checkbox"/> cannot swallow well | <input type="checkbox"/> does not take dentures out at night |                                            |

**Date – dd/mm/yyyy**  
(Re-assessment every 6 months)

<b>Exterior of face</b>	<b>Healthy</b> Both sides of face/neck are symmetrical, no lumps or bumps, swallowing normal, lips open and close								
	<b>Changes</b> Asymmetrical changes to face/neck, presence of lumps or bumps, swallowing challenging, lips do not open or close								
	<b>Unhealthy *</b> Asymmetrical changes to face/neck, presence of lumps or bumps, painful swallowing, lips do not open and close *								
	<b>Dental referral</b> Y – Yes * N – No								

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

Date	Assessor Comments

## 2-4-6 Oral Health Care Plan (OHCP)

The individualized Oral Health Care Plan (OHCP) is a mirror cling that is in the washroom of each resident who received an oral health assessment [Appendix 6].

Oral Health Care Plan			
Name: _____			
Oral Health Assessment (OHA) Date: _____			
Challenges: <input type="checkbox"/> difficulty swallowing <input type="checkbox"/> frequent head movement <input type="checkbox"/> difficulty opening mouth <input type="checkbox"/> fear of being touched <input type="checkbox"/> difficulty eating/nutrition			
Interventions: <input type="checkbox"/> bridging <input type="checkbox"/> modelling <input type="checkbox"/> hand over hand <input type="checkbox"/> distractions (activity board/toy) <input type="checkbox"/> alternative provider <input type="checkbox"/> other _____			
Daily Activities of Oral Hygiene			
	Morning	After Lunch	Night
<b>Natural Teeth</b> <input type="checkbox"/> Yes <input type="checkbox"/> No Cleaned by: <input type="checkbox"/> Self <input type="checkbox"/> Supervise <input type="checkbox"/> Assist Replace toothbrush (once every 3 months) Date: _____	<input type="checkbox"/> clean teeth, gums, tongue	<input type="checkbox"/> rinse mouth with water <input type="checkbox"/> antibacterial product (teeth & gums)	<input type="checkbox"/> clean teeth, gums, tongue
<b>Denture</b> <input type="checkbox"/> Full <input type="checkbox"/> Partial <input type="checkbox"/> Upper <input type="checkbox"/> Lower Inserted/removed by: <input type="checkbox"/> Self <input type="checkbox"/> Staff Cleaned by: <input type="checkbox"/> Self <input type="checkbox"/> Supervise <input type="checkbox"/> Assist	<input type="checkbox"/> clean teeth, gums, tongue <input type="checkbox"/> brush denture	<input type="checkbox"/> rinse mouth with water <input type="checkbox"/> rinse denture <input type="checkbox"/> antibacterial product (gums)	<input type="checkbox"/> clean teeth, gums, tongue <input type="checkbox"/> brush denture with mild soap <input type="checkbox"/> leave dentures out overnight <input type="checkbox"/> soak denture in cold water Disinfect dentures (weekly) Specify day: _____
<b>Oral Hygiene Aids</b> <input type="checkbox"/> soft toothbrush <input type="checkbox"/> modified toothbrush <input type="checkbox"/> toothbrush grip <input type="checkbox"/> denture brush <input type="checkbox"/> spray bottle (labelled)	<b>Oral Health Care Products</b> <input type="checkbox"/> mild soap (denture) <input type="checkbox"/> antibacterial product <input type="checkbox"/> saliva substitute <input type="checkbox"/> lip moisturiser <input type="checkbox"/> fluoride toothpaste	<b>Additional Oral Care Instructions</b> <input type="checkbox"/> antifungal gel <input type="checkbox"/> denture adhesive <input type="checkbox"/> interproximal brush <input type="checkbox"/> tongue scraper <input type="checkbox"/> normal saline solution	
Date of next assessment: _____			
Signed: _____		Date: _____	

The OHCP is completed by the OHC/oral health professional/health professional based on the findings of the oral health assessment. The plan is to be carried out by the care providers on a daily basis. Each care plan is tailored for individual residents, based on their oral care needs and ability levels (as to whether the residents need assistance with oral care or just reminding).

The OHCP contains information on the residents:

- oral health problems (difficulty in swallowing, etc.);
- special interventions for the resident (bridging, hand over hand, distractions);
- oral hygiene regime, if resident has natural teeth or dentures or both; and
- oral hygiene aids and oral health care products to be used.

## 2-5 Basic Oral Hygiene Supplies

Based on the pilot program at Parkridge Centre in Saskatoon the following products are to be supplied to each resident within the monthly allowance for personal care items for LTC homes. This is approximately \$20.25 per month.

### 2-5-1 Residents Needing Assistance or Having Swallowing or Expectorating Difficulties

The oral hygiene products that are supplied are:

- Perivex (antibacterial non-foaming tooth gel) **[Appendix 2]**
- Two Toothbrushes GUM (one to be used for mouth propping)
- End-Tuft toothbrushes GUM (for cleaning between the teeth)



Along with these products, the Oral Health Program at SHR provides Collis Curve toothbrushes to the LTC home for residents who require this specialized brush( this brushes three sides of a tooth at once).

The use of Perivex as an antibacterial gel was adopted from the oral care policies in Deer Lodge Centre, a LTC home in Manitoba. A study in this LTC home showed that following the implementation of new protocol for oral care (toothbrushing and use of Perivex) oral health status of the residents significantly improved. Residents showed reductions in debris, plaque, bleeding gums, and bad breath (143).




Supplies for Residents Needing Assistance or Having Swallowing or Expectorating Difficulties		
Product	Cost per unit (2016)	
Perivex	\$ 1.67	
Toothbrush GUM	\$0.52	
End-Tuft toothbrush GUM	\$0.50	
Collis Curve toothbrush	\$4.50	

## 2-5-2 Residents That Are Edentulous

The oral hygiene products that are supplied are:

- Perivex (antibacterial non-foaming tooth gel)
- Toothbrushes GUM
- Polident Tablet **[Appendix 2]**



Supplies for Residents that are Edentulous		
Product	Cost per unit (2016)	
Perivex	\$1.67	
Toothbrush GUM	\$0.52	
Polident Tablet	\$0.11 per tablet	

### 2-5-3 Residents with Natural Dentition Not Requiring Assistance

The oral hygiene products that are supplied are:

- Fluoridated toothpaste – residents that are able to spit/swallow independently can use regular toothpaste.
- Toothbrushes GUM
- End-Tuft toothbrushes GUM



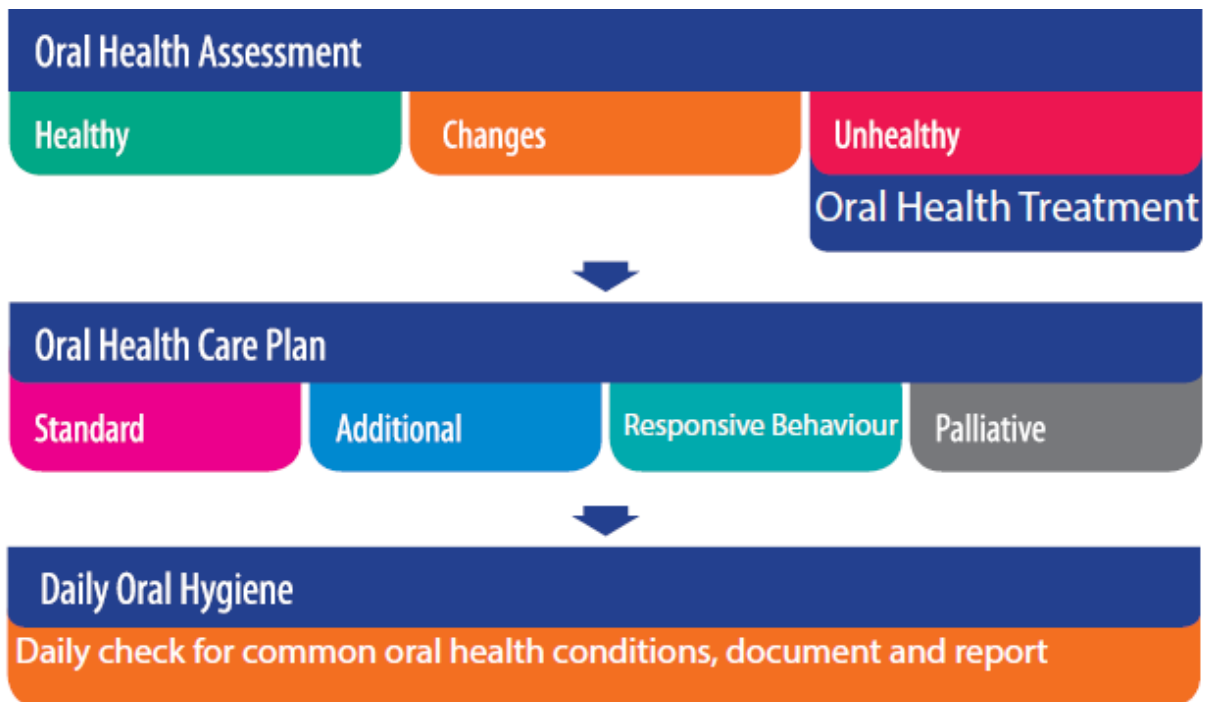
Supplies for Residents with Natural Dentition not Requiring Assistance		
Product	Cost per unit (2016)	
Fluoridated toothpaste (24 gram tube)	\$0.72	
Toothbrush GUM	\$0.52	
End-Tuft toothbrush GUM	\$0.50	

## 2-6 Key Processes

The Australian Better Oral Health in Residential Care model was modified and adapted to the Canadian/Saskatchewan health care system. The main modification made was the identification and delineation of responsibilities to the four key processes of the BOH in LTC.

The four key processes are:

1. Oral Health Assessment
2. Oral Health Care Plan
3. Daily Oral Hygiene
4. Oral Health Treatment



Better Oral Health in LTC – Best Practice Standards in Saskatchewan model requires a team approach to maintain a resident's oral health care.

The Oral Health Care Team (OHCT) may be comprised of an OHC, care aides, nurses, physicians, other health professionals and oral health professionals (dental assistants, dental hygienists, dental therapists, dentists, and denturists).

From this OHCT, appropriate members will be responsible for the four key processes.

- Oral Health Assessment – this is performed by a registered and licensed oral health professional on admission of a resident, and subsequently, on a regular basis and as need arises by the OHC/oral health professional or nurse.
- Oral Health Care Plan – the OHCT develops an oral health care plan.
- Daily Oral Hygiene – trained care aides are designated to maintain daily oral care based on the oral health care plan.
- Oral Health Treatment – referrals for a more comprehensive oral health examination and treatment are made on the basis of the oral health assessment. Oral health treatment can be provided in the LTC home or at a private/public oral care service outside the care home. It is recognized residents may be best treated at the LTC home.

## **2-7 Stakeholders**

Stakeholders include:

- Oral Health Professionals

LTC-OHC, dental assistants, dental hygienists, dental therapists, dentists, and denturists.

- LTC Home Staff

care aides, nurses, physicians and other health care professionals employed at the LTC home.

- Residents

The aim of the program is to provide good oral care to residents at the LTC homes. The focus of all the other stakeholders should be the residents and the better oral health outcome to be attained.



## **A LTC-OHC:**

- Delivers presentations to the LTC Directors of Cares.
- Trains/mentors and provides oral health guidance and expertise to the workforce.
- Provides daily health education to the Continuing Care Aides (CCAs) and promote the BOH in LTC Program.
- Provides assessment of the oral health of residents.
- Assists with the referrals.
- Assists with the new annual consents and medical/ dental history forms that need to be completed by the residents before they are seen by a Dentist- support staff to help complete the dental consents.

Following a presentation to the LTC Directors of Care delivered by LTC-OHC, directors who are interested in implementing the BOH in LTC Program are responsible to contact the LTC-OHC to present the program to their LTC homes. LTC-OHC will be invited to a home to train their staff and implement the BOH in LTC Program.

Registered Nurses (RNs), Manager(s), and CCAs are invited to participate in the training. CCAs that have been identified by the Manager to implement the program and will be the oral health champions in their neighbourhood to train the other CCAs. The training is a full day or two half days (*see 3-1-1 Training the Staff*). Training staff includes train the trainer, so staff can train the other staff they work with. LTC-OHC encourages the staff to report to the oral health champions any difficulties they have with providing daily oral care. LTC-OHC will assess any oral health issues that the newly trained staff are challenged with.

Mentoring in LTC homes happens on a weekly basis through visits, emails and phone calls until each staff feel comfortable with the training. LTC-OHC ensures trained staff all have an understanding of why it is so important for residents to have a clean mouth daily.

## 2-8 Main Messages

A healthy mouth will improve overall health and wellbeing. Six ways to maintain a healthy mouth for residents:

1. Brush morning and night
2. Fluoride toothpaste on teeth
3. Soft toothbrush on gums, tongue and teeth
4. Antibacterial product daily as required
5. Keep the mouth moist
6. Reduce frequency and amount of sugar

It takes a team approach to maintain a healthy mouth, with care aides, nurses, physicians, allied health professionals and oral health professionals taking responsibility for all of the four key processes:

1. Oral health assessment
2. Oral health care planning
3. Daily oral hygiene
4. Oral health treatment

## 2-9 Oral Health Care Education and Training

Literature has shown that while a number of oral health programs were developed for residents in care homes, only a handful of programs were successful.

Some of the key reasons that led to the successful programs were:

- A multidisciplinary approach was used. The team included care givers, oral health professionals, general physicians, facility managers and other key organization members.
- An OHC should be appointed, who facilitates the program and liaises with LTC staff and management.

- An Oral Health Contact Person (OHCP) can also be appointed. This person can train other new caregivers and also confirm if daily oral care is provided to the residents.
- Educational training should be provided to all caregivers. This training should be both theoretical and hands-on including basic oral health, oral diseases that are commonly seen in residents and how to provide daily oral care.
- Educational materials (information sheets, manuals) should also be provided along with training.
- Caregivers were monitored to ensure guidelines and standard protocols/standard work were followed when providing oral care (33, 217).

### **2-9-1 On-going Oral Health Care Training Program in Saskatoon**

BOH in LTC Program was first implemented in 2013-2014 in one neighbourhood<sup>13</sup> at Parkridge Centre. Parkridge Centre is a LTC home for 237 residents, located in Saskatoon, Saskatchewan.

The following steps were undertaken to implement the program:

- Dental Health Educators (DHEs) from SHR conducted initial oral health assessments using the OHAT.
- Utilizing the Educators' Portfolio, DHEs provided educational training, as well as hands-on instruction for daily oral care to two Clinical Nurse Educators
- Clinical Nurse Educators in turn trained two CCAs using the train the trainer model.

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<sup>13</sup> Each LTC home is divided into different neighbourhoods. The residents live in the neighbourhoods with the dedicated staff. Each neighbourhood is subdivided into households/houses.

- Pre and post tests were provided during the training, which supported understanding and knowledge transfer between the DHEs and the LTC home staff being trained.
- The OHCP mirror clings were customised for individual residents who received an oral health assessment and placed in their washrooms. The resident's caregivers refer to this care plan as their guide to provide daily oral care.
- Oral health kits, containing residents' oral hygiene products: antibacterial product (Perivex), 2 soft handled toothbrushes, and an end-tuft brush were placed in every resident's room.
- Thereafter, oral care became the responsibility of two RNs and two CCAs to train staff in the five other neighbourhoods to do the oral health assessments without the aid of an oral health professional. All five neighbourhoods were assessed by the RNs identified by the Team Managers of the neighbourhoods. As of May 2015, BOH in LTC Program was implemented in six neighbourhoods at Parkridge Centre.

## **2-10 Oral Health Care Policies/Standards for LTC Homes**

Standard oral health care policies, procedures or standard work should be made available for all the LTC homes in Saskatchewan. This will ensure a standard practice of daily oral health care throughout the province.

Templates of oral health care policies, procedures or standard work that can be implemented are:

- Foam swab (Toothette®)
- Lemon glycerine swabs
- Oil based lubricants
- Oral care and tube feeding
- Proper oral care in LTC

- The provision of oral care
- Work standard – oral care routine assessment
- Work standard – proper oral care in LTC (74).

Generic forms are:

- Consent for oral exam
- Oral assessment report
- Annual oral examination consent form
- Record of treatment
- Consent for oral treatment
- Oral services - resident tooth chart
- Consent for financial responsibility for oral treatment
- Assessment of current hygiene care
- Denture assessment care (74)

## 2-11 Research and Data from Saskatchewan LTC-Oral Health Projects

In 2007, two projects were launched in Santa Maria Senior Citizens Home (Regina), and at St. Ann's Senior Citizens Village and Saskatoon Convalescent (Saskatoon). From these two projects data collection and analysis were made on the oral health status, treatment needs and average cost of treatment of the residents [Tables 5 and 6].

**Table 5:** Findings of 2007 Pilot Project in Santa Maria and St. Ann's (Qualitative Research)

Statistics	Santa Maria	St. Ann's
Average Age (years)	85	87
Male/Female (%)	34/66	24/76
Residents requiring oral health care %	66	68
Dentate (residents with teeth) %	57	43
Edentulous (residents without teeth) %	43	57
Edentulous with dentures (residents without teeth and with dentures) %	85	94
Faulty dentures (%)	38	54
Dentures without ID (%)	81	62
Residents with decay (%)	43	67
Oral hygiene time (total hours)	30	25
Restorations required (numbers)	40	24
Restoration time (total hours)	40	24
Denture repairs (numbers)	13	5
Dentures repairs (hours)	4	13
Extractions (numbers)	21	18
Extractions (hours)	12	12
Total Treatment (\$)	15255.50	9443.50
Treatment cost per resident (\$)	157.27	255.23

Along with this data and analysis, an oral health survey was gathered at the St. Ann's Senior Citizens Village and Saskatoon Convalescent Home. The purpose of this survey was to gather baseline data on residents, family members, and staff on behaviours and beliefs about oral health.

**Table 6:** Findings of 2007 Pilot Project in Santa Maria and St. Ann's (Qualitative Research)

Consistent Themes Throughout both LTC Homes
<ul style="list-style-type: none"> <li>• Staff who received an education session and then answered the post-test survey answered significantly more questions correctly than staff who completed the pre-test and had not had an education session in both LTC sites.</li> <li>• Staff at both LTC sites indicated that the most challenging aspect of providing mouthcare to residents is uncooperative residents.</li> <li>• The primary reason given by family members who reported that the LTC resident does not go for regular dental treatment is because they wear dentures.</li> <li>• On average, residents at both sites only answered 7 out of the 13 true and false questions correctly.</li> <li>• At least 30% of residents at both sites were currently experiencing problems with their teeth or gums.</li> <li>• Many residents (ranging from 50-80%) at both sites do not believe they need a dental check-up or were unsure because they do not have teeth.</li> </ul>

## 2-12 Program Achievements and Impact

To date BOH in LTC Program achievements and impact are:

- A report entitled "Saskatchewan Seniors Oral Health and Long Term Care Strategy: Better Oral Health in Long Term Care: Best Practice Standards for Saskatchewan" was released in September 2016. The report and recommendations for consideration/action was presented to the Saskatchewan Ministry of Health, Community Care Branch. The Ministry of Health was motivated and interested in keeping the momentum going on this work. They will be looking for opportunities to share the strategy/training with other Directors of Care in all health regions.
- Two videos on BOH in LTC (2016) and one documentary video (October 2017) was launched.
- The SHR LTC Advisory Committee reviewed Better Oral Health in LTC strategy and is supportive (2016).
- In February 2017, Saskatchewan's only LTC-OHC, did an interview with CBC radio on oral health care in LTC homes in Saskatchewan and called on the Ministry of Health to hire more coordinators. Following a CBC radio interview with SHR LTC-OHC, town of Kamsack within Sunrise Health Region, Saskatchewan has expressed interest in implementing BOH in LTC Program.
- In March 2017, the Manager of Population and Public Health, Oral Health Program, SHR and the LTC-OHC were invited back the to present the overview and progress of the BOH in LTC Program to the Ministry of Health, and the LTC Directors of Care in Saskatchewan health regions. There was a focus on the importance of a minimum of one LTC-OHC (who is a registered and licensed oral health professional) in each health region to facilitate the delivery of initial oral health assessments, coordinate oral examinations and treatment, daily oral hygiene for residents and oral health education. Health regions expressed interest in the program and



were provided with the program resources if they decided to implement the program.

- The majority of Saskatchewan health regions have expressed interest in or implemented BOH in LTC Program **[Table 7]**.
- The evaluation of BOH in LTC Program showed a significant improvement in oral health status of two LTC homes in Saskatoon, SHR (see 3-2 Results) following the Implementation of BOH in LTC Program
- A scientific poster “ Evaluation of the Oral Health Status of Saskatchewan Long Term Care Home Residents” was presented at the 51th Canadian Association of Public Health Dentistry in Toronto (September 22-23, 2017). The poster was well received among the attendees.

**Table 7:** Better Oral Care in Long Term Care Program at the Saskatchewan Health Regions

Health Region	Description
Athabasca Health Authority	Senior Dental Therapist has assessed residents at Stony Rapids Health Centre, and provided oral health supplies.
Cypress Health Region	DHE provides Oral Health Module for CCAs training in Community College.
Five Hills Health Region	<ul style="list-style-type: none"> <li>• Contract dental hygienist/ therapist provides oral health assessments at Providence Place.</li> <li>• DHE provides annual assessments at Grasslands Health Centre in Rockglen. DHE would like to begin the BOH in LTC Program there.</li> <li>• Referrals from Prairie Villa and Ross Payant Centennial Home in Assiniboia, Lafleche, and Gravelbourg.</li> <li>• BOH in LTC Program will be implemented in neighbourhoods at Extendicare.</li> </ul>
Heartland Health Region	<ul style="list-style-type: none"> <li>• The SHR LTC-OHC has trained/orientated a dental hygienist to implement the BOH in LTC Program for Heartland Health Region and Prairie North Health Region.</li> <li>• DHE provides Oral Health Module to Special Care Aides taking course at community college.</li> </ul>
Mamawetan Churchill River Health Region	Consultant/referral dentist has provided oral health assessments as requested by Senior Dental Therapist.
Prairie North Health Region	<ul style="list-style-type: none"> <li>• Contract dental hygienist (Unity) has been trained and will be implementing BOH in LTC Program.</li> <li>• In the past, DHE and Speech-Language Pathologist implemented training for LTC staff in several LTC homes, to provide assessments and daily oral care. Due to staff changes, this has changed.</li> </ul>

Prince Albert Parkland Health Region	<ul style="list-style-type: none"> <li>• DHE provides Oral Health Module for CCAs at the Saskatchewan Polytechnic in Prince Albert.</li> <li>• DHE provided assessments in the following LTC homes: Birchview Home (Birch Hills); Evergreen Health Centre (Leoville); Health Complex (Spiritwood); Herb Bassett Home (Prince Albert); Lakeland Lodge (Big River); Mont St. Joseph (Kinistino); Parkland Terrace Pineview Terrace Special Care Centre (Hafford); Wheatland Lodge (Leask); Whispering Pine (Canwood)</li> </ul>
Regina Qu'appelle Health Region	<ul style="list-style-type: none"> <li>• DHEs and dental assistants with Primary Health Care have implemented BOH in LTC Program, and have completed education in the following LTC homes: Balcarres Integrated Care Centre; Centennial Lodge (Broadview); Echo Lodge (Fort Qu'Appelle); Golden Prairie Nursing Home (Indian Head); Grenfell Pioneer Home; Long Lake Valley Integrated Care Centre (Imperial); Montmartre Health Centre; St. Josephs Integrated Care Centre (Lestock); Silver Heights (Raymore); South East Integrated Care Centre (Moosomin); Whitewood Community Health Centre; Wolseley Integrated Care Centre.</li> <li>• DHEs, dental assistants and Director of Care have been trained on BOH in LTC Program (assessments, etc.).</li> </ul>
Saskatoon Health Region	<ul style="list-style-type: none"> <li>• The SHR LTC-OHC has audited and refreshed staff at the Parkridge Centre.</li> <li>• The SHR LTC-OHC implemented BOH in LTC Programs in the following LTC homes: Sherbrooke Community Centre; SunnySide Adventist Centre</li> <li>• Two contract dental hygienists will work with LTC and within acute care to implement BOH in LTC Program.</li> <li>• The following LTC homes have contacted SHR LTC-OHC to implement BOH in LTC Program: Saskatoon Convalescent Home and Central Haven Special Care Home and Luther Special Care Home.</li> <li>• The SHR LTC-OHC will give a presentation on BOH in LTC in Saskatoon where North Battleford and Assiniboine DHEs will travel to observe the presentation.</li> </ul>
Sun Country Health Region	<ul style="list-style-type: none"> <li>• The Sun Country Health Region contacted SHR LTC-OHC to give a presentation on BOH in LTC Program.</li> </ul>
Sunrise Health Region	<ul style="list-style-type: none"> <li>• The Sunrise Health Region will be starting a pilot in one LTC home using BOH in LTC framework.</li> <li>• DHE trained in BOH in LTC Program.</li> <li>• Following a CBC radio interview with SHR LTC-OHC, town of Kamsack has expressed interest in implementing BOH in LTC Program.</li> </ul>

DHE: Dental Health Educator

### 3 Evaluation of Better Oral Care in Long Term Care Program



Monitoring of oral health and evaluation of oral health program are essential functions of public health. Reporting the oral health trends of the community and the effects of interventions, provides accountability for the funds spent.

A study was conducted to analyze the oral health status of residents of two LTC homes in Saskatchewan and assess the effects of the implementation of BOH in LTC Program over 6 months. The evaluation was conducted by a targeted literature review as well as statistical data analysis. Literature reviews have been previously provided in the background section (see *1- Background*).

### 3-1 Methods and Materials

In 2016-2017 BOH in LTC Program was fully implemented in at two LTC homes (Sherbrooke Community Centre and Sunny Side Adventist Centre) in Saskatoon, SHR. The program was adapted at three neighbourhoods of Sherbrooke Community Centre and all three neighbourhoods at the Sunny Side Adventist Centre [Table 8].

**Table 8:** Sherbrooke Community Centre and Sunny Side Adventist Centre – Number of Residents and Neighbourhoods

LTC home	Total number of residents	Total number of neighbourhoods	Neighbourhoods assessed	Total number of residents at initial assessment	Total number of residents at follow up assessment
Sherbrooke Community Centre	263	7	<ul style="list-style-type: none"> <li>• Kinsmen Village (Houses 1 to 7)</li> <li>• Veteran's Village (Houses 8 to 11)</li> <li>• 4<sup>th</sup> Floor</li> </ul>	148	115
Sunny Side Adventist Centre	104	3	<ul style="list-style-type: none"> <li>• Diefenbaker</li> <li>• Prairie land</li> <li>• Riverview</li> </ul>	104	62
Total				252	177

#### 3-1-1 Training LTC Staff

A full day of training (or two half days) was booked at the LTC homes. SHR LTC-OHC invited RNs, Manager(s), and CCAs to training. These CCAs were identified by the Manager to implement the program and would be the oral health champions in their neighbourhood to train the other CCAs.

RNs and CCAs received professional training by a LTC-OHC. The training process was as follows:

- Participating staff were given a pre-quiz- questions about oral health to assess their understanding of oral health.
- PowerPoint presentations (three modules) and a video (one 3-hour learning module) were used as training resources.

- 1<sup>st</sup> Module- Daily Oral Care. Some hands on demonstrations was given as well.
- 2<sup>nd</sup> Module - Good Oral Health and What to Look for in the Mouth. Some hands-on demonstrations was given as well.
- Videos “Mouth Care Without a Battle” or “ Dental Rescue” (created by the Australian program) were shown.
- 3<sup>rd</sup> Module- things in the first 2 modules were put into perspective. Change in resident’s behaviours, health changes due to medications, different situations with the residents were also discussed.
- The participating staff were given a post-quiz- questions (the same questions as pre-quiz questions). Then explanation for each question was provided.
- 3-hour hands-on training was provided, so LTC staff could have the opportunity to identify various oral health problems. LTC-OHC provided OHAT, and the Daily Oral Care mirror clings for the residents’ rooms.
- “Purpose of mouth is to keep the mouth and body healthy” **[Appendix 4]** was posted in their staff rooms along with the “Lift the Lip” pamphlets **[Appendix 7]**.

LTC-OHC returned to these two homes to assist staff with their OHATs over the weeks following the initial training day. She visited their weekly huddles and encouraged the staff with the positive impact they have had on the improvement of the residents quality of life through the implementation of BOH in LTC Program. She also attended their huddles to encourage staff and to train new staff that joined the LTC home.

Mentoring in LTC homes happened on a weekly basis through visits, emails and phone calls until staff feel comfortable with the training they received. LTC-OHC also ensured that the trained staff have an understanding of why it is so

important for the residents to have a clean mouth daily. The communication between LTC-OHC and staff in these two homes, also took place through a mail box labeled DENTAL. Staff filled out forms and placed them in the mail box to be reviewed/assessed by the LTC-OHC through regular visits. The LTC-OHC reported weekly to the Manager of Oral Health Program, Population and Public Health, SHR.

### 3-1-2 Initial Oral Health Assessment

Sherbrooke Community Centre has 263 residents, consisting of seven neighbourhoods. The oral health status of residents in Kinsmen Village neighbourhood (Houses 1 to 7), Veteran's Village (Houses 8-11), and the forth floor was assessed. In Sunny Side Adventist Centre, 104 residents lived in three neighbourhoods. The oral health of residents in all three neighbourhoods (Riverview, Diefenbaker, and Prairie land) was assessed **[Table 8]**. In 2016-2017, 252 residents in these LTC homes were initially assessed.

The oral health assessments were provided at no cost to the resident under the BOH in LTC Program. Oral health assessments were done for the residents in the comfortable surroundings of their own rooms. This was conducted by a LTC-OHC or a RN who has received the training from the LTC- OHC. The oral health assessments were conducted by using a visual approach with a flash light, in a position best suited to the residents individual needs (e.g. in a wheel chair) with care and attention to their medical conditions. Oral health assessment was provided using OHAT. In this modified colour-coded OHAT **[Appendix 5]**, the following aspects of the residents' face/mouth was examined: exterior of face, lips, tongue, gum and tissues, oral cleanliness, teeth, denture(s), saliva, and dental pain. Each of these nine categories was graded as Healthy (**green**), Changes (**yellow**), or Unhealthy (**red**) **[Table 9]**. If any one of the categories was assessed as 'unhealthy', the resident was referred to an oral health professional for a detailed oral examination. If the resident was assessed as 'healthy' or

'changes', the oral condition was managed by the caregiver using the OHCP (which was individualized for each resident).

**Table 9:** OHAT Scores

	Healthy	Changes	Unhealthy
<b>Exterior of Face</b>	Both sides of face/neck are symmetrical, no lumps or bumps, swallowing normal, lips open and close	Asymmetrical changes to face/neck, presence of lumps or bumps, swallowing challenging, lips do not open or close	Asymmetrical changes to face/neck, presence of lumps or bumps, painful swallowing, lips do not open and close
<b>Lips</b>	Smooth, pink, moist	Dry, chapped or red at corners	Swelling or lump, red/white/ulcerated bleeding/ulcerated at corners
<b>Tongue</b>	Normal moist, roughness, pink	Patchy, fissured, red, coated	Patch that is red and/or white/ulcerated, swollen
<b>Gums and Oral Tissue</b>	Moist, pink, smooth, no bleeding	Dry, shiny, rough, red, swollen, sore, one ulcer/sore spot, sore under dentures	Swollen, bleeding, ulcers, white/red patches, generalized redness under dentures
<b>Saliva</b>	Moist tissues watery and free flowing	Dry, sticky tissues, little saliva present, resident thinks they have a dry mouth	Tissues parched and red, very little/no saliva present, saliva is thick, resident thinks they have a dry mouth
<b>Natural Teeth</b>	No decayed or broken teeth or roots	1-3 decayed or broken teeth/roots, or teeth very worn down, mobile	4 or more decayed or broken teeth/roots or fewer than 4 teeth, or very worn down teeth, mobile
<b>Dentures</b>	No broken areas or teeth, worn regularly, and named	1 broken area or tooth, or worn 1-2 hours per day only or not named	1 or more broken areas or teeth, denture missing/not worn, need adhesive or not named
<b>Oral Cleanliness</b>	Clean and no food particles or tartar in mouth or on dentures	Food tartar, plaque 1-2 areas of mouth, or on small area of dentures	Food particles, tartar, plaque most areas of mouth or on most of dentures
<b>Dental Pain</b>	No verbal behavioural signs or physical signs of dental pain	Verbal &/or behavioural signs of pain such as pulling at face, chewing lips, not eating, responsive behaviour	Physical pain signs (swelling of cheek or gum, broken teeth, ulcers), as well as verbal &/or behavioural signs (pulling at face, not eating, responsive behaviour)

### 3-1-3 Oral Daily Care Plan

The oral daily care plan was made through a team approach (between LTC-OHC, RN, CCAs). Based on the residents' ability level (i.e. independent, needs

reminding, supervised, fully assisted) it was decided as to whether they required full assistance with oral care, or gentle reminding or fully assistance. It was also determined at this time whether a resident needed toothpaste or an oral antibacterial gel (Perivex). Then OHCP, was posted on their mirror to make it readily available to each CCA for providing care for each resident who received an oral health assessment **[Appendix 6]**. Daily mouth care was adjusted to meet the individual needs of each resident.

### 3-1-4 Daily Oral Care Delivery

CCAs delivered daily oral care based on the oral daily care plan. In Sherbrooke Community Centre, in neighbourhoods Kinsmen Village and Veteran's Village there were 2 CCAs for an 8 hour shift caring for 9 residents. On the forth floor, there were 2 CCAs in an 8 hour shift caring for the needs of 20 residents. The same CCA performed daily oral care.

Based on the pilot program at the Parkridge Centre in Saskatoon, basic oral hygiene supplies were charged to each resident (approximately \$20.25 per month).

For residents required assistance or had swallowing/expectorating difficulties, the following oral hygiene products were supplied:

- Perivex (antibacterial non-foaming tooth gel, instead of fluoridated toothpaste)
- Two toothbrushes GUM (one to be used for propping<sup>14</sup>)
- End-Tuft toothbrushes GUM (for cleaning between the teeth)
- Collis Curve toothbrushes (for cleaning all three sides of teeth at the same time for residents who require this specialized brush).

For edentulous residents, the following oral hygiene products were supplied:

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<sup>14</sup> Two brush technique



- Perivex (antibacterial non-foaming tooth gel)
- Toothbrushes GUM
- Polident tablet (for cleaning dentures)

For residents with natural dentition who did not require assistance, the following oral hygiene products were supplied:

- Fluoridated toothpaste
- Toothbrushes GUM
- End-Tuft toothbrushes GUM (for cleaning between the teeth)

For residents with dry mouth, a mouth moisturizer such as Biotène was prescribed. In addition, sips of water (throughout the day) and Perivex for moisturizing dry and cracked lips was encouraged (up to six times a day, if needed). For ill-fitting dentures, denture adhesives such as Poligrip or Fixodent was used.

#### **CCAs:**

- Wore gloves, glasses and a mask to prevent cross-contamination.
- Removed dentures before brushing.
- Encouraged residents to brush their own teeth and supported care where needed. They always brushed with a soft tooth brush.
- If resident could not spit or had trouble swallowing tooth paste was replaced with Perivex- using only a dab on the tooth brush while brushing.
- Always chose a comfortable location for brushing- in the bathroom, if possible.
- Brushed around the mouth in sequence to cover all parts of the teeth (the outer, inner and chewing surfaces). Also, brushed the tongue.
- Engaged the resident in the process - let them know what they were doing as they did it.

- Replaced toothbrushes every three months, when worn or following a cold or flu.
- Always stored toothbrushes upright in a container.

**Residents:**

- Brushed natural teeth twice a day; especially before bedtime.
- Used a soft toothbrush with a pea-sized amount of fluoride toothpaste.
- Could use an electric or adaptive toothbrush- this could help residents with dexterity problems.
- Cleaned between teeth with floss or an interproximal brush to remove plaque and food debris.
- Were informed not to brush dentures with regular toothpaste.
- Asked to visit the dentist regularly.

The RNs followed up with checking the daily oral care that the CCA's provide for the residents and completed the referrals to a dentist/denturist as needed. Referrals were made for more comprehensive examination, broken ill-fitting dentures, fillings, or debridments. Consents for referrals, were completed by RNs and or LTC-OHC. For unlabelled dentures, denture identification (denture labeling) was performed by a dental therapist or the LTC-OHC who received training from the dental therapist.

### **3-1-5 Oral Exam/Treatment**

Fee-for- service dentistry was provided either on-site by dental team (e.g. dentist, hygienist) or by a resident's private practice dentist/denturist. If a resident received Social Services, Veteran Affairs or private dental insurance the dental fees were direct billed to those insurance companies, the patient did not have to pay up front first. For residents with financial barriers, the LTC-OHC followed up with Social Services to apply for assistance. Residents with their own

private practice dentists, were transported to the office by a family member or a taxi.

The oral service included exams, X-rays, scaling and fluoride varnish, fillings, extractions, root canals, crowns, denture repair, full dentures, partial dentures, and night guards.

At the Sherbrooke Community Centre, the oral services were provided on-site at the Sherbrooke Community Centre Dental Clinic. At the Sunny Side Adventist Centre, portable equipment was used to provide oral treatment for consenting residents. A dentist would bring portable equipment and the dental team were given space to work in storage rooms, meeting rooms, beauty salons or the residents' rooms. Varsity Dental Group (one dentist, dental assistants, dental hygienists) provided oral health services at both LTC homes. The dental hygienists, performed oral hygiene services (scaling and fluoride varnish), and the dentist with his dental assistant performed oral treatments.

With regard to oral hygiene services, fluoride varnish was applied after the scaling was completed. Some residents were seen at 3, 4 or 6 month intervals, whereas for some (e.g. First Nations and those with Social Services) fluoride varnish was applied once each year. This was because the insurance company would only cover this charge every 12 months.

### **3-1-5-1 Generic Forms**

Generic forms used in the study were developed by the Dean of College of Dentistry, University of Saskatchewan, the Manager of Oral Health Program, Population and Public Health, SHR and SHR LTC-OHC.

The forms include: **[Appendix 7]**

- **Annual oral exam consent** - The form is completed by the residents or family or power of attorney before the dentist sees a resident for the first time as new client. The form can be completed for a one signing time.

- **Medical history form for oral exam** - The form is completed by the residents or family or power of attorney before the dentist sees a resident for the first time as new client. Medical questions on this form need to be completed by the resident care coordinator.
- **Daily record of treatment** - This form is used for routine visits and is dated by the dentist or dental hygienist and OHC-LTC.
- **Consent for financial responsibility for oral treatment** - This form will be completed by the dentist and then be signed by the residents or family before the dental work is started.
- **Consent for oral treatment** - This form is to be completed by the dentist and then be signed by the residents or family when there is a change in treatment plan.

### 3-1-6 Follow-up Oral Health Assessment

Following six months, the oral health status of the same individuals were re-assessed [Table 8].

### 3-1-7 Statistical Analysis

The oral health status of residents before and after program implementation was analyzed using Wilcoxon Signed-Rank Test (SPSS Statistics 22). P-value <0.05 was significant.

## 3-2 Results

### 3-2-1 Training

In total, 49 staff (including Director of Care, Managers, CCAs, RNs) received training by a LTC-OHC [Table 10].

**Table 10:** Numbers of Staff Trained for the BOH in LTC Program

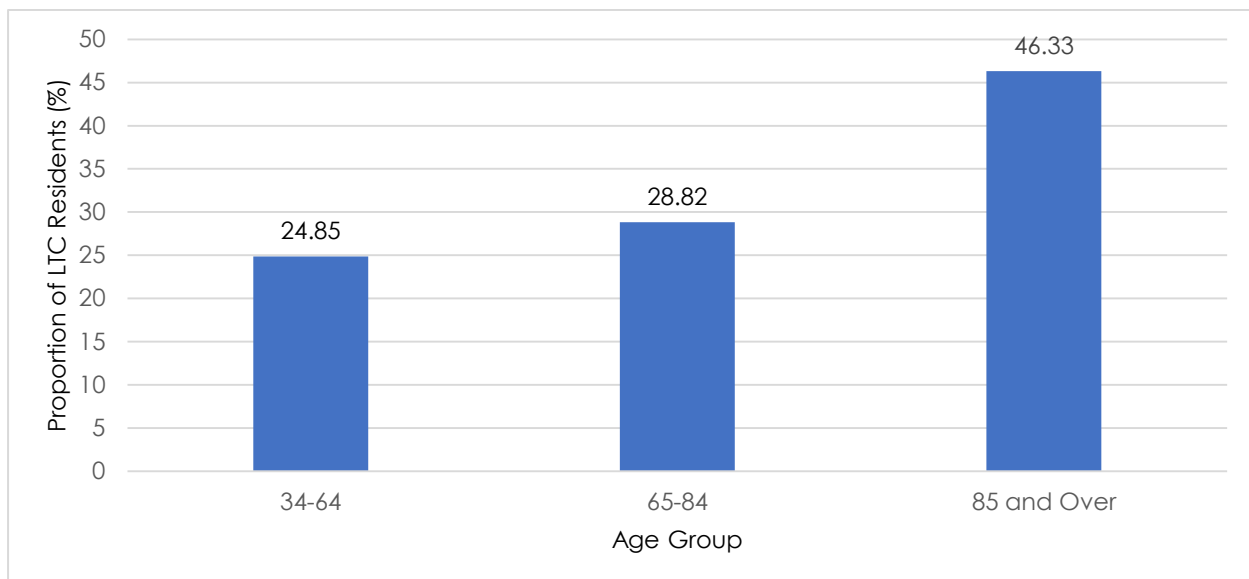
LTC Home	Number of Staff Trained
<b>Sherbrooke Community Centre</b>	<b>39</b> <ul style="list-style-type: none"><li>• 1 Leadership Manager of Learning and Growth/ Training and development</li><li>• 7 Neighbourhood Team Mangers</li><li>• 9 Registered Nurses</li><li>• 22 Continuing Care Aides</li></ul>
<b>Sunny Side Adventist Centre</b>	<b>10</b> <ul style="list-style-type: none"><li>• 1 Director of care</li><li>• 1 Leadership Director of Education and Safety</li><li>• 1 Resident Care Coordinator</li><li>• 2 Registered Nurses</li><li>• 5 Continuing Care Aides</li></ul>
Total	<b>49</b>

### 3-2-2 Oral Health Status

Initially, the oral health status of 252 residents was assessed. However, 75 individuals (almost 30%) were not followed up due to death, moving to another home, or refusal to be assessed. The data analysis included 177 participants.

The oral health status of 177 residents 92 females (52%) and 85 males (48%) were assessed. The residents ranged from 34 to 102 years old with the average age of 76.24±17.65 years. Seniors made up 75.15% of the residents' population, and 46.33% of residents were 85 years and older [Figure 17].

**Figure 17:** Proportion of LTC Residents by Age Group



75.15% of the residents were  $\geq 65$  years old.

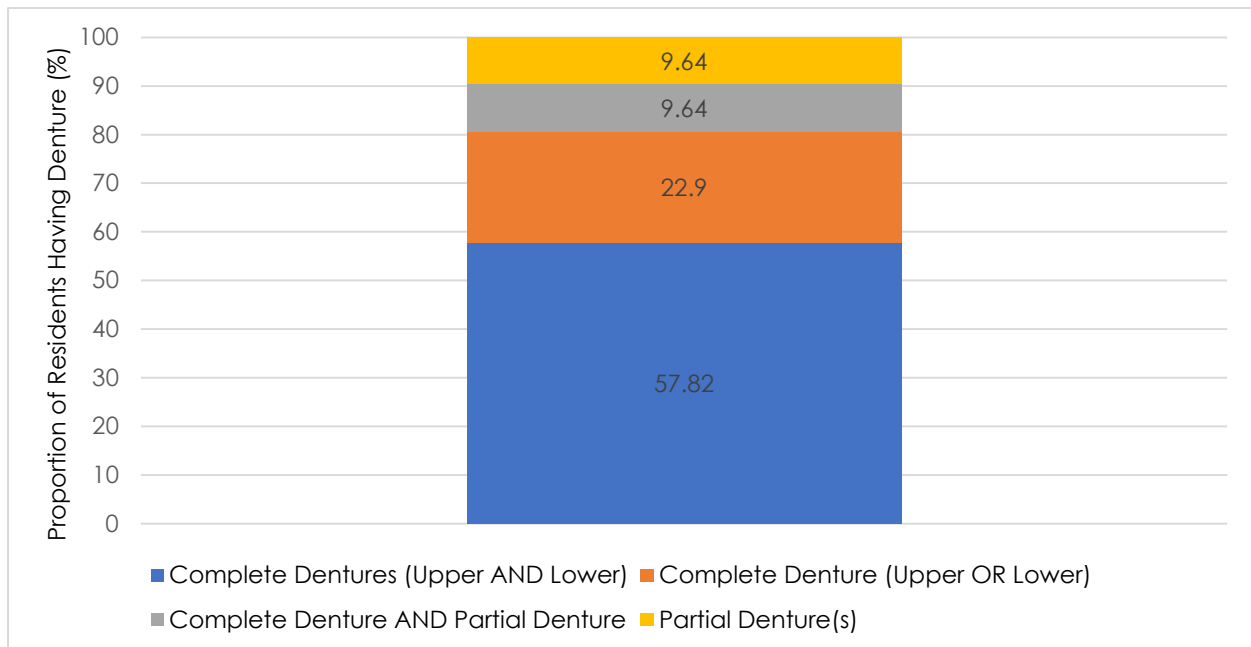
Initially and after 6 months, out of 177 residents: 111 individuals were (62.72%) dentate, and 66 (37.28%) were edentulous; and 83 residents (47%) wore dentures (either partial or complete) **[Figures 18-20]**.

Of 177 residents, 83 wore dentures: complete denture(s) and/or partial denture(s). More than half, 48 (57.82%) wore complete dentures (both arches), 19 (22.90%) wore complete denture in one arch, 8 (9.64%) wore complete denture in one arch and partial denture in another arch, 8 (9.64%) had partial dentures (in one or both arches) **[Figure 18]**.

Among 66 edentulous residents, the majority, 48 (72.73%) wore a complete denture in both arches, 5 (7.57%) had either upper or lower complete dentures, and 13 individuals (19.70%) didn't have any dentures **[Figure 19]**.

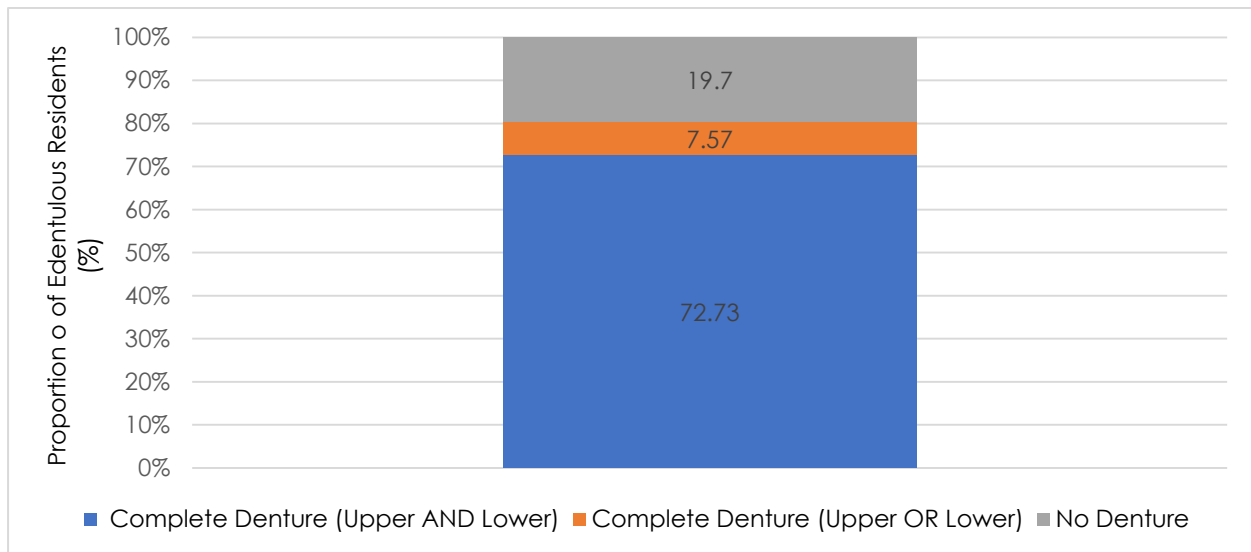
Of 111 dentate residents, 14 (12.60%) had either upper or lower complete dentures, 8 (7.21%) had complete denture in one arch and partial denture in another arch, 8 (7.21%) had partial denture(s), and 81 individuals (72.98%) didn't have any complete/partial dentures **[Figure 20]**.

**Figure 18:** Proportion of Residents Having Denture - Denture Type



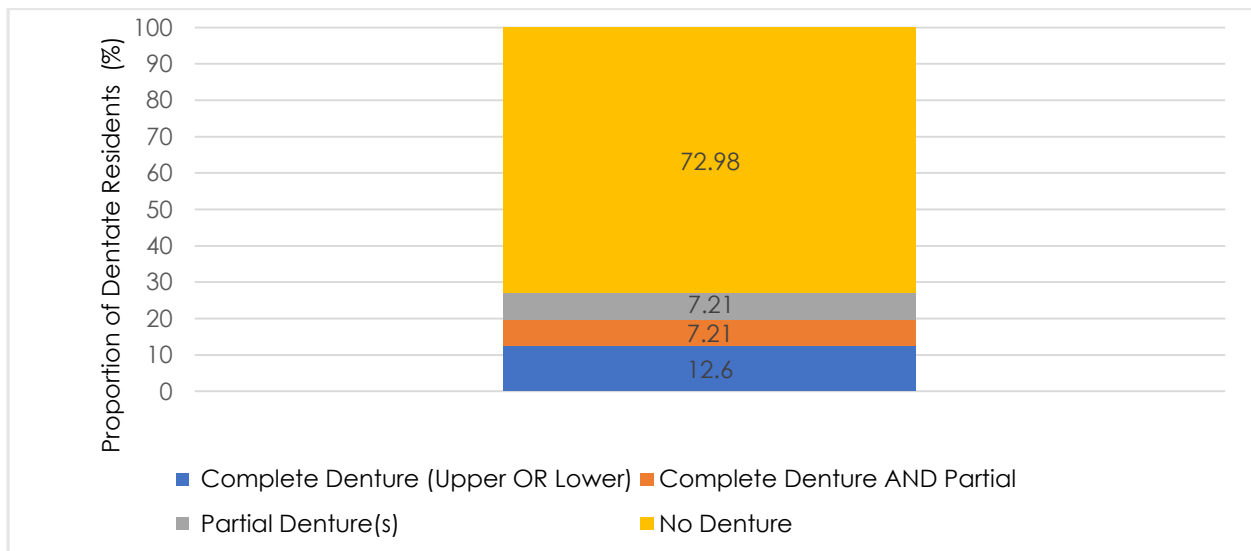
Of 177 residents, 83 (47%) used dentures (initially and after six months): complete denture(s) and/or partial denture(s). More than half, 48 (57.82%) used complete dentures in both arches, 19 (22.90%) used complete denture in one arch, 8 (9.64%) used complete denture in one arch and partial denture in another arch, 8 (9.64%) had partial dentures (in one or both arches).

**Figure 19:** Proportion of Edentulous Residents Having Dentures



Of 177 residents, 66 (37.28%) were edentulous. Among 66 edentulous residents, the majority, 48 (72.73%) had complete denture in both arches, 5 (7.57%) had either upper or lower complete dentures, and 13 individuals (19.70%) didn't have any complete dentures. The majority (80.3%) of edentulous residents had dentures.

**Figure 20:** Proportion of Dentate Residents Using Dentures



Of 177 residents, 111 (62.72%) were dentate (initially and after 6 months). Among 111 dentate residents, 14 (12.60%) used either upper or lower complete dentures, 8 (7.21%) used complete denture in one arch and partial denture in another arch, 8 (7.21%) used partial denture (s), and 81 individuals (72.98%) didn't have any complete/partial dentures.

Among dentate residents, 27.02% had removable denture (upper and/or lower complete, or partial denture).



2 (1.8%) of 111 dentate residents used electric brush. 97 (54.80%) of 177 residents used Perivex for dry lips. And for 11 (6.21%) of residents Biotène products were utilized to relieve dry mouth.

The result of Wilcoxon Signed Rank Test for evaluating difference in oral health status (initial assessment vs. 6-month follow-up assessment) showed statistically significant differences between the OHAT scores for lips, tongue, gum, saliva, denture, and oral cleanliness at the initial examination and at the 6-month examination within the same population (p-value <0.05). After six months the above mentioned scores were significantly improved compared to the baseline **[Table 11]** and **[Figures 21 – 29]**.

**Table 11:** Oral Health Status of LTC Residents Before and After BOH in LTC Program

OHAT	Initial %      % 95 CI	6 Month-Follow-up %      % 95CI	P-value
<b>Exterior of Face</b>			0.257
Healthy	98.31 (95.14, 99.42)	99.44 (96.87, 99.90)	
Changes	1.13 (0.31, 4.03)	0.56 (0.10, 3.13)	
Unhealthy	0.56 (0.10, 3.13)	0	
<b>Lips</b>			<0.001*
Healthy	58.76 (51.39, 65.75)	83.62 (77.46, 88.34)	
Changes	41.24 (34.25, 48.61)	15.25 (10.70, 21.28)	
Unhealthy	0	1.13 (0.31, 4.03)	
<b>Tongue</b>			<0.001*
Healthy	58.20 (50.83, 65.21)	80.23 (73.74, 85.42)	
Changes	41.24 (34.25, 48.61)	19.77 (14.58, 26.26)	
Unhealthy	0.56 (0.10, 3.13)	0	
<b>Gums and Oral Tissue</b>			<0.001*
Healthy	55.94 (48.57, 63.04)	78.53 (71.91, 83.94)	
Changes	33.33 (26.81, 40.57)	18.08 (13.11, 24.41)	
Unhealthy	10.73 (6.98, 16.16)	3.39 (1.56, 7.20)	
<b>Saliva</b>			0.01*
Healthy	83.06 (76.84, 87.86)	92.10 (87.16, 95.23)	
Changes	16.38 (11.66, 22.54)	7.34 (4.34, 12.16)	
Unhealthy	0.56 (0.10, 3.13)	0.56 (0.10, 3.13)	
<b>Natural Teeth<sup>a</sup></b>			0.88
Healthy	30.63 (22.82, 39.73)	49.55 (40.42, 58.71)	
Changes	46.85 (37.83, 56.08)	40.54 (31.87, 49.84)	
Unhealthy	22.52 (15.75, 31.14)	9.91 (5.62, 16.88)	
<b>Dentures<sup>b</sup></b>			0.001*
Healthy	57.83 (47.09, 67.88)	71.08 (60.57, 79.73)	
Changes	31.33 (22.36, 41.94)	26.51 (18.20, 36.89)	
Unhealthy	10.84 (5.81, 19.34)	2.41 (0.66, 8.37)	
<b>Oral Cleanliness</b>			<0.001*
Healthy	42.94 (35.87, 50.30)	72.32 (65.30, 78.38)	
Changes	46.89 (39.69, 54.23)	24.86 (19.07, 31.71)	
Unhealthy	10.17 (6.53, 15.50)	2.82 (1.21, 6.44)	
<b>Dental Pain</b>			0.449
Healthy	90.40 (85.16, 93.92)	92.09 (87.16, 95.23)	
Changes	5.65 (3.10, 10.09)	4.52 (2.31, 8.66)	
Unhealthy	3.95 (1.93, 7.94)	3.39 (1.56, 7.20)	

Wilcoxon Signed Rank Test was used for evaluating difference in oral health status (initial assessment vs 6-month follow-up assessment). P-value <0.05 was considered statically significant\*

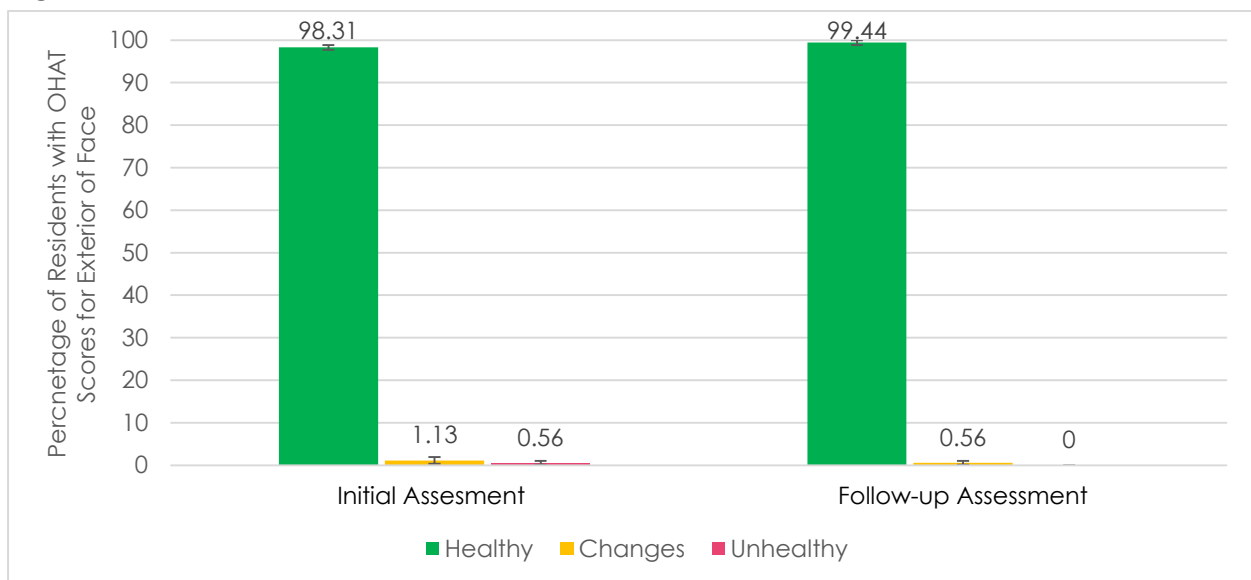
**%95 CI:** %95 Confidence Interval (lower limit, upper limit)

The Wald interval method (based on a normal approximation) for calculation of confidence interval often has inadequate coverage. Thus, confidence interval was calculated using Wilson Score interval, the recommended method for small and large number of subjects.

**a:** The analysis for natural teeth were conducted for 111 dentate residents.

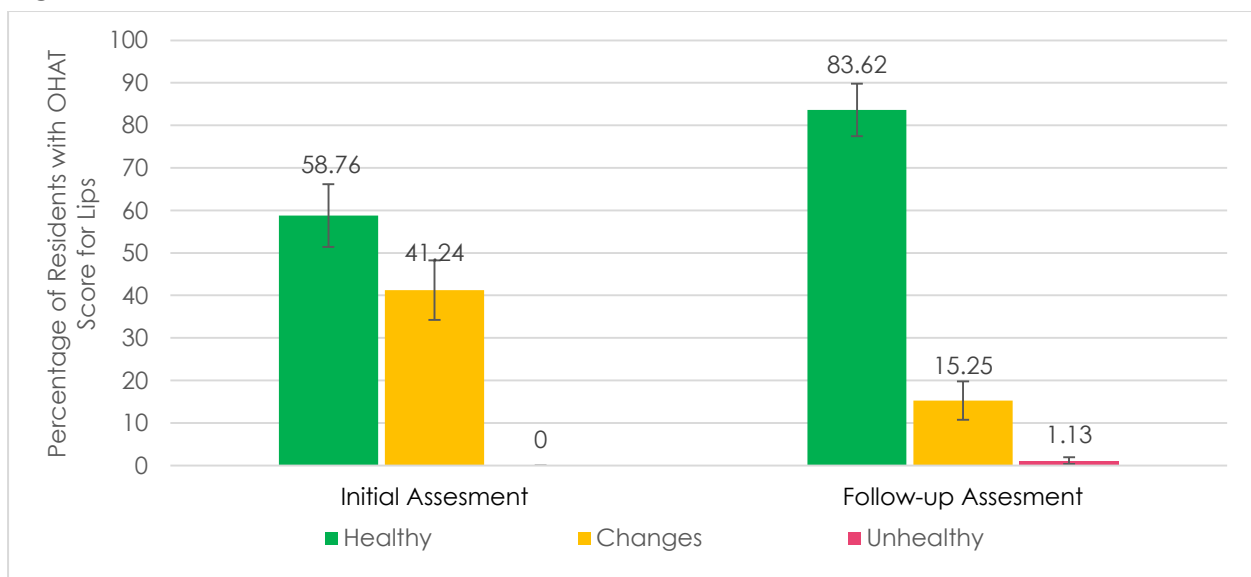
**b:** The analysis for dentures were conducted for 83 residents who had dentures.

**Figure 21:** Proportion of Residents with OHAT Scores for Exterior of Face



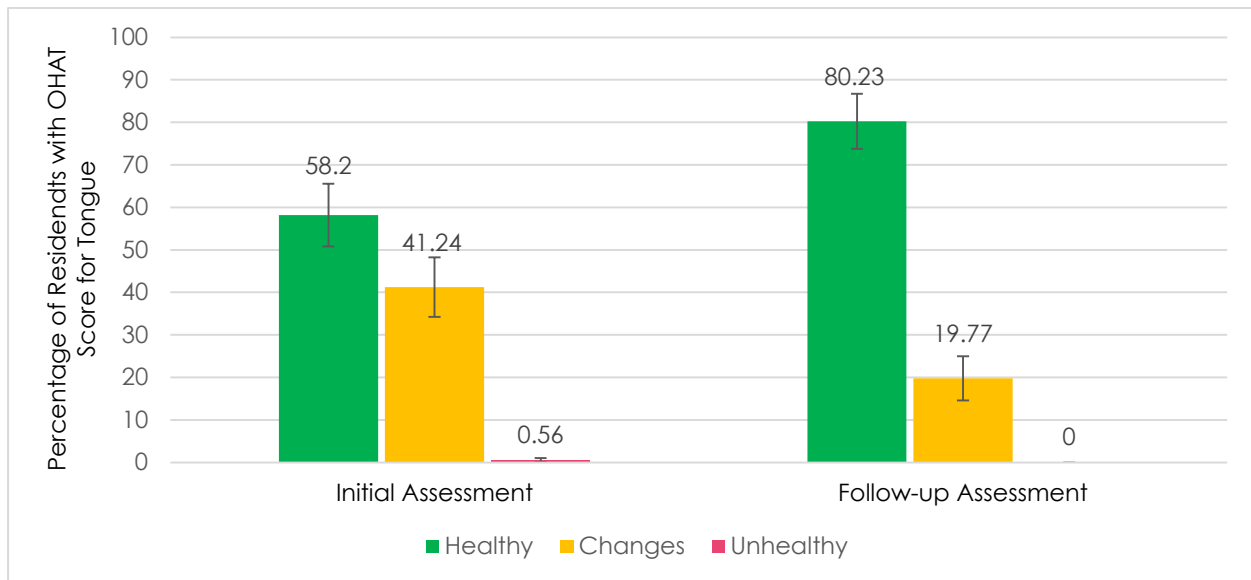
After 6 months: OHAT score for face was not statistically different from baseline. However, 1.13% more residents had healthy face. 95% CI are shown as error bars.

**Figure 22:** Proportion of Residents with OHAT Scores for Lips



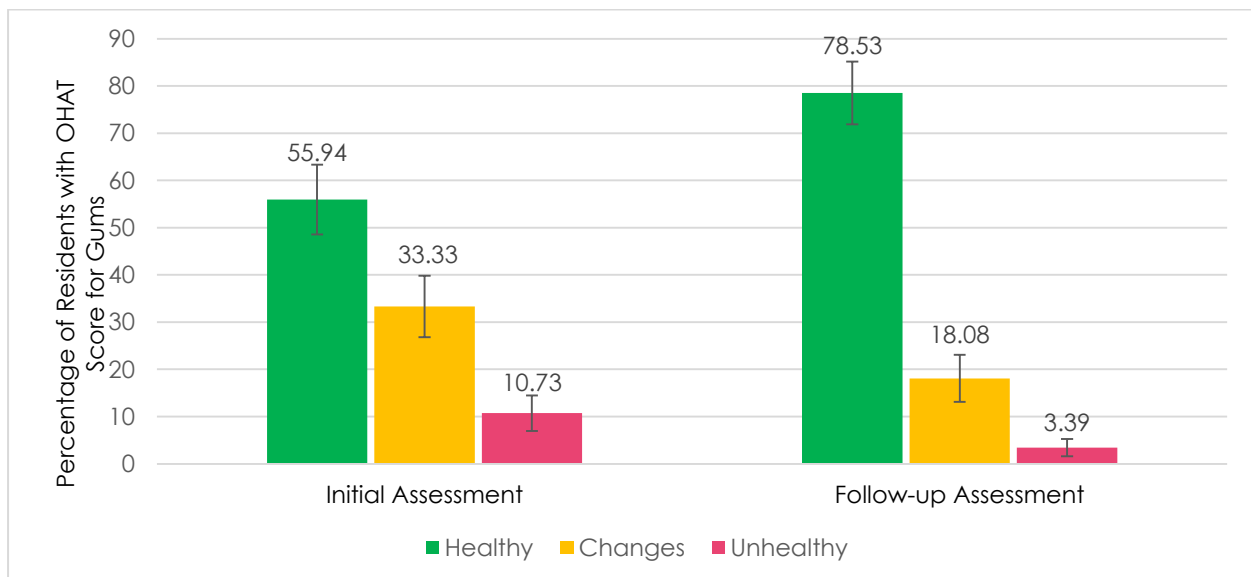
After 6 months: OHAT score for lips significantly improved ( $p < 0.001$ ). Almost one-third (29.72%) more residents had healthy lips. 95% CI are shown as error bars.

**Figure 23:** Proportion of Residents with OHAT Scores for Tongue



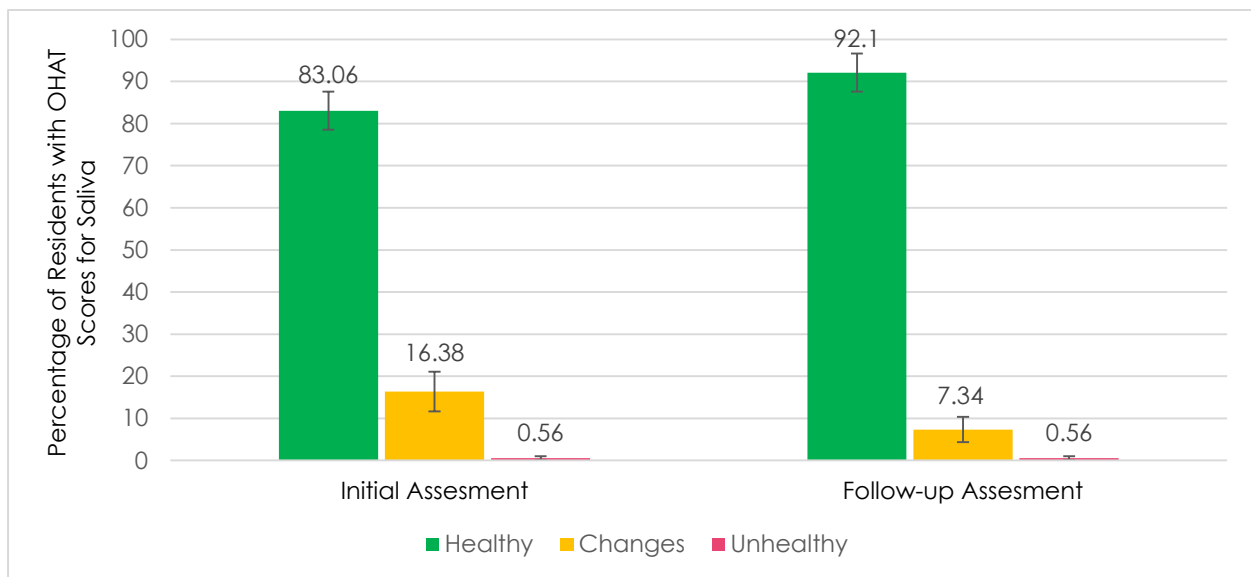
After 6 months: OHAT score for tongue significantly improved ( $p < 0.001$ ). 27.45% more residents had healthy tongue.  
95% CI are shown as error bars.

**Figure 24:** Proportion of Residents with OHAT Scores for Gums



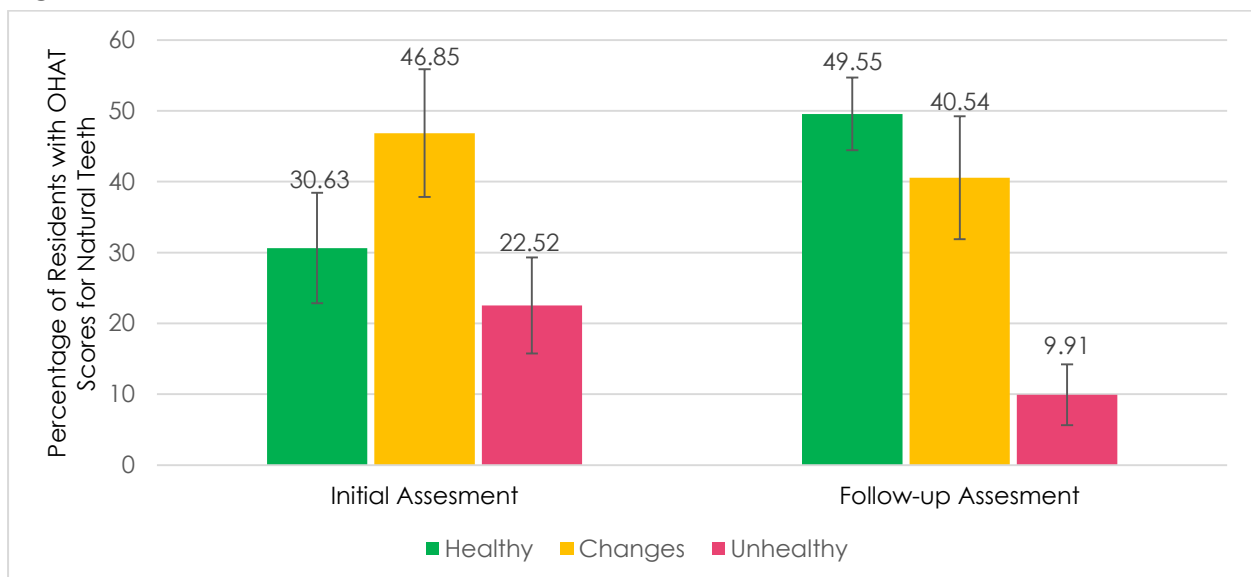
After 6 months: OHAT score for gum(s) significantly improved ( $p < 0.001$ ). 28.76% more residents had healthy gum(s). 68.40 % fewer residents had unhealthy gums.  
95% CI are shown as error bars.

**Figure 25:** Proportion of Residents with OHAT Scores for Saliva



After 6 months: OHAT score for saliva significantly improved ( $p=0.01$ ). 9.81% more residents had healthy saliva.  
95% CI are shown as error bars.

**Figure 26:** Proportion of Residents with OHAT Scores for Natural Teeth

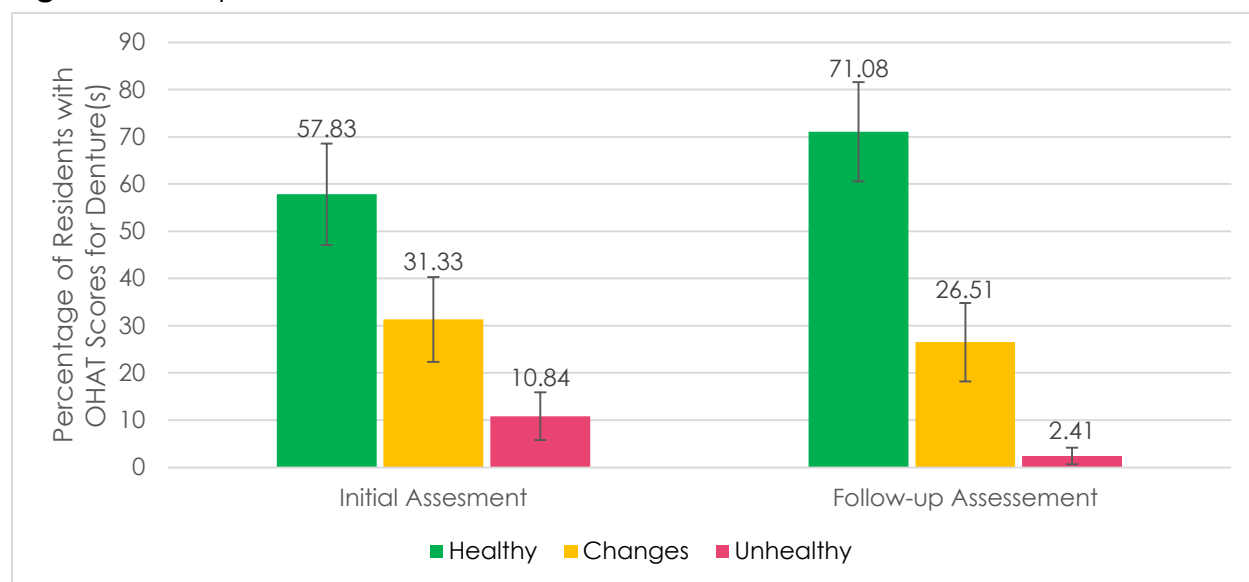


After 6 months: OHAT score for natural teeth was not statistically different from baseline. However, 38.18% more residents had healthy teeth. 56% fewer residents had unhealthy teeth.

Note: the statistical analysis was done based in 111 dentate residents.

95% CI are shown as error bars.

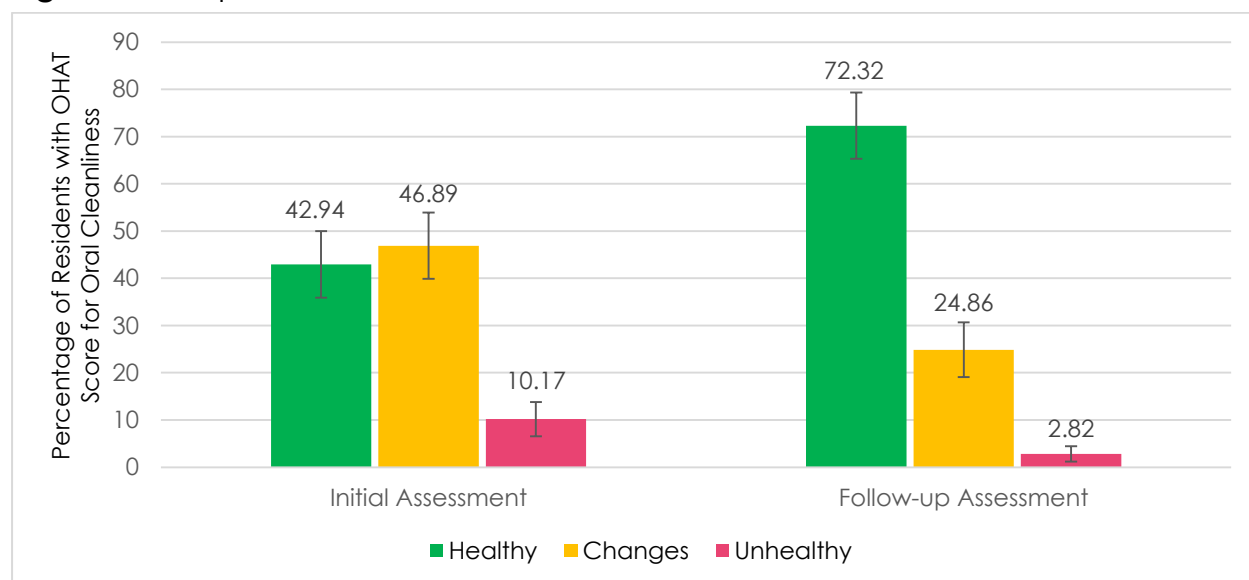
**Figure 27:** Proportion of Residents with OHAT Scores for Dentures



After 6 months: OHAT score for denture(s) significantly improved ( $p < 0.001$ ). 18.64% more residents had healthy dentures. 15.38% fewer residents had one broken area or tooth, or worn 1-2 hours per day only or not named. 77.76 % fewer residents had unhealthy dentures. Out of 83 residents with dentures, 16 (19.27%) initially had unnamed dentures.

Note: the statistical analysis was done in 83 residents who had dentures.  
95% CI are shown as error bars.

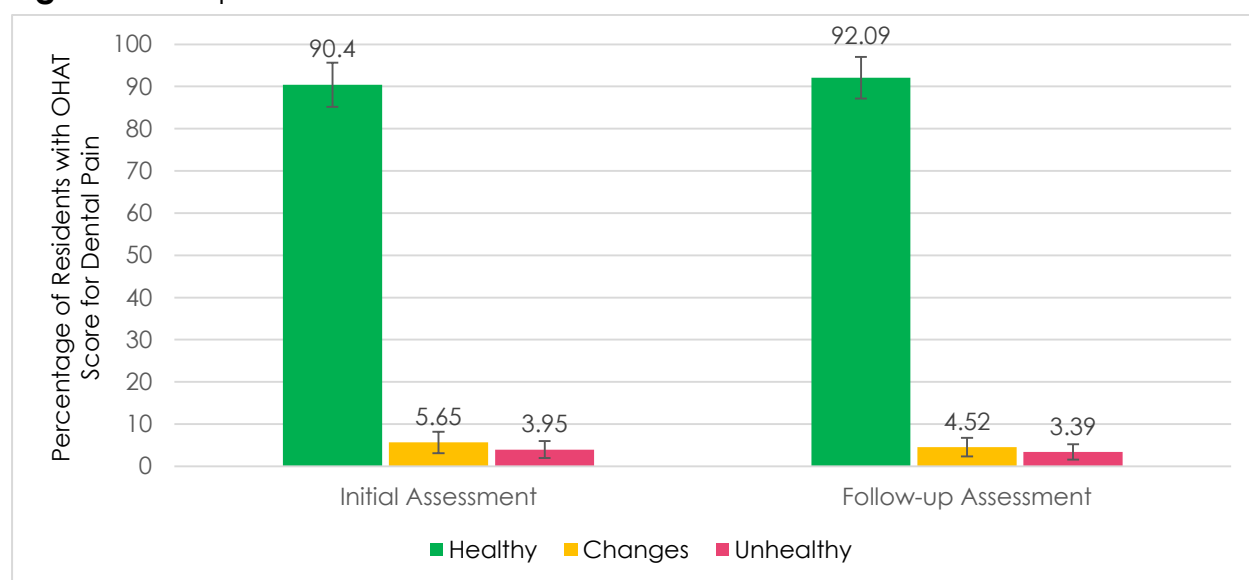
**Figure 28:** Proportion of Residents with OHAT Scores for Oral Cleanliness



After 6 months: OHAT score for oral cleanliness significantly improved ( $p < 0.001$ ). 40.62% more residents had clean mouth. 72.27 % fewer residents had food particles, tartar and plaque in their mouth.

95% CI are shown as error bars.

**Figure 29:** Proportion of Residents with OHAT Scores for Dental Pain



After 6 months: OHAT score for dental pain was not statistically different from baseline. However, 1.83% more residents had no verbal, physical or physical sign of dental pain.

Initially 9.6% of residents experienced some sort of pain (physical/ verbal/behavioural sign), this decreased to 7.91% following 6 months.

95% CI are shown as error bars.

### 3-2-3 Referrals and Treatments

In total, 84 (47.45%) referrals were required, but 55 residents completed consent and were seen by a dental team (e.g. dentist, dental hygienist, denturist) [Table 12]. 51 residents received in-house oral exam/treatment of some form over the six months provided by the Varsity Dental Group [Table 13].

**Table12:** Referrals for More Comprehensive Oral Exam or Treatment

Required Referrals	Made Referrals
84 (47.45%) 71 dentate, 13 edentulous	55 (31.07%) 48 dentate, 7 edentulous

55 out of 84 (65.5% ) residents who required more comprehensive oral examination/treatment completed consent and were seen by a dental team within six months. 23 out of 71 (30%) dentate residents who required prevention measures and/ or oral treatment were not referred. Also, 6 out of 13 (46.15%) of edentulous residents who required prevention measures and/ or treatment were not referred.

**Table13:** Oral Examination or Treatment Performed by Varsity Dental Group Over 6 Months

Service	Number	Average Cost (\$)
<b>Initial Exams</b>	39	68\$
<b>X-Rays</b>	71	31 per X-Ray
<b>Hygiene</b> (including Scaling, Fluoride Varnish)	32	\$104.89 per patient
<b>Comprehensive Oral Treatments</b> (including Fillings, Extractions, Root Canals, Crowns, Full Dentures, Partial Dentures, Night guards)	37	\$1402.52 per patient

Of 51 residents who received oral exam/care in-house, 12 were already patients of Varsity Dental Group and treatment was continued on to completion but not included in these numbers.

For 39 residents, initial exams were conducted.

71X-rays were taken with an average of \$31 per X-ray. However, some residents required more than one X-ray.

32 of 39 residents received dental hygiene care, by a hygienist, with an average cost of \$104.89 per patient. However, some residents required more than one appointment.

37 of 39 residents received comprehensive oral treatment, by a dentist, with an average cost of \$1402.52 per patient.



### 3-3 Discussion

Ample evidence shows providing daily oral care and/ or oral treatment in LTC homes significantly improves residents oral health status, enhances quality of life, reduces the risk of aspiration pneumonia morbidity and mortality, and lead to better control of diabetes and CVD (89, 104, 126, 127).

In the current study, the oral health status of residents of two LTC homes in SHR after implementation of the BOH in LTC Program (with the focus on daily oral care) was assessed. The oral health of 252 LTC residents were initially assessed by a LTC-OHC (an oral health professional) or trained RNs. A significant percentage of this population (70%) was available for oral assessment after six months. Eventually, the oral health status of 177 residents (52% women and 48% men), with an average age of  $76.24 \pm 17.65$  years (with 75.15% seniors and 46.33% residents 85 years and older) were assessed over 6 months.

The women and men in the study had approximately similar distribution, whereas according to the 2015-2016 Continuing Care Reporting System, women made up 70% of population of residential care in Canada (2). Similarly, OECD reported that in 2016, 63% of LTC home residents in Canada were women (11).

In the study, 37.28% of the LTC residents were edentulous, which is almost similar to that of 2008-2009 TOHAP study in Nova Scotia, Canada (41%) (41). The proportion of edentulous LTC residents in our study was higher than that of Canadian age 60 to 79 years (21.7%) reported in the 2007-2009 CHMS (21). The oral health component of the 2007-2009 CHMS has become the gold standard for surveys in Canada (30). However, the 2007-2009 CHMS provided an incomplete picture of oral health in very old Canadians. It excluded people 80 years of age or older, it also did not include institutional residents (20), who are generally frailer, have poor oral health, receive less oral care, and greater treatment needs (32).

In total, approximately one in two (47%) residents had a removable denture (upper and/or lower complete, or partial denture); among dentate residents, 27.02% had a removable denture (upper and/or lower complete, or partial denture). The majority of edentulous residents (80.30%) had a complete denture in one or both arches. The high percentage of denture use in our study highlights the importance of education and provision of denture care by residents/staff. As with natural dentition, dentures provide surfaces that enable the build-up of plaque biofilms over time. Residents who wear dentures are at high risk of developing infections such as denture stomatitis and other denture-related lesions such as denture hyperplasia and traumatic ulcers (68). Evidence indicates that dentures could act as a reservoir for potential respiratory pathogens in the oral cavity, thus increasing the theoretical risk of developing aspiration pneumonia(127). A 3-year follow up study in Japan indicated that denture wearing during sleep doubles the risk of pneumonia in very old individuals. Those who wore dentures during sleep were more likely to have gum inflammation, tongue and denture plaque and positive culture for *Candida Albicans* (132). Implementation of routine denture hygiene practices could help decrease the risk of respiratory infection among the elderly individuals (127). Poorly functioning dentures result in problems chewing which is linked to poor nutrition.

It is crucial to assess dentures, perform daily care, and make referrals for repair/exchange if needed. In the present study, after six months OHAT score for 'denture'(s) significantly changed: 18.64% more residents had healthy dentures, 5.38% fewer residents had one broken area or tooth, or worn 1-2 hours per day only or not named, and 77.70 % fewer residents had unhealthy dentures. While, the majority of edentulous residents wore dentures, about one in 5 edentulous residents (19.70%) didn't have any dentures which could lead to problems in chewing ability and eventually poor nutrition.

Following 6 months, 6 of 9 OHAT scores significantly improved: 'lips', 'tongue', 'gum'(s), 'saliva', 'denture'(s), and 'oral cleanliness'. Almost one-third more residents had healthy lips, tongue, gums; 10% more residents had healthy saliva; and 20% more individuals had healthy dentures. In addition, 40 % more residents had a clean mouth (no food/tartar in mouth/denture). The improvement in scores for oral cleanliness is promising, as evidence shows the most significant predictor of coronal caries is a high debris score (55). The daily oral care (brushing), use of moisturizing agents for lips, tongue (such as Biotène, Perivex), denture care (e.g. daily cleaning, labelling, use of adhesives), and oral treatments (e.g. scaling, denture replacement) all may have contributed to improvement in the above-mentioned scores.

After 6 months, OHAT scores for 'face' did not change significantly. One explanation could be the fact that the majority of the residents were healthy at the baseline (98.31%). The scores for 'dental pain' didn't change significantly as well. The percentage of residents who experienced dental pain slightly decreased over six months (9.6% vs. 7.91%). Pain indicates a range of problems (mild to serious) and impacts the quality of life. While the OHAT scores for 'teeth' slightly improved, the change was not statistically significant. The fact that 23 out of 71(30%) dentate residents who required prevention measures and/or treatment, was not referred and as a result did not receive treatment for decayed/broken teeth, can partly explain the findings for 'dental pain' and 'teeth' scores. A side from prevention of dental caries with daily oral care, other forms of prevention measures (fluoride varnish) and oral treatments would have been provided following a referral to a dental team. Therefore, the 6-month OHAT scores related to 'dental pain' and 'teeth' might indicate that more residents required oral health preventive services (e.g. fluoride varnish) and treatment services (e.g. fillings, extractions, root canals).

With regard to referral services, 65.5% of residents who required more comprehensive oral examination/treatment completed consent and were seen by a dental team (e.g. dentist, dental hygienist, denturist). The reasons for not consenting should be discovered to identify as to whether this was mainly due to financial barriers or resident/family values on oral health.

An important point to consider when evaluating oral health care improvement strategies is that oral health issues are multi-factorial oral health is influenced by more than oral health care alone. Influencing factors are general health of the elderly (which can fluctuate) (43), the support of family (informal care), the care dependence of the individual, financial situation and access to oral care (45). Henriksen et al showed that patients with cognitive impairment (i.e. severe dementia), have an increased risk of developing oral health problems, and their oral health is less than the oral health of older people not suffering from dementia. This is mostly due to medication, care dependency for oral health and difficulties with oral health care because of restraining behaviour (218).

In the current study, the oral health status of residents showed significant improvement following the implementation of the BOH in LTC Program. There are many factors which might contribute to the findings: successful delivery of daily oral care in LTC homes could be achieved through an integrated approach that includes role of a LTC-OHC in implementing and maintaining the BOH in LTC Program, education of staff, commitment of CCAs in daily oral care, role of RNs in monitoring CCAs to ensure standard protocols/standard work were followed, and support from managers and administrators.

In the SHR there is only one LTC-OHC, a dental assistant that works closely with several SHR LTC homes to implement and maintain the BOH in LTC program. A LTC-OHC facilitated the delivery of initial oral assessments, oral examinations and treatment, daily oral hygiene for residents and oral health education. She played an important role in the intervention, ensuring that each resident had the

most appropriate care plan, and a labeled and clean oral supply. The LTC-OHC contacted families to see if the resident in the home had a family dentist or not, and to inform them that there is a dental team that comes to the home who could see the resident. Contact was also made to explain the rationale for the resident to receive a dental cleaning every 4 months or 6 months. The LTC-OHC also liaised with family to find out if a family member could join the resident at the dental appointment (to feel more relaxed at the appointment). She also liaised with staff to coordinate Occupational Therapist staff and dental staff for the same time of dental appointments that are made.

Consent and medical history process require LTC-OHC time at the LTC home consulting with the resident's RN or support staff to help complete the dental consents. The consent for treatment and costs for LTC residents typically involved the resident, resident's family, public trustee and others, and the dental team had to ensure effective communication between the various parties. The consent process for LTC residents is time consuming but critical in providing appropriate care in a timely manner. LTC-OHC plays a critical role in completing consents and referrals (219).

The presence of a LTC-OHC can result in a heightened awareness, support, accountability and greater efficiency (=time saving) amongst care team (217). LTC-OHC takes a leadership role in providing ongoing oral health care support and encouragement for CCAs and other relevant staff within the LTC homes. This will enhance sustainability of the action plan (33). Ongoing communication with the staff (frequent project updates and face-to-face meetings) ensures that staff do not become burned out (33).

Overall, the oral health status of residents showed significant improvement following the implementation of the BOH in LTC Program. The multidisciplinary approach, train-the-trainer aspect of the program, and the LTC-OHC's role as an educator, mentor, and support are necessary to make this change

sustainable. Due to on-going training and CCAs turnover, there needs to be a consistent oral health presence to provide appropriate training, support and mentorship. The opportunity for every Saskatchewan health region to have the capacity of a LTC-OHC is what will make this initiative sustainable.

Through leadership, SOHC collaborates with government leaders, policy makers, organizations, Saskatchewan health regions and communities to successfully oversee the delivery of BOH in LTC Program and consistently utilizes evidence-based dentistry. Policy makers must acknowledge that oral conditions in LTC residents pose a serious public health problem and that oral health goals must be included in the health agenda.

The province wide implementation of the BOH in LTC will result in:

- Consistent integration of oral health into policy and practice of LTC homes in the province
- A provincial framework for oral health assessment, oral health care planning and oral care treatment for residents
- A multidisciplinary team approach, to improve the oral health of the residents
- Improved quality of life for residents who suffer from poor oral health and nutritional deficiencies
- Decreased occurrence of systemic conditions in the residents
- Residents receiving oral health treatment in the LTC homes rather than having to face the challenges involved with travelling offsite for care
- Regular assessments and oral health treatments
- Decreased health care spending

"I feel my position as the first oral health coordinator of long term care very pivotal in the dental world! As the health professionals that are working in long term care such as care aides, RNs and LPNs become more comfortable with my position and as they are becoming more comfortable with assisting the long term care residents with their oral health, they are now asking me questions about the residents' mouths. They are also asking me questions about their own oral health and their children's oral health as well. It seems to be win/win situation all around as these health professionals are learning about oral health on so many levels because of my presence in the long term care homes. "

Sometimes care aides contact me because a resident is really failing in their health and that particular resident needs full assistance, instead of supervision or they may go from independent to full assistance or palliative care. Sometimes, care aides are even afraid to take a partial denture out and I will show them how to do so and then have them to try the same technique while I am there. Often, they thank me and express to me how thankful they are that I am available for this teaching".

"Our experience throughout this journey in the Saskatoon Health Region is that an oral health professional is the key component to success and to sustain daily care and assessments. This was a strong message delivered at our meetings. Due to ongoing training and continuing care aide staff turnover, there needs to be a consistent oral health presence to provide appropriate training, support and mentorship. The opportunity for every health region to have the capacity of a long term care oral health coordinator is what will make this initiative sustainable."

Kerrie Krieg, *SHR LTC-OHC*

"It is so wonderful to be able to refer the residents to the dental team that come into their homes! The Varsity Dental Group has been very caring and co-operative in treating the residents. Dr. Bhargava from the Varsity Dental Group, has been able to treat in the Sherbrooke Community Centre Dental Clinic, two residents who were initially referred to Hospital Dental for their dental treatment because their private practice dentist could not treat them in his office setting. This happened because I know the coordinator at the Hospital Dental and she knew about Varsity Dental going into long term care to do dentistry. Both residents and families were so appreciative for this option and end result. Treating these two residents, with successful outcomes, without receiving general anesthetic at the hospital would save thousands of dollars of our health system."

Kerrie Krieg, *SHR LTC-OHC*

### **3-3-1 Limitation**

- The study sample was not representative of the LTC population, and the outcomes may not be applicable to other LTC homes.
- The project was a short period (6-months) follow-up study.

### **3-4 Conclusion**

Within the limitations of this study, residents who received daily oral care and/ or treatment showed an improvement in their oral health status after 6 months. The results also signify the multidisciplinary approach and role of LTC-OHC, who works collaboratively with the LTC team, in improving the oral health care.



### 3-5 Recommendations

In addition to the 10 recommendations that were previously developed and endorsed by SOHC and SOHP for consideration and action by the Saskatchewan Ministry of Health, (see 2-2 *Recommendations*), additional recommendations include:

- **To make some adjustments to the existing OHAT form.** For example: with regard to 'denture': "not being named dentures" should be categorized under either 'changes' or 'unhealthy' – not be fallen under both. While, LTC-OHC confirmed that this condition corresponded to 'changes', this needs to be modified on the OHAT form. Also, the existing form does not contain pain related to tongue or lips.
- **To make some adjustments to the existing data collection form.** For example, it seems having two distinct sections for 'initial assessment' and 'follow-up assessment' will ease the process of data entry and data analysis. Also, it is recommended that data entry be performed as soon as possible (preferably the same day). Any delay in data entry may lead to loss of some important information. Also, in addition to the oral health status, number of residents used oral preventive/treatment services, and number of services provided should be recorded carefully. Since the data analysis is the basis of the policy making, it is of utmost importance that to have the most accurate data possible.
- **That SOHC and SOHP continue data collection (quantitatively and qualitatively) with longer follow up periods.** For qualitative research it is suggested to conduct one-on-one semi-structured interviews with administrators, health professionals who provide oral health services to residents, and the families of residents. Using qualitative methods are particularly well suited to finding answers to "what" questions (what are

people doing, what does it mean) and “how” questions (how are things done, how is meaning produced) (33). For example: it is recommended that to recognize resident's barriers (e.g. financial, value of oral care) to access oral care treatments; to identify oral team's viewpoints on delivery of preventive/therapeutic services (e.g. financial barriers, need for a designated area for oral care). These barriers need to be considered for planning future service delivery. Effects of interventions, provides accountability for the funds spent and requires good surveillance. It is also recommended to continuously evaluate and monitor the guideline implementation. Monitoring the adherence to the LTC oral health care protocol and the compliance of each resident's oral health care program is a crucial factor in the program success.

- **To establish an effective data collection and information systems, and provincial oral health surveillance system** (such as the oral health dashboard in the Alberta Health Services proposed by the Oral Health Action Plan) and utilize surveillance data in planning, implementing, and evaluating oral services to seniors. Currently, there is no provincial level tracking mechanism for oral health services that are being provided specifically to LTC settings. As a result, it is unclear how many individuals are receiving oral care. The surveillance activities would detect and monitor oral diseases in LTC residents, assess the impact of interventions, and assist in the management of disease.
- **To raise the profile of oral care for residents, their family or guardian.** The value of professional oral care depends on the personal values of residents and their families (33). The educational strategies should be fun, with creative delivery. For instance, laminated posters should be placed in residents' washrooms. These posters would be used as a visual reminder and would include information on the importance of proper oral care and steps

outlining proper care. They should be bright and colourful and include a number of pictures (33).

- **That LTC staff should be educated continuously to deliver a standard care service.** Theoretical and practical oral health education of LTC staff improves the residents' oral health (220). However, a single educational session or workshop is not sufficient to establish a long term result. After some time, the education effect diminishes and the residents' oral health declines (221). In addition, some methods such as role-playing may help to put care providers in the residents' shoes (33).
- **That all denturists and dentists to have dentures labeled when they are made.** Labeling of all dentures is recommended by most international dental associations. Labeled dentures can be important in identifying the owners in case of loss of memory, states of unconsciousness, being inadvertently misplaced on admission to a hospital, an accident, or in identifying the bodies of those who have died in a calamity. Given that many residents have dementia or are taken to hospital for some reason, having dentures labelled is crucial (222).
- **To communicate the finding of this evaluation report with relevant stakeholders, relevant oral and other health care professional, relevant provincial government agencies,** concerning the core problems, to enable mutual understanding of the report's findings and initiate discussions to address the recommendations. It is recommended to engage LTC residents/families/guardians in order to identify their needs for standards of oral health care and obtain their input to contextualize them.
- **To expand the number of LTC homes trained to support the BOH in LTC Program,** as the evaluation of the program indicated a significant improvement in the oral health of residents.

- **That to promote the inclusion of oral health care training in non-dental training programs**, such as medicine, nursing, and continuing care assistance. For example, the inclusion of this in CCA program, would decrease 6 hours of training in the BOH in LTC Program to significantly shorter period of time.
- **That dental schools provide relevant training at both the undergraduate and postgraduate levels on geriatric dentistry and LTC settings.** They also need to collaborate with licensing bodies through the provision of appropriately accredited continuing education in these areas. In addition, stronger emphasis on public health and community education, outreach situation should be placed. Outreach experiences will improve students' confidence in tackling clinical situations, and help them develop a more understanding of the complexity of the determinants of oral health. The challenge of access to oral health care is partly a cultural issue. Dental professions have cultures/models of care that privilege those can afford oral services (via insurance, out of pocket). An effort to change the cultural prerogatives of the dental profession will start at its educational roots (14).
- **That new models (such as Virtual Dental Home) should be developed to further strengthen our oral health delivery system** (in addition to maintaining existing oral care delivery programs) (30). Currently, in California, the United States, several LTC homes have been implementing the Virtual Dental Model as the success of the current model was recognized (187).
- **To establish a provincial legislation for an oral screening and care plans for LTC residents.** In tough economic times, the lack of legislative protection for these programs allows governments to stop funding without any significant resistance, regardless of the negative impact that this can have on many people's lives (14).

- **That provincial government and dental regulatory bodies to renew the role of dental therapy, review the use of dental hygienists,** and explore the use of alternative providers of oral health care to ensure that cost-effective care is provided in settings not currently served by dental professionals. For example, the expansion of the scope of practice for dental hygienists will allow them to bridge the gaps in service (223).

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## List of Abbreviations

<b>CCA</b>	Continuing Care Aid
<b>CDA</b>	Canadian Dental Association
<b>CDSS</b>	College of Dental Surgeons of Saskatchewan
<b>COHF</b>	Canadian Oral Health Framework
<b>CHMS</b>	Canadian Health Measure Survey
<b>DHE</b>	Dental Health Educator
<b>LPN</b>	Licensed Practical Nurses
<b>LTC</b>	Long Term Care
<b>LTC-OHC</b>	Long Term Care Oral Health Coordinator
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>OHAT</b>	Oral Health Assessment Tool
<b>OHCP</b>	Oral Health Contact Person
<b>OHC</b>	Oral Health Coordinator
<b>OHCT</b>	Oral Health Care Team
<b>SDAA</b>	Saskatchewan Dental Assistants' Association
<b>SDHA</b>	Saskatchewan Dental Hygienists' Association
<b>SDTA</b>	Saskatchewan Dental Therapists Association
<b>SHR</b>	Saskatoon Health Region
<b>SOHC</b>	Saskatchewan Oral Health Coalition
<b>SOHP</b>	Saskatchewan Oral Health Profession
<b>TOHAP</b>	The Oral Health of our Aging Population
<b>RN</b>	Registered Nurse
<b>WHO</b>	World Health Organization

## Glossary

**Alveolar Bone:** The bone that surrounds the roots of the teeth forming bone sockets.

**Calculus (Tartar):** If dental plaque is not removed by proper brushing and flossing, it can harden into calculus which is calcified (or hardened) plaque that attaches to the enamel on teeth.

**Cancer:** An abnormal growth of cells which proliferates in an uncontrolled way and, in some cases, to metastasize (spread).

**Cemento-Enamel Junction (CEJ):** The point on a tooth surface where the tooth crown joins the tooth root.

**Cochrane Database of Systematic Reviews (Cochrane Reviews):** The Cochrane Database contains systematic reviews and meta-analyses which summarize and interpret the results of medical research. The Cochrane Library is a key resource in evidence-based medicine.

**Complete Denture:** A removable dental prosthesis that replaces all of the natural dentition in upper/lower jaws or both; full denture (see *partial denture*)

**Confidence Interval (CI):** A 95% confidence interval is a range of values, above and below a finding, in which you can be 95% certain the actual value is likely to fall. The confidence interval represents the accuracy or precision of an estimate.

**Coronal:** Pertaining to the crown of a tooth.

**Crown:** The portion of tooth covered by white enamel that usually is visible in the mouth

**Dental Caries (Tooth Decay= Cavities):** is a breakdown of teeth due to acids made by specific bacteria

**Dental Crown:** a restoration (tooth-shaped cap) that is placed over a tooth to cover the tooth to restore its shape, size, and strength.

**Dental Bridge:** A fixed dental prosthesis used to replace a missing one or more missing teeth; bridges literally bridge the gap created by one or more missing teeth.

**Dental Implant:** Metal posts that are surgically placed into the jawbone to replace missing teeth.

**Dental Plaque:** A film composed of bacteria and food debris that adheres to the tooth surface and causes dental caries/periodontal disease.

**Dentate:** Having teeth as opposed to edentulous (see *Edentulous*).

**Dentin:** The main calcified part of a tooth beneath the enamel, surrounding the pulp chamber and root canals.

**Disability-Adjusted Life Year (DALY):** DALY is a metric that measures the burden of disease from both mortality and morbidity (non-fatal health problems). One DALY can be thought of as one year of healthy life lost. People can lose a healthy year of life because of death or being sick (disability). DALY is used to measure the health of a population, not just one person.

DALYs of a population = years of life lost due to death + years of life lost due to disability. For example, in 2016 in a village of 100 people, one child suddenly died from malaria at age 3, when ideal life expectancy was 86. So, that child lost 83 years of life. One man contracted tuberculosis when he was 53. Over the course of his illness, let's assume he would lose 2 years of healthy life. The remaining residents of village were all healthy and did not die or get sick in 2016. Therefore, DALYS lost would be 85 (83+2), which means 85 years lost in the village in 2016 due to death and disability.

**DMFT:** An index of dental caries experience measured by counting the number of decayed (D), missing (M), and filled (F) permanent teeth (T) of an individual.

**Economic Analysis:** The four types of economic analyses commonly used to assess health interventions include *Cost Analysis*, *Cost-Effectiveness Analysis*, *Cost-Utility Analysis*, and *Cost-Benefit Analysis*. A *Cost Analysis*, measures net costs. A *Cost-Effectiveness Analysis* compares the relative costs to the outcomes (e.g. cases of disease prevented and years of life saved) of two or more courses of action. A *Cost-Utility Analysis*, which is a type of *Cost-Effectiveness Analysis*, measures net costs per unit increase in a quality of life measure. *Cost-benefit Analysis* is a systematic approach for comparing benefits and costs of a policy/project. This basically systematically estimates the strengths and weaknesses of alternatives.

**Edentulous:** A state of complete loss of all natural teeth (see *Dentate*).

**Enamel:** The hard white substance covering the crown of a tooth.

**Five-Year Survival Rate:** Surviving at least 5 years after a cancer diagnosis

**Gingiva:** gum

**Gingivitis:** The inflammation of gingiva (the gums) in the absence of clinical attachment loss (without any loss of bone and other tissues). This characterized by redness, swelling or bleeding of the gums.

**Incidence:** The number of new cancer cases diagnosed in a given period of time, often a year (see *Prevalence*).

**Health Inequality:** Health inequality is the difference in health status between population groups. For example, differences in mobility between elderly people and younger population are considered health inequalities (see *Health Inequity*).

**Health Inequity:** Health inequity is the difference in health status between population groups that is avoidable, unfair, and unjust. For example, differences

in mortality rates between people from different social classes are considered health inequities (see *Health Inequality*).

**Life Expectancy at Birth:** The average number of years a newborn is expected to live.

**Long Term Care (LTC) Home:** In the present report the residential care setting in Saskatchewan is referred to LTC home.

**Loss of Attachment (LOA) or Attachment Loss:** The distance (mm) from where the enamel of the tooth meets the root to the bottom of the pocket between the gum tissue and the tooth.

**Meta-analysis:** Meta-analysis is a statistical analysis that combines the results of multiple scientific studies in order to test the pooled data for statistical significance.

**Morbidity Rate:** is the frequency with which a disease appears in a population.

**Mortality Rate:** is the number of deaths in a given area or period, or from a particular cause.

**Non-Communicable Disease (NCD):** or chronic diseases are diseases of long duration and generally slow progression such as heart attack, cancer, chronic respiratory diseases, diabetes, and oral conditions.

**Nursing Home Acquired Pneumonia (NHAP):** Pneumonia occurring in LTC homes/ nursing homes.

**Odds Ratio (OR):** is a measure of association between an exposure and an outcome. The OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. Odds ratios are most commonly used in case-control studies.

**Periodontal pocket:** An abnormal space below the gum line that forms between the root of a tooth and the gum surrounding that tooth.

**Periodontitis:** An inflammatory disease affecting the periodontium. It is characterized by loss of connective tissue attachment and bone.

**Periodontium:** Is the supporting structure of a tooth which attaches the tooth to surrounding tissues. This consists of four components: gum, tooth cementum, alveolar bone, and periodontal ligament.

**Pre-cancerous (Pre-malignant) Condition:** The conditions that have the potential to progress to cancer. If left untreated, these conditions may lead to cancer.

**Prevalence:** The total number of cases of disease at a given time (see *Incidence*).

**P-value:** The p-value is the level of marginal significance within a statistical hypothesis test representing the probability of the occurrence of a given event. The p-value is used as an alternative to rejection points to provide the smallest

level of significance at which the null hypothesis would be rejected. The  $p$ -value is a number between 0 and 1; a smaller  $p$ -value (typically  $< 0.05$ ) means that there is stronger evidence in favor of the alternative hypothesis.

**Randomized Control Trials (RCTs):** RCTs are the gold standard of scientific (often medical) experiment.

**Relative Risk (RR):** is the ratio of the probability of an event occurring (for example, developing a disease) in an exposed group to the probability of the event occurring in a comparison, non-exposed group. Relative risks are most commonly used in cohort studies.

**Residential Care:** Residential care is available for seniors who are no longer able to function independently and require full-time facility-based long-term care with 24-hour nursing supervision. Terminology is different among jurisdictions (see Appendix 1).

**Root:** That part of the tooth below the crown which extends into the jawbone.

**Senior:** An individual age 65 and older.

**Social Determinants of Health:** The primary factors/conditions that shape the health of populations. These include income and social status, education, employment/working conditions, culture and etc.

**Stomatitis:** The inflammation of the mouth; a general term for an inflamed and sore mouth.

**Systematic Review:** A systematic review involves a systematic search of the literature and summarises the results of available carefully designed healthcare studies. This provides a high level of evidence on the effectiveness of healthcare interventions.

**Vulnerable Populations:** Some populations/ groups are more vulnerable to environmental risks as a result of physical differences, behaviours, location and/or control over their environment. These vulnerable populations include, for example: children, seniors, Aboriginal peoples, etc.

**Xerostomia:** Dry mouth

## Appendix 1: Jurisdictional Differences in Residential Setting Terminology

Jurisdiction	Home Care Setting		Residential Care Setting
	Home Care services	Supportive Needs Services	
<b>Alberta</b>	Home care	Supportive living (designated and non-designated)	Long term care facilities
<b>British Columbia</b>	Home care	Assisted living	Residential care
<b>Manitoba</b>	Home care	Supportive housing	Personal care homes/ nursing homes
<b>Ontario</b>	Home care/ community support services	Retirement homes/ supportive housing	Long term care homes/ nursing homes
<b>Saskatchewan*</b>	Home care	Assisted living services/ personal care homes	Special care homes/ nursing homes*
<b>Yukon</b>	Home care programs	Not applicable	Long term/facility care

Source: Canadian Institute for Health Information. Seniors in Transition: Exploring Pathways Across the Care Continuum. 2017. (6)

\*In the present report the residential care setting in Saskatchewan is referred to LTC home.



## Appendix 2: Characteristics and Properties of Oral Health Products

Biotène®	
<b>Appearance</b>	Available in four products: <ul style="list-style-type: none"> <li>moisturizing oral rinse (mouthwash), mouth spray,</li> <li>toothpaste, and</li> <li>moisturizing gel</li> </ul>
<b>Ingredients</b>	Water, Glycerin, Xylitol, Sodium Benzoate, Propylparaben, Cetylpyridinium Chloride LP3 protein enzyme system
<ul style="list-style-type: none"> <li>Biotène products are alcohol free.</li> <li>Biotène products contain moisturising and lubricant ingredients.</li> <li>Biotène products contain four antibacterial enzymes (lysozyme, lactoferrin, glucose oxidase, lactoperoxidase) which boost the defense system in saliva and help kill bacteria.</li> <li>Some products contain fluoride and xylitol (a non-cariogenic sugar).</li> <li>The spray is directly used into mouth and onto the surface of tongue.</li> <li>The gel is placed directly on the tongue and spread thoroughly inside the mouth.</li> </ul>	

Perivex	
<b>Appearance</b>	Clear green liquid gel
<b>Flavor</b>	Spearmint flavor
<b>Ingredients</b>	Cetylpyridinium Chloride 0.05%, Propylene Glycol, Sodium Benzoate, Phosphoric Acid, Colorant
<ul style="list-style-type: none"> <li>Perivex should not be confused with Peridex™ which contains chlorhexidine.</li> <li>Perivex is an alcohol-free and non-fluoridated antibacterial mouth cleaning gel.</li> <li>Antibacterial agent, cetylpyridinium chloride, provides protection against dental plaque and gingivitis.</li> <li>Glycerin, helps lubricate the oral cavity, which is particularly valuable for those who do not receive nutrition by mouth and those with dry mouth.</li> <li>As it has thickened form, there is a lower risk for aspiration than foaming toothpastes. Therefore, it is highly used for residents at risk of choking.</li> </ul>	

Polident®	
<b>Appearance</b>	Tablet
<b>Ingredients</b>	Alkaline Peroxide, Sodium Bicarbonate, Citric Acid, Sodium Perborate, Potassium Monopersulfate, Sodium Lauryl Sulfoacetate
<ul style="list-style-type: none"> <li>Polident is a denture cleanser.</li> <li>It reduces plaque and removes stains.</li> <li>It is gentle on dentures (mild abrasiveness)</li> <li>Alkaline peroxide is the antibacterial agent.</li> <li>Sodium bicarbonate and citric acid provide mechanical cleaning through effervescent action.</li> <li>Sodium perborate and potassium monopersulfate, the oxidants, remove stain and whiten the denture teeth.</li> <li>Sodium lauryl sulfoacetate acts as the detergent and remove all the particles that were loosened by the active ingredients.</li> </ul>	

### Appendix 3: Community-Based Oral Health Programs for Seniors in the United States

Program	Location	Service Delivery Model	Payment for Care	Dental/Oral Health Services and Other Program Services	Integration Services
Across the Smiles Northeast Mobile Dental Program (194)	Multiple locations through Connecticut	Mobile-portable model	Sliding fee scale	Emergency services  Basic services (e.g. screening, debridement)  Comprehensive services (e.g. Fillings, Extractions, Dentures)  Referrals to dental/oral health services	Medical services  Behavioural health services
Apple Tree Dental*(184)	Multiple locations throughout Minnesota and California	Dental clinic model Mobile-portable model Eligibility and enrollment model Virtual model	Medicaid  No charge to client  Sliding fee scale  Out of pocket  Commercial dental insurance	Emergency services  Basic services (e.g. screenings, debridement)  Comprehensive services (e.g. fillings, scaling/root planning, extractions, dentures)  Referrals to dental /oral health services	Medical Services  Behavioural health services  Pharmacy services  Transportation services  Translation services  Nutrition services
Commonwealth Mobile Oral Health Services* (197)	Lakeville, Massachusetts	Mobile-portable model	Medicaid  Out of pocket  Commercial dental insurance	Basic services (e.g. screenings, debridement)  Comprehensive services (e.g. fillings, scaling/root planning, extractions, dentures)  Referrals to dental/oral health services	Medical services  Vision services

Community-Based Oral Health Program for Senior Citizens(195)	Clinton County, Indiana	Eligibility and enrollment model  Outreach and education model	No Charge to Client	Basic services (screenings)  Patient education	Transportation services
D-DENT (203)	Oklahoma City, Oklahoma	Mobile-portable model  Eligibility and enrollment model	No charge to client	Basic Services (screenings)  Comprehensive services  Patient education  Caregiver education	-
Dientes Community Dental* (191)	Santa Cruz County, California	Dental clinic model  Mobile-portable model	Medicaid  Sliding fee scale  Commercial dental insurance	Emergency services  Basic services (e.g. screenings, debridement)  Comprehensive services (e.g. Fillings, Extractions, Dentures)  Referrals to dental/oral health services  Patient education  Caregiver education	Medical services  Translation services
Elderly Oral Health Care Consulting, Inc.(198)	Westland, Michigan	Mobile-portable model	Medicaid  Out of pocket	Basic services (e.g. screenings, debridement)  Referrals to dental/oral health services Care  Patient education  Caregiver education  Provider	

				education	
Elks Dental Care Program* (200)	Multiple locations throughout Missouri	Mobile-portable model	Medicaid	Basic services (e.g. screenings, debridement)  Comprehensive services (e.g. fillings)  Referrals to dental/oral health services Care  Patient education	
Geriatric Dental Group of South Texas (204)	San Antonio, Texas	Mobile-portable model	Medicaid  Out of pocket  Commercial dental insurance	Basic services  Comprehensive services (Dentures)	-
Hygienist Recommended (199)	Multiple locations throughout Michigan	Mobile-portable model	Medicaid  Out of pocket  Commercial dental insurance	Emergency services  Basic services (e.g. screenings debridement)  Comprehensive services (e.g. fillings, dentures) Referrals to dental and oral health services  Care coordination/ care management  Patient education  Caregiver education  Provider education  Advocacy/ coalition	Behavioural health services  Transportation services  Translation services  Nutrition services
I-Smile Silver Pilot Project (196)	Multiple locations throughout	Eligibility and enrollment	-	Referrals to dental and oral health services	-

	Iowa	model  Outreach and education model		Patient education  Caregiver education	
IDC In-Home Dental/Nursing Home and Assisted Living Program (205)	Washington, DC	Mobile-portable model  Eligibility and enrollment model	Medicaid  Out of Pocket	Emergency services  Basic services (e.g. screenings, debridement)  Comprehensive services (e.g. fillings, scaling/root planning, extractions, dentures)  Referrals to dental/oral health services  Care coordination/ care management  Caregiver education	Medical Services
Public Health Dental Hygienists (Limited Access Permit) (201)	Multiple locations throughout Montana	Mobile-portable model  Outreach and education model	Medicaid  Out of Pocket	Basic services (e.g. screenings, debridement)  Comprehensive services (scaling/root planning)  Referrals to dental/oral health services  Patient education  Caregiver education	Medical services  Transportation services  Translation services
Senior Mobile Dental* (193)	Multiple locations throughout Colorado	Mobile-portable model  Virtual model	Medicaid  No charge to client  Sliding fee scale	Emergency services  Basic services (e.g. screenings, debridement)	Medical services  Behavioural health services  Transportation

			Out of pocket	<p>Comprehensive services (e.g. fillings, scaling/root planning, extractions, dentures)</p> <p>Referrals to dental/oral health services</p> <p>Care coordination/ care management</p> <p>Patient education</p> <p>Caregiver education</p> <p>Provider education</p> <p>Advocacy/ coalition</p>	<p>services</p> <p>Nutrition services</p>
Smiles for Seniors (202)	Columbus, Ohio	Outreach and education model	No charge to client	<p>Patient education</p> <p>Caregiver education</p>	Nutritional services
Tooth Mobile (192)	Multiple locations throughout California	Mobile-portable model	<p>Medicaid</p> <p>Sliding fee scale</p>	<p>Basic services (e.g. screenings)</p> <p>Comprehensive services (e.g. fillings, dentures)</p> <p>Referrals to dental/oral health services</p> <p>Patient education</p> <p>Caregiver education</p>	Translation services
Virtual Dental Home* (187)	Multiple locations throughout the United States	<p>Dental clinic model</p> <p>Mobile-portable model</p> <p>Virtual</p>	<p>Medicaid</p> <p>No charge to client</p> <p>Sliding fee scale</p> <p>Out of</p>	<p>Emergency services</p> <p>Basic services (e.g. screenings, debridement)</p> <p>Comprehensive services (e.g.</p>	<p>Medical services</p> <p>Behavioural health services</p> <p>Transportation services</p>

		model	pocket Commercial dental insurance	fillings, scaling/root planing)  Referrals to dental/oral health services  Care coordination/ care management  Patient education  Caregiver education  Provider education  Advocacy/ coalition	Translation services  Nutrition services
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Featured programs were selected through a systematic review process and are distinguished with a star\*  
Source: <https://oralhealth.acl.gov/>

**Medicaid** in the [United States](#) is a social health care program for families and individuals with limited resources. Medicaid is a "government insurance program for persons of all ages whose income and resources are insufficient to pay for health care".

**Sliding fee scale** are variable prices for products, services, based on a customer's ability to pay.

#### Appendix 4: Posters, Pamphlets, Brochures

**Did you know????**



Reduce risk of Diabetes    Help prevent Heart Disease    Avoid Pneumonia    Reduce risk of Stroke    Prevent Tooth Decay    Reduce Gum Disease & Bad Breath



**A healthy mouth will improve overall health and well-being**

Good oral health is essential for overall health

 Better Oral Health in LTC - *Best Practice Standards for Saskatchewan*

 **SASKATCHEWAN ORAL HEALTH COALITION**

 **SASKATCHEWAN ORAL HEALTH PROFESSIONS**

(Adapted from Australia's Better Oral Health in Residential Care)





Brush morning  
and night

Fluoride  
toothpaste  
on teeth

Soft toothbrush  
on gums, tongue  
& teeth

Antibacterial  
product after  
lunch

Keep the  
mouth moist

Cut down  
on sugar



## Six of the best ways to maintain a healthy mouth

Protect your residents' oral health



Better Oral Health in LTC - *Best Practice Standards for Saskatchewan*



(Adapted from Australia's Better Oral Health in Residential Care)



Oral Health  
Professionals



Nurses



Physicians



Residents



Care aides



Speech Language  
Pathologist



Dietitians



# It takes a team approach to maintain a healthy mouth

Work together to protect your residents' oral health



Better Oral Health in LTC - *Best Practice Standards for Saskatchewan*



(Adapted from Australia's Better Oral Health in Residential Care)

## Six of the best ways to maintain a healthy mouth



Clean your mouth every morning and every night.



Use only a pea-sized amount of fluoride toothpaste to protect your teeth.

Spit - do not rinse after brushing so the fluoride can soak into your teeth.



Use a soft toothbrush to brush your teeth and to clean your gums and tongue.

If you require help, a care giver may sometimes use an extra toothbrush, so that they can see inside your mouth.

Replace your toothbrush with a new one with the change of seasons (every three months).

If you wear dentures clean them by brushing with a denture brush using soap and water. Rinse well. Disinfect dentures once a week. Dentures should have your name on them.



If you wear dentures take your dentures out overnight to rest your gums. Soak your cleaned dentures in a container with cold water.



Keep your mouth moist by sipping water.

A lip moisturiser may be helpful.

Try to reduce the amount of sugary drinks, juices and coffee you drink.



Cut down on sugary foods and beverages, particularly between meals.

## A healthy mouth will improve overall health and well-being

When your mouth is not clean, germs from the mouth may enter the airways and cause chest infections such as **pneumonia**.

The same blood that goes through infected gums also goes through the rest of the **body**.

This may cause infections far away from the mouth and may increase the risk of having a heart attack or even a **stroke**.

When oral health is poor, it can lead to:

- bad breath
- bleeding gums
- dental pain and infection
- inability to eat
- low self-esteem
- poor/impaired speech
- tooth decay
- change in behavior when pain or infection is present

**Simple daily mouth care and regular checks will help protect you**



**Better Oral Health in LTC - Best Practice Standards for Saskatchewan**



**Good Oral Health is essential for Overall Health**

(Adapted from Australia's Better Oral Health in Residential Care)

## **Appendix 5: Oral Health Assessment Tool**



## *Better Oral Health in Long Term Care – Best Practice Standards for Saskatchewan*

### Oral Health Assessment Tool (OHAT)

**Resident:** ☐ is independent    ☐ needs reminding    ☐ needs supervision    ☐ needs full assistance

☐ not able to open mouth    ☐ grinding or chewing    ☐ head faces down    ☐ refuses treatment  
☐ has responsive behaviour    ☐ bites    ☐ excessive head movement  
☐ not able to rinse and spit    ☐ cannot swallow well    ☐ does not take dentures out at night

<b>Date – dd/mm/yyyy</b> (Re-assessment every 6 months)									
<b>Exterior of face</b>	<b>Healthy</b> Both sides of face/neck are symmetrical, no lumps or bumps, swallowing normal, lips open and close								
	<b>Changes</b> Asymmetrical changes to face/neck, presence of lumps or bumps, swallowing challenging, lips do not open or close								
	<b>Unhealthy *</b> Asymmetrical changes to face/neck, presence of lumps or bumps, painful swallowing, lips do not open and close *								
	<b>Dental referral</b> Y – Yes * N – No								

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

Date	Assessor Comments

<b>Date – dd/mm/yyyy</b> (Re-assessment every 6 months)									
<b>Lips</b>	<b>Healthy</b> Smooth, pink, moist								
	<b>Changes</b> Dry, chapped or red at corners								
	<b>Unhealthy *</b> Swelling or lump, red/white/ulcerated bleeding/ulcerated at corners *								
	<b>Dental referral</b> Y – Yes * N – No								

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

Date	Assessor Comments

<b>Date – dd/mm/yyyy</b> (Re-assessment every 6 months)									
<b>Tongue</b>	<b>Healthy</b> Normal moist, roughness, pink								
	<b>Changes</b> Patchy, fissured, red, coated								
	<b>Unhealthy *</b> Patch that is red and/or white/ulcerated, swollen *								
	<b>Dental referral</b> <b>Y – Yes *</b> <b>N – No</b>								

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

Date	Assessor Comments



<b>Date – dd/mm/yyyy</b> (Re-assessment every 6 months)									
<b>Gums and Oral Tissue</b>	<b>Healthy</b> Moist, pink, smooth, no bleeding								
	<b>Changes</b> Dry, shiny, rough, red, swollen, sore, one ulcer/sore spot, sore under dentures								
	<b>Unhealthy *</b> Swollen, bleeding, ulcers, white/red patches, generalized redness under dentures *								
	<b>Dental referral</b> Y – Yes * N – No								

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

Date	Assessor Comments

<b>Date – dd/mm/yyyy</b> (Re-assessment every 6 months)								
<b>Saliva</b>	<b>Healthy</b> Moist tissues watery and free flowing							
	<b>Changes</b> Dry, sticky tissues, little saliva present, resident thinks they have a dry mouth							
	<b>Unhealthy *</b> Tissues parched and red, very little/no saliva present, saliva is thick, resident thinks they have a dry mouth *							
	<b>Dental referral</b> Y – Yes * N – No							

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

<b>Date</b>	<b>Assessor Comments</b>

<b>Date – dd/mm/yyyy</b> (Re-assessment every 6 months)									
<b>Natural Teeth</b>	<b>Healthy</b> No decayed or broken teeth or roots								
	<b>Changes</b> 1-3 decayed or broken teeth/roots, or teeth very worn down, mobile								
	<b>Unhealthy *</b> 4 or more decayed or broken teeth/roots or fewer than 4 teeth, or very worn down teeth, mobile *								
	<b>Dental referral</b> <b>Y – Yes *</b> <b>N – No</b>								

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

Date	Assessor Comments

<b>Date – dd/mm/yyyy</b> (Re-assessment every 6 months)									
<b>Dentures</b>	<b>Healthy</b> No broken areas or teeth, worn regularly, and named								
	<b>Changes</b> 1 broken area or tooth, or worn 1-2 hours per day only or not named								
	<b>Unhealthy *</b> 1 or more broken areas or teeth, denture missing/not worn, need adhesive or not named *								
	<b>Dental referral</b> <b>Y – Yes *</b> <b>N – No</b>								

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

<b>Date</b>	<b>Assessor Comments</b>

<b>Date – dd/mm/yyyy</b> (Re-assessment every 6 months)									
<b>Oral Cleanliness</b>	<b>Healthy</b> Clean and no food particles or tartar in mouth or on dentures								
	<b>Changes</b> Food tartar, plaque 1-2 areas of mouth, or on small area of dentures								
	<b>Unhealthy *</b> Food particles, tartar, plaque most areas of mouth or on most of dentures *								
	<b>Dental referral</b> Y – Yes * N – No								

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

Date	Assessor Comments

<b>Date – dd/mm/yyyy</b> (Re-assessment every 6 months)									
<b>Dental Pain</b>	<b>Healthy</b> No verbal behavioral signs or physical signs of dental pain								
	<b>Changes</b> Verbal &/or behavioral signs of pain such as pulling at face, chewing lips, not eating, responsive behavior								
	<b>Unhealthy *</b> Physical pain signs (swelling of cheek or gum, broken teeth, ulcers), as well as verbal &/or behavioral signs (pulling at face, not eating, responsive behavior) *								
	<b>Dental referral</b> Y – Yes * N – No								

**\*Unhealthy signs usually indicate referral to a dentist is necessary**

Date	Assessor Comments

## Appendix 6: Oral Health Care Plan

### Oral Health Care Plan

Name: \_\_\_\_\_

Oral Health Assessment (OHA) Date: \_\_\_\_\_

**Challenges:** ☐ difficulty swallowing ☐ frequent head movement ☐ difficulty opening mouth ☐ fear of being touched  
☐ difficulty eating/nutrition

**Interventions:** ☐ bridging ☐ modelling ☐ hand over hand ☐ distractions (activity board/toy) ☐ alternative provider  
☐ other \_\_\_\_\_

#### Daily Activities of Oral Hygiene

	Morning	After Lunch	Night
<b>Natural Teeth</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <b>Cleaned by:</b> <input type="checkbox"/> Self <input type="checkbox"/> Supervise <input type="checkbox"/> Assist <b>Replace toothbrush</b> (once every 3 months) Date:	<input type="checkbox"/> clean teeth, gums, tongue	<input type="checkbox"/> rinse mouth with water antibacterial product (teeth & gums)	<input type="checkbox"/> clean teeth, gums, tongue
<b>Denture</b> <input type="checkbox"/> Full <input type="checkbox"/> Partial <input type="checkbox"/> Upper <input type="checkbox"/> Lower <b>Inserted/removed by:</b> <input type="checkbox"/> Self <input type="checkbox"/> Staff <b>Cleaned by:</b> <input type="checkbox"/> Self <input type="checkbox"/> Supervise <input type="checkbox"/> Assist	<input type="checkbox"/> clean teeth, gums, tongue <input type="checkbox"/> brush denture	<input type="checkbox"/> rinse mouth with water <input type="checkbox"/> rinse denture <input type="checkbox"/> antibacterial product (gums)	<input type="checkbox"/> clean teeth, gums, tongue <input type="checkbox"/> brush denture with mild soap <input type="checkbox"/> leave dentures out overnight <input type="checkbox"/> soak denture in cold water <b>Disinfect dentures</b> (weekly) Specify day:

#### Oral Hygiene Aids

- ☐ soft toothbrush
- ☐ modified toothbrush
- ☐ toothbrush grip
- ☐ denture brush
- ☐ spray bottle (labelled)

#### Oral Health Care Products

- ☐ mild soap (denture)
- ☐ antibacterial product
- ☐ saliva substitute
- ☐ lip moisturiser
- ☐ fluoride toothpaste

#### Additional Oral Care Instructions

- ☐ antifungal gel
- ☐ denture adhesive
- ☐ interproximal brush
- ☐ tongue scraper
- ☐ normal saline solution

Date of next assessment: \_\_\_\_\_

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

## **Appendix 7: Lift the Lip Poster**





## ORAL SCREENING

### Oral Health Assessment

Supplies: Exam gloves, face mask and flash light

Look for anything out of the ordinary as part of your routine oral assessment. You may identify potentially life threatening oral infections or cancer.

- Make sure that mouth care is done daily.
- Offer Perivex for moisturizing dry and cracked lips (up to six times a day, if needed).
- Use fluoride toothpaste on natural teeth.
- Adjust daily mouth care to meet the needs of the resident daily.
- Offer sips of water throughout the day.
- Limit drinks high in sugar content.
- Dry mouth is a very uncomfortable feeling and it may require a prescription for a mouth moisturizer such as Biotene.
- Check if the resident can swallow comfortably.
- If the resident cannot swallow or spit, do not use toothpaste! Use **Perivex**.
- Never use regular toothpaste to clean dentures!
- Very loose teeth, tooth aches or infection in the mouth requires immediate attention.
- Make referrals to a dentist for other dental needs such as fillings or dental cleanings.
- Make referrals to the dentist for broken or ill -fitting dentures.

*For more information, ask a LTC oral health coordinator  
or an oral health professional at your local  
public health office*



## ORAL SCREENING

### Oral Health Assessment

Supplies: Exam gloves, face mask and flash light

Look for anything out of the ordinary as part of your routine oral assessment. You may identify potentially life threatening oral infections or cancer.

- Make sure that mouth care is done daily.
- Offer Perivex for moisturizing dry and cracked lips (up to six times a day, if needed).
- Use fluoride toothpaste on natural teeth.
- Adjust daily mouth care to meet the needs of the resident daily.
- Offer sips of water throughout the day.
- Limit drinks high in sugar content.
- Dry mouth is a very uncomfortable feeling and it may require a prescription for a mouth moisturizer such as Biotene.
- Check if the resident can swallow comfortably.
- If the resident cannot swallow or spit, do not use toothpaste! Use **Perivex**.
- Never use regular toothpaste to clean dentures!
- Very loose teeth, tooth aches or infection in the mouth requires immediate attention.
- Make referrals to a dentist for other dental needs such as fillings or dental cleanings.
- Make referrals to the dentist for broken or ill -fitting dentures.

*For more information, ask a LTC oral health coordinator  
or an oral health professional at your local  
public health office*

### Check your Residents' Lips and Mouth

Why check? To catch a problem before it becomes serious. **Lift at the inside of the lips by pulling the lower lip down and the upper lip up.**

#### What to look for:

##### Healthy Mouth:



Gums are light pink in colour and visibly moist. Teeth are clean with no plaque and calculus.

##### Dry Mouth with Acid Erosion from sugary drinks:



Gums are dry and mouth will often have a burning feeling.

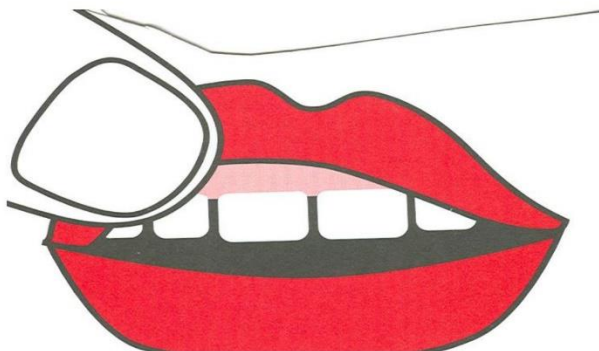
##### Unhealthy Mouth:



Visible plaque, calculus (hard deposits on the teeth and under the gums), food deposits in the mouth. Teeth may be loose, broken, or have decay or lost fillings.

*Not all problems are painful.*

*It is best to ask the resident if there is a concern.*



### Check your Residents' Lips and Mouth

Why check? To catch a problem before it becomes serious. **Lift at the inside of the lips by pulling the lower lip down and the upper lip up.**

#### What to look for:

##### Healthy Mouth:



Gums are light pink in colour and visibly moist. Teeth are clean with no plaque and calculus.

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Gums are dry and mouth will often have a burning feeling.

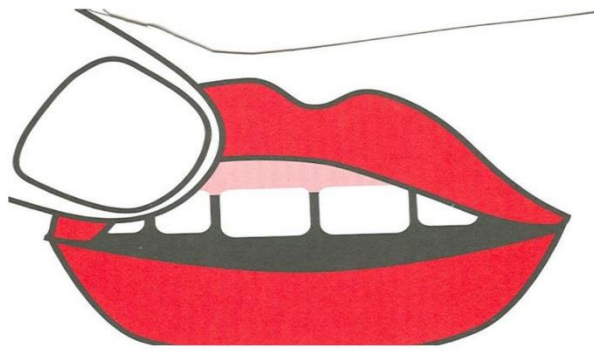
##### Unhealthy Mouth:



Visible plaque, calculus (hard deposits on the teeth and under the gums), food deposits in the mouth. Teeth may be loose, broken, or have decay or lost fillings.

*Not all problems are painful.*

*It is best to ask the resident if there is a concern.*



## Appendix 8: LTC Forms

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### *Annual Dental Examination Consent Form*

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\_\_\_\_\_  
Resident's Name

\_\_\_\_\_  
Long Term Care Home

\_\_\_\_\_  
Room #

I hereby authorize a dentist who is working with the program to perform an annual examination.

In requesting this examination, I recognize that the dentist accepts my right to choose the treatment of my choice following consideration of the treatment plan provided to me.

I fully understand that:

- An annual examination prior to receiving dental treatment from other oral health professionals, employed by the dentist, is mandatory. This is important to prevent, diagnose, and minimize conditions which may result in complications associated with dental treatment.
- All findings of the examination will be provided to each resident as a treatment plan. The written plan will be presented to the resident and/or care provider. This will include the treatment plan, a fee estimate for the dental treatment, and consent to proceed with the proposed treatment.
- A prescription for mild oral sedation may be required prior to dental treatment. If necessary, I consent to the physician providing a sedation prescription.
- There is a charge for the dental examination, as outlined in the *College of Dental Surgeons of Saskatchewan* current fee guide.

The collection of health and dental information is consistent with the requirements of our profession and those of the *Health Information Protection Act of Saskatchewan* and the *Personal Information Protection and Electronic Documents Act of Canada*. This includes consultation with health professionals as necessary. We acknowledge our duty and responsibility to hold in confidence your personal health information gathered in the course of our professional relationship. I understand that it is my responsibility to pay for dental treatment. I understand that if I have provided an email address that correspondence may occur through email.

If you have any questions about these services, or if you have limitations, possible complications or other information, contact the Long Term Care Oral Health Coordinator at **306-655-4317**.

\_\_\_\_\_  
(Name of the authorizing person)

\_\_\_\_\_  
(Relationship to resident)

\_\_\_\_\_  
(Address and postal code of authorizing person)

\_\_\_\_\_  
(Email address of authorizing person)

\_\_\_\_\_  
(Home Phone #/ Cell Phone #/ Work Phone #)

Dental Benefits/Insurance: ☐ Y ☐ N

\_\_\_\_\_  
(Authorizing person's signature)

Name of Insurance Plan: \_\_\_\_\_

Group Plan Number: \_\_\_\_\_

Name of Subscriber: \_\_\_\_\_

Certificate/ID # of Subscriber: \_\_\_\_\_

Date of Birth (Subscriber): \_\_\_\_\_

Date of Birth (Spouse): \_\_\_\_\_

Please return this form to:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

#2 \_\_\_\_\_  
Rev 02/2016



Oral Health Program  
Population and Public Health

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## *Medical History Form for Dental Examination/Treatment*

---

### Personal Health Information

Long Term Care Home: \_\_\_\_\_

Name: \_\_\_\_\_

Room #: \_\_\_\_\_ Unit Telephone #: \_\_\_\_\_

Date of Birth: \_\_\_\_\_ M/F: \_\_\_\_\_

Dental Benefits/Insurance: \_\_\_\_\_

Saskatchewan Personal Health (Health card #): \_\_\_\_\_

Veterans Affairs (K#): \_\_\_\_\_

First Canadian Health (Treaty#): \_\_\_\_\_

Person Responsible for Account: \_\_\_\_\_

Billing Address: \_\_\_\_\_

Email Address for Family Representative: \_\_\_\_\_

Phone Number for Family Representative: \_\_\_\_\_

### Dental Information

1. When was your last dental exam? \_\_\_\_\_
2. When were your last dental x-rays taken? \_\_\_\_\_
3. Are your teeth sensitive to:    ☐ Cold        ☐ Heat        ☐ Sweets
4. Do you have bad breath or a bad taste in your mouth?    ☐ Y    ☐ N
5. Do your jaws crack, pop or grate when you open or close?    ☐ Y    ☐ N
6. Do you grind or clench your teeth?    ☐ Y    ☐ N
7. Do you have food catch between your teeth?    ☐ Y    ☐ N
8. Have you ever had any of the following?
 

<input type="checkbox"/> Bridgework	<input type="checkbox"/> Crowns or caps	<input type="checkbox"/> Dental implants
<input type="checkbox"/> Gum surgery	<input type="checkbox"/> Complete dentures	<input type="checkbox"/> Root canal treatment
<input type="checkbox"/> Partial dentures		
9. Are complete dentures and/or partial dentures labelled with resident's name?    ☐ Y    ☐ N
10. If you wear dentures, do you have any concerns about your current dentures?  
☐ Y    ☐ N    If yes, what? \_\_\_\_\_



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**Name:** \_\_\_\_\_

**Medical History**

1. Name of Physician: \_\_\_\_\_  
Physician Phone#: \_\_\_\_\_ Physician Fax #: \_\_\_\_\_
2. Have you been hospitalized? ☐ Y ☐ N  
If yes, explain: \_\_\_\_\_
3. Current Medication Administration Review (MAR) list attached? ☐ Y ☐ N
4. Are you allergic to latex? ☐ Y ☐ N
5. Do you have any allergies? ☐ Y ☐ N
6. Have you ever had an allergic reaction to any drug or anesthetic, at the time or later?  
\_\_\_\_\_  
\_\_\_\_\_
7. Do you bruise easily or have prolonged bleeding? ☐ Y ☐ N
8. Have you ever fainted, had shortness of breath or chest pains? ☐ Y ☐ N
9. Do you have a heart or circulatory problem of any kind? ☐ Y ☐ N
10. Are you taking or have you ever taken Bisphosphonate drugs such as Fosamax, Skelid or Actonel (for osteoporosis) or Aredia, Zameta or Didronel (for cancer treatments)? ☐ Y ☐ N
11. If yes to #10, how were the drugs given? ☐ Oral ☐ I.V.  
Duration of therapy: \_\_\_\_\_
12. Are you MRSA, ESBL, or VRE positive (+)? ☐ Y ☐ N
13. If yes to #12, which one? \_\_\_\_\_
14. Do you have or have had any of the following?
 

<input type="checkbox"/> Aids	<input type="checkbox"/> Emphysema	<input type="checkbox"/> Leukemia
<input type="checkbox"/> Anemia	<input type="checkbox"/> Epilepsy	<input type="checkbox"/> Lung disease
<input type="checkbox"/> Angina	<input type="checkbox"/> Glaucoma	<input type="checkbox"/> Mental disorder
<input type="checkbox"/> Anorexia	<input type="checkbox"/> Head/neck injury	<input type="checkbox"/> Mitral valve prolapse
<input type="checkbox"/> Antibiotic resistance organisms	<input type="checkbox"/> Heart disease	<input type="checkbox"/> Organ transplant
<input type="checkbox"/> Arthritis	<input type="checkbox"/> Heart Murmur	<input type="checkbox"/> Radiation/chemo
<input type="checkbox"/> Artificial heart valve	<input type="checkbox"/> Heart pacemaker	<input type="checkbox"/> Rheumatic/Scarlet fever



Oral Health Program  
Population and Public Health

Name: \_\_\_\_\_

14. Do you have or have had any of the following? (Continued)

- |                                            |                                                       |                                                         |
|--------------------------------------------|-------------------------------------------------------|---------------------------------------------------------|
| <input type="checkbox"/> Artificial joints | <input type="checkbox"/> Heart rhythm disorder        | <input type="checkbox"/> Sinus trouble                  |
| <input type="checkbox"/> Asthma            | <input type="checkbox"/> Hepatitis A/B/C              | <input type="checkbox"/> Stomach problems               |
| <input type="checkbox"/> Blood disorder    | <input type="checkbox"/> Herpes                       | <input type="checkbox"/> Stroke                         |
| <input type="checkbox"/> Bronchitis        | <input type="checkbox"/> High/Low B.P.                | <input type="checkbox"/> Thyroid disease                |
| <input type="checkbox"/> Bulimia           | <input type="checkbox"/> HIV                          | <input type="checkbox"/> Tuberculosis                   |
| <input type="checkbox"/> Cancer            | <input type="checkbox"/> Implanted Electrical Devices | <input type="checkbox"/> Ulcers                         |
| <input type="checkbox"/> Diabetes          | <input type="checkbox"/> Kidney disease               | <input type="checkbox"/> Sexually Transmitted Infection |
| <input type="checkbox"/> Drug dependence   | <input type="checkbox"/> Liver disease                |                                                         |

15. Have you ever had any illness not included above? ☐ Y ☐ N

If yes, explain: \_\_\_\_\_.

### *Consent for Dental Examination/Treatment*

I understand that the information contained in the medical and dental history is important to my dental examination and treatment. I certify that all the information I have completed is correct, and that I have not knowingly omitted information.

I authorize the dentist/oral health professional to perform diagnostic procedures including x-rays and photographs inside and outside the mouth. Any photographs taken of the resident and/or family members may be used for education purposes. This also includes collecting personal health information as required to determine necessary treatment. This includes consultation with other health professionals as necessary.

A prescription for mild oral sedation may be required prior to dental treatment. If necessary, I consent to the physician providing a sedation prescription.

The collection of health and dental information is consistent with the requirements of our profession and those of *The Health Information Protection Act of Saskatchewan* and the *Personal Information Protection and Electronic Documents Act of Canada*.

We acknowledge our duty and responsibility to hold in confidence your personal health information gathered in the course of our professional relationship.

I understand that it is my responsibility to pay for dental treatment.

I understand that if I have provided an email address that correspondence may occur through email.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name (Print)

OH 862 09/16

---

Resident Name: \_\_\_\_\_ Room #: \_\_\_\_\_

Resident Name: \_\_\_\_\_ Room #: \_\_\_\_\_

[illegible]

#2A 10/15



Long Term Care Home: \_\_\_\_\_

**The following treatment has been recommended:**

The dental procedures will be performed at:

- Name: \_\_\_\_\_ Relation to Resident: \_\_\_\_\_
- Address: \_\_\_\_\_ Home Phone: (\_\_\_\_) \_\_\_\_\_
- \_\_\_\_\_ Business Phone: (\_\_\_\_) \_\_\_\_\_
- Email: \_\_\_\_\_ Cell Phone: (\_\_\_\_) \_\_\_\_\_

Complete and sign the *Consent for Financial Responsibility for Dental Treatment* and return to:



211

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## Consent for Dental Treatment

---

Re: \_\_\_\_\_  
(Home) (Residents Name)

I, the person signed below, give consent for the following dental treatment, procedure or surgical operation to be provided by an oral health professional (dentist, dental assistant, dental hygienist, dental therapist and denturist as required):

The treatment is:

\_\_\_\_\_  
\_\_\_\_\_.

The nature, possible effects, risks and alternatives to this treatment have been explained to me. I understand the explanation and the alternatives. A prescription for mild oral sedation may be required prior to dental treatment. If necessary, I consent to the physician providing a sedation prescription.

I consent to receiving anesthetic, and to the use of anesthetics as may be considered necessary. I consent that the oral health providers may provide additional treatment if it is considered immediately necessary. I also consent that the oral care providers may be assisted by other oral/health care providers and that they may perform all or part of the treatment.

The collection of health and dental information is consistent with the requirements of our profession and those of *The Health Information Protection Act of Saskatchewan* and the *Personal Information Protection and Electronic Documents Act of Canada*. We acknowledge our duty and responsibility to hold in confidence your personal health information gathered in the course of our professional relationship.

I understand that it is my responsibility to pay for dental treatment.

I understand that if I have provided an email address that correspondence may occur through email.

Signed: \_\_\_\_\_ Date: \_\_\_\_\_  
(Resident or Responsible Party)

Print Name: \_\_\_\_\_

**Complete and sign the *Consent for Dental Treatment* and return to:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

#3 10/15



Oral Health Program  
Population and Public Health

## Appendix 9: Oral Health Status Before Implementation of BOH in LTC Program



This resident didn't brush and had a very unhealthy mouth: red inflamed gums and heavy plaque



The bridges are missing and teeth fractured at the gum line. Dental caries are seen all around porcelain crowns.



Before brushing daily



After brushing daily