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The Impact of Oral Health on Quality of Life in the Aging Population

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The Impact of Oral Health
on Quality of Life in the Aging Population

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by

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To: Jana Mannen, Department of Dental Hygiene, 160 HSB

From: Sarah Keller, Chair, Institutional Review Board for Human
Subjects Research

Date: February 3, 2014

Subject: Expedited IRB Review of HS-4428 *The Impact of Oral Health
               on Quality of Life in the Aging Population*

Thank you for your response to my memo of January 29. Your
clarifications and revisions have addressed our concerns. Human
subjects protocol HS-4428 *The Impact of Oral health on Quality of Life in
the Aging Population* has been approved as amended. The signed copy of
your approved application is enclosed.

Human subjects research approval granted by the IRB is good for one
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(contact OGRD for procedure). If, subsequent to initial approval, a
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If you have additional questions please contact me at 359-7039; fax 509-
359-2474; email skeller@ewu.edu.   It would be helpful if you would refer
to HS-4428 if there were further correspondence as we file everything
under this number. Thank you.

cc: R.Galm
     R.Stolberg
     A.Wetmore
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Abstract

Purpose: This study sought to bring awareness to the scientific community of the need for regular dental care in skilled nursing facilities (SNF) by proving access to oral care has an effect on oral health and may have an impact on the SNF residents' daily performance and Quality of Life (QoL).

Methods: This study was conducted at a private SNF in a southern metropolitan area with a sample size of 30 (N=30). The PI and two research assistants conducted interviews and oral exams using a modified 10 item Oral Impacts on Daily Performance (OIDP) with two free response (QoL) questions, OHI-S, and DMFT indices to collect data.

Results: Spearman's rank coefficient analyzed correlations between OHI-S, DMFT, and OIDP indices and found a significant relationship between the OHI-S and OIDP (p=0.036) implying oral disease from plaque and calculus buildup in the mouth impact daily performance. Furthermore the strongly suggested relationship between the DMFT and OIDP (p=0.054) alludes to the fact the number and condition of the teeth has an impact on how these subjects lived their daily lives. Considering the strongly suggested relationship between the Missing (M) in DMFT scores and the OIDP (p= 0.059), the number of teeth has more potential to impact daily performance than whether the teeth are decayed or filled. Qualitative data analysis found four themes related to the social, psychological, physical, and financial well-being of the subjects and their oral health.

Conclusion: Oral health has the potential to impact daily performance resulting in an effect on quality of life. The health care professions are charged with developing health care provider models and collaborative interprofessional health care teams to meet the future needs of aging adults.

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Second, I would like to thank Clarewood House and all of its employees for their permission and support of my research within their skilled nursing facility. Not only did they allow me to conduct this research, but their employees were supportive and friendly. Dr. Elizabeth Tipton, my statistician, kindly ran my results, and analyzed my statistics. Sarah Keller, Chair, Institutional Review Board for Human Subjects Research, patiently assisted me with clarifications and revisions through the IRB process. Thank you to Emilie Crawford for always making the time to listen and give support when the going got tough. A special thank you, to Dr. and Mrs. Massingill for their confidence and support of my study.

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Introduction/Review of the Literature

Introduction to the Research Question

By the year 2030, 72 million people in America will be 65 or older, approximately one out of every five adults. This group of geriatric adults is known as the Baby Boomers. These boomers, a growing portion of our population, will have: retained most of their teeth; maintained their health; taken prescription medications; attained a higher level of education; and developed high expectations about their long term healthcare plans. Given the growth of these aging baby boomers, long-term care facilities face the task of caring for the oral health of a group of adults who are dentulous geriatric residents. The connection between oral health and systemic disease renders quality dental care important for a satisfactory Quality of Life (QoL) (Landau, 2010).

In order to better understand the health needs of boomers, this research asked the following questions:

1)   What effect does oral health have on the daily performance in the elderly?

2)   Does poor oral hygiene affect QoL in the elderly?

In conducting this study, the following key terms must be defined.

Definition of Key Terms and Operational Definitions

Baby Boomers-generation of people born between the years of 1946-1964. This generation has the longest life expectancy at 77.6 years. This generation will be 40 million strong by the year 2014 (Landau, 2010)

Oral Health-is multi-faceted and may be described as a healthy mouth free of pathologies with a functional dentition (Chalmers, 2005).

Dentulous-possessing or bearing teeth (Justice & Justice, 2009).

Edentulous-having no natural teeth (Justice & Justice, 2009).

Partial edentulous-having a limited number of natural teeth (Justice & Justice, 2009).

Geriatric-old age or aged 60 and up (Welsh, 1992).

Long-term care facilities (LCF)-a place of residence for people who require constant nursing care and have significant deficiencies with activities of daily living (Soini et al., 2006).

Oral Impacts on Daily Performance (OIDP) –The Oral Impacts on Daily Performance score quantifies the effect of oral health on the activities of daily living (Locker, D., Allen, F., 2007).

Daily Performance-actions preformed on a daily basis for proper hygiene health. Examples of performances commonly measured include eating, bathing, and dressing (Matear & Barbaro, 2006)

Xerostomia-dry mouth due to inadequate saliva. The most common cause of xerostomia is the use of certain types of prescription drugs (Culross, 2008).

Successful aging-perceived satisfaction of happiness, good health, and longevity-a combination of many aspects of aging including but not limited to the value of a healthy smile, self-esteem, comfort, and nutrition (Locker, Allen, 2007).

Active Aging-desire and ability of many seniors to remain engaged in economically and socially productive activities (Locker, Allen, 2007).

Admission nursing assessment (NA)-skilled nursing facilities require nurses to conduct an admissions assessment for all residents which includes an oral component (Munoz, Touger-Decker, Byham-Gray & Maillet, 2009).

Skilled nursing facility (SNF)-any facility providing long-term or short-term care to people who cannot live alone (APS Texas, 2011).

Minimum Data Set 3.0 (MDS)-Federal government requires this comprehensive assessment completed for residents within 14 days of admission to a SNF and thereafter updated quarterly, which includes an oral component (Health Centers for Medicare and Medicaid Services, 2011).

Quality of Life (QoL)- general well-being of individuals and societies (Guyatt and Cook, 1994)

Oral Impacts on Daily Performance/Quality of Life (OIDP/QoL)- The OIDP index is used to measure the frequency and the severity of major oral impacts in the last six months combined with two QoL free response questions to measure subjective health concerns (Guyatt and Cook, 1994).

Decayed Missing Filled Teeth(DMFT)- The DMFT index provide detailed oral cavity information on decayed, missing, and filled teeth to demonstrate the potential health risks associated with unresolved dental needs (Klein, Palmer, & Knutson, 1938).

Oral Hygiene Index-Simplified(OHI-S)- This index measures the plaque and calculus to quantify oral hygiene. (Green and Vermillion, 1964).

Background of Study

According to previous research, dental care for residents of Skilled Nursing Facilities (SNF) is a global need (Munoz, Touger-Decker, Byham-Gray, & Maillet, 2009). Evaluation of the oral health of residents must be integrated into the required healthcare assessments of our elderly. The population of residents in long-term care facilities is changing as more of the baby boomer generation ages. Availability of dental

care, perceived need, and the importance of quality dental care with the connection to

"active aging" and "successful aging" will play a larger role in the long term care of this

increasing population. Successful aging is perceived as a combination of many aspects of

life including but not limited to self-esteem, comfort, value of a smile, as well as oral

health (Matear & Barbaro, 2006). Oral health is multi-faceted and may be described as a

healthy mouth free of pathologies with a functional dentition. Further, a functional

dentition provides a smile for social reasons and self-esteem, is free of infection, presents

with minimal effects from xerostomia, provides nutrition with the ability to chew, taste,

and eat plus provides the oral borders for speech to be effective (Ettinger, 2007).

Inclusion of oral health assessments with the traditional regulatory needs provided

in long-term care facilities may identify residents with compromised dentition and allow

for proper nutritional needs to be addressed and evaluation of the presence of infection

for early intervention and health maintenance. Additionally, assessing the oral health

needs of long-term residents may lead to an increase in self-esteem and freedom from

pain that contributes to diminishing coping skills. Indeed, the link between the

inflammatory process of an oral infection and systemic diseases denotes the importance

of oral health assessments to reduce co-morbidity factors of the aging (Genco &

Williams, 2010). This link identified by the America Medical Association demonstrates

the importance for collaboration between medical and dental professionals in providing

comprehensive health care (Genco & Williams, 2010).

Overview of Research

Discovery of the connection between oral health and the health of the whole body

is a positive milestone in the collaboration between the medical and dental fields. Dental

and medical professionals have the potential to prevent disease and preserve QoL through

collaborative health prevention (Genco & Williams, 2010). High blood pressure and systemic conditions such as diabetes can be screened plus side effects from medications and radiation treatments can be evaluated through regular oral examinations. The inflammatory process is the common link between oral health and systemic diseases with the association of oral bacteria from the host response during the inflammatory process (Hughes, 2007). The importance of access to care has been documented in previous studies where research identifies the need for routine oral assessments and access to dental treatment for the identification of oral infections and signs of possible systemic conditions (Matear & Barbaro, 2006; Slaughter and Yoneyama et al., 2002).

With the baby boomers increasing the number of people in the population who are 65 and older, the need for access to care for the elderly is essential in order to maintain growing healthcare needs. Demand for services will increase instead of drop off because the generations to follow (generation Y and X) and the baby boomers are living longer with more chronic diseases (American Heart Association, 2007). Baby boomers will make up the largest population in the skilled SNFs and expect to enjoy their daily routines and high QoL. Educating nursing staff of SNF about the connection between oral and systemic health has the potential to improve daily performance and QoL for residents of skilled nursing facilities. Helping caregivers, administrators, and family members gain current knowledge about the importance of access to dental care, value of oral health, different types of dental therapies available, and benefits of quality dental treatment may have a positive impact on the overall health of the residents (Frenkel, Harvey, & Newcombe, 2001; Coleman & Watson, 2006; Matear & Barbaro, 2006).

Related or Theoretical Frameworks and Supporting Research

       Oral systemic connection. The connection between oral health and systemic disease is not a new concept (Munro, 2006; Genco, 2009; Genco & Williams, 2010). Oral health has been connected to disease in the human body since ancient times from Hippocrates (400 B.C.) in Greece (Genco & Williams, 2010). Dental and medical pioneers Miller, Hunter, and Billings traced the oral and systemic disease connection to other parts of the body (King, 1984; Ring 2002; Genco &Williams, 2010). These early observations led to further development and discoveries of the connection between the oral cavity and the body. The most common disease among man is periodontal disease (Genco, 2009; Genco & Williams, 2010). Clinicians and scientists from around the world launched studies and research on periodontal disease and its etiology establishing an oral health and systemic connection (Genco, 2009; Genco & Williams, 2010). Over the past 50 years, the study of the complicated relationship between chronic diseases including periodontal disease and systemic conditions such as cardiac disease has taken the dental and medical field down an important road of discovery. From this Genco & Williams research, the following systemic conditions have been linked to periodontal health, atherosclerosis (thickening of artery wall), diabetes, stroke, preterm labor, low birthrate, respiratory infections, osteoporosis, and renal disease (Genco, 2009; Genco & Williams, 2010). The impact poor oral health has on systemic health is multifaceted including the bidirectional association with diabetes, the inflammatory response, the potential for causing infection, and the effect on nutritional status.

       Diabetes. The bidirectional association between oral health and systemic illnesses involves the discussion of diabetes and periodontal disease (PD) (Genco, 2009; Genco &

Williams, 2010). Approximately, 23.6 million people or 7.8% in the U.S. have diabetes with the prevalence increasing with advancing age. Diabetes mellitus (DM) refers to a group of endocrine disorders associated with elevated blood glucose along with abnormal processing of carbohydrates, fats, and proteins. DM is a metabolic disorder resulting in hyperglycemia, an increased blood sugar, and presenting with a triad of symptoms. These symptoms affect every tissue in the body through excessive thirst called polydipsia, excessive urination called polyuria, and polyphagia, excessive weight loss, inducing fatigue, and loss of strength. Of those, most have Type II diabetes mellitus (DM) (85%-90%) while approximately 5% to10% have Type I DM. Gestational Diabetes (GDM) affects pregnant women (4%) and is a risk factor for developing DM Type II later in life (Genco & Williams, 2010). DM is linked to periodontal disease (PD) because it is a risk factor for developing PD and conversely having periodontitis increases the risk of poor glycemic control or control of blood sugars for people with DM. PD is supported by this destructive host response through the multifaceted cascade of tissue-destructive pathways. The more uncontrolled the DM, the higher the risk is of developing PD (Genco & Williams, 2010). The research points to possible glycemic control, delay of PD progression, and prevention of the development of DM and GDM with preventative measures such as modest weight loss through diet and exercise with regular dental maintenance and good oral hygiene.

Genco conducted numerous studies since 1963 on the relationship between PD and DM showing a bidirectional relationship between PD and DM. (Genco & Williams, 2010). For example, a prospective longitudinal study ($N = 628$) with subjects aged ≥ 35 years conducted by Genco and nine other colleagues on Pima Indians in Arizona,

confirmed PD is a strong predictor of mortality (Saremi et al.,2005). According to an 11

year follow up of the original 628 subjects, 204 subsequently died. Resulting data for

those subjects (n=204) found the following breakdown of disease classification: no or

mild PD 3.7 % (95%CI 0.7-6.6), moderate PD 19.6 % (95%) CI1need a space 0.7-28.5)

and severe PD 28.4 %(CI22.3-34.6). Additionally, results suggested a significant

relationships between PD and ischemic heart disease ($p = 0.04$) and diabetic nephropathy

($p < 0.01$) (Saremi et al., 2005).

There are other oral complications associated with DM besides PD and gingival

inflammation. These include: xerostomia; dental caries; Candida Albicans infection;

burning mouth syndrome; association with oral cancer; lichen planus; and poor wound

healing (Santacroce, Carloaio, Bottalico, 2010). Besides increasing risk for the

progression of DM an overarching principle in PD is the host response to inflammation.

The inflammatory response. The relationship between oral infection and

systemic health was first documented in Ancient Egypt (Meurman & Hamalainen, 2006).

The focal infection concept, which means microorganisms travel to distant sights causing

infection, is more than a hundred years old and may be involved in many systemic

diseases. This concept has become popular because inflammatory cells from the oral

cavity have been detected when diagnosing systemic diseases (Meurman & Hamalainen,

2006). There are two types of inflammation: acute and chronic. In the acute condition,

the inflammatory response is of rapid onset and short duration. Manifestation of exudates

and plasma proteins, with migration of leukocytes called neutrophils dominates the short

duration of activity. In the chronic state, the inflammatory response involves extended

durations of time. The histological manifestation of lymphocytes and macrophages, white

bloods cells that ingest foreign material, result in fibrosis and tissue necrosis throughout

the body perpetuated by prolonged periods of time in the chronic inflammatory situation

(see Figure1).

Plaque
(*Biofilm*)

Endotoxins
Cytokins/ Protein toxins

Gingivitis

Proliferation of Biofilm

White Blood Cells
(Leukocytosis)
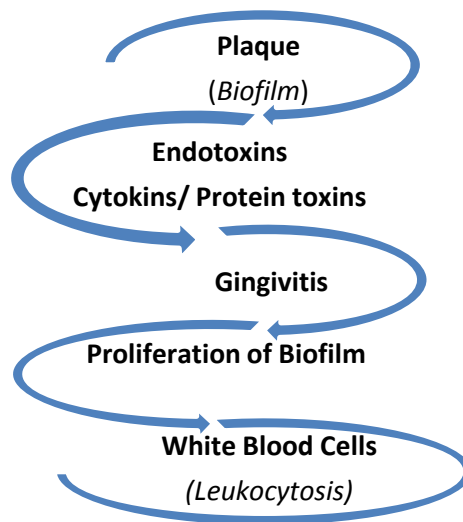
Figure 1. Inflammation process in diseases of the periodontium

The inflammatory response involves a vascular and a cellular reaction. Each reaction is

mediated by chemical factors resulting from plasma proteins or cells. The signs of the

inflammatory response includes: redness, swelling, heat, pain, and loss of function

(Gurenlian, 2006). Signs of the inflammatory response on a more cellular level include

chemical mediators including histamines, serotonin, prostaglandins, and cytokines etc., as

well as leukocytosis, an increase in the number of circulating white blood cells (see

Figure 2) (Gurenlian, 2006). The biologically active products, including gram-negative

bacteria from the plasma proteins or cell, trigger the chemical mediators directing the

inflammatory response. The inflammatory response for instance, in established gingivitis,

begins with mature plaque biofilm releasing biologically active products that penetrate

the epithelium and triggers the host response eventually resulting in gingivitis (see Figure

1) (Gurenlian, 2006). Proliferation of gingivitis into a chronic infection signals the epithelium to produce more virulent chemical mediators that increase the permeability of the gingival vessels allowing plasma proteins into the tissue from the blood vessel (see Figure 2) (Gurenlian, 2006). The acute phase host response involves c-reactive proteins (CRP) and fibrinogen (Fbgn) causing deleterious changes in localized tissues such as the periodontal ligament and bone loss as well as possible progression of systemic diseases throughout the entire body (Gurenlian, 2006). The CRP and other acute phase reactants (APR) or proteins are produced by the liver in response to the inflammatory process. The proteins can release large or small amounts of plasma derived mediators resulting in an exacerbated effect in the initiation or progression of systemic disease by establishing colonial sites elsewhere in the body setting up the potential of infection at these sites (Gurenlian, 2006).
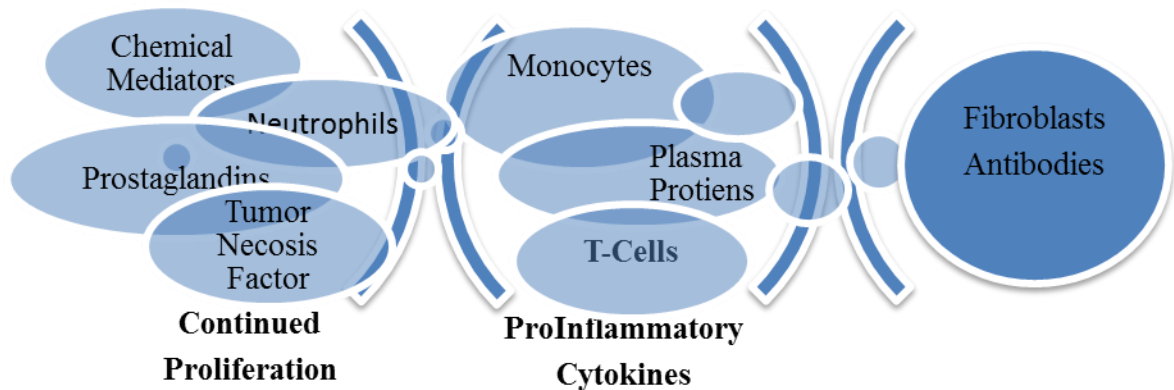
Figure 2. Proliferation of cells in the inflammatory response.

The potential for infection. It is necessary to call attention to untreated infections of oral origin that spread resulting in life-threatening complications. Oral infections left untreated are a risk to people from developing countries as well as industrialized countries (Meurman & Hamalainen, 2006). For example, in a 1995 epidemiological study conducted with 14,500 Finnish soldiers, the highest occurrence of respiratory tract infections was observed three days before pericoronitis of the third molar ,(commonly called the wisdom tooth), was diagnosed (Meurman, Rajasuo, Murtomaa, & Savolainen, 1995). The most common systemic infections resulting from poor oral health are respiratory conditions (Mylotte, 2002, Genco, 2009). Research correlations suggest a relationship between oral health and four subtypes of bacterial pneumonia: community-acquired; nosocomial or hospital acquired; ventilator-associated; and SNF-associated (Genco & Williams, 2010). Bacterial pneumonia starts first with viral invasion decreasing cough reflex, interrupting mucocilliary clearance, and enhancing pathogenic adherence setting up the perfect conditions for bacterial growth (Genco & Williams, 2010). For example in a study of older veterans ($N = 358$) conducted by Terpenning, (2004) the two main risk factors demonstrating a connection to the incidence of pneumonia is difficulty swallowing and PD. In a second study of elderly SNF residents ($N = 613$) the two main risk factors having a significant association are difficulty swallowing (dysphagia) ($p = .043$) and oral care ($p = .03$) (Terpenning, 2004). The elderly are more susceptible to the aspiration of fluids due to a weakened gag reflex and epiglottis. The risk of malnutrition and multiple bouts of pneumonia caused by poor oral health points to the significance of the need for access to care for the elderly and the future benefits for the reduction of the cost of medical treatments (Terpenning, 2004).

Nutrition. A functional dentition is needed in order to maintain a diet that fulfills

nutritional needs of the body (Kimura et al., 2009). Restricted food choices may lead to

increased consumption of fermentable carbohydrates leading to a rise in the percentage of

plaque as well as a negative effect on overall health (Kimura et al., 2009). Poor oral

health resulting in oral diseases including periodontal disease and caries can lead to

inadequate chewing ability because of loose and broken teeth, dry mouth, tooth loss,

mucositis, an acute inflammation of the oral mucosa, ill-fitting dentures, poor taste, and

pain (Kimura et al., 2009). Lack of chewing ability is implicated in malnutrition for

instance, inadequate or painful dentition limits food choices to soft foods that are

processed. Soft foods are often laden with carbohydrates and may not provide optimum

nutrition or clearing of the oral cavity (Kimura et al., 2009). For example, in a

multicenter cross-sectional study of residents in a Finland SNF Nursing Home (NH) ($N =$

2036) and long-term care facility (LT) ($N = 1052$) researchers compared the oral hygiene

of residents with their nutritional status. The results of this study showed in the NH

facility 11% of the residents were well nourished, 60% were at risk for malnourishment

and 29% were malnourished. The results in the LT facility were 3% were well

nourished, 40% were at risk of malnourishment, and 57% were malnourished. The study

found a statistically significant correlation between malnutrition and both poor oral health

status and oral health problems ($p<.001$) (Soini et al., 2006).

Before vitamins and minerals were discovered the United States Department of

Agriculture (USDA) developed its first model for Americans to determine their

nutritional needs in 1894 (Welsh, 1992). The focus was on "protective foods" until 1916

when nutritionist Caroline Hunt authored "Food for Young Children" dividing food into

five basic groups (milk and meat, cereal, vegetables and fruits, fats and fatty foods, and

sugar and sugary foods) emphasizing the importance of number of servings for each

group along with adequate nutrient intake (USDA, 2011). Starting in the 1940's until

1980's dividing the food groups into seven different groups, the focus was on serving

size to control calorie intake and limiting daily servings of sugar, alcohol, and fats

(USDA, 2011). In 1992, the first food pyramid introduced focused on nutrient adequacy

and moderation. A graphic, MyPyramid, demonstrated the recommended daily servings

of food as well as reinforced the concept of exercise by including a picture of a person

running up the pyramid. Special needs pyramids have been developed for diabetics and

geriatric Americans to help them sort through their complicated food intake (Welsh,

1992). During 2011, the My Plate concept was introduced going back to the five basic

food groups. (USDA, Center for Nutrition Policy and Promotion, 2011). Since then My

Plate, a simpler graphic, is utilized for determining recommended daily food intake per

meal, however the recommended amount of daily servings of food is still the same as My

Pyramid.

Because My Plate was recently adopted little research exists; however, there are

sufficient studies on MyPyramid to warrant discussion here. Tufts University developed a

modified pyramid for the older adult because of the multiple changes they go through as

they age (Tufts University, 2007). Changes affecting older adults include sacropenia, a

loss of lean muscle mass, leading to reduction of total body water content and the

common problem of loss of bone density that increases the risk of osteoporosis (Culross,

2008). Additionally, many changes occur within the digestive system of the older adult.

A reduction in gastric acid secretions limits the absorption of iron and Vitamin B12

(Culross, 2008). Xerostomia has been mentioned along with changes in the dentition

(Culross, 2008). The pyramid for older adults emphasizes nutrient dense foods, adequate

fluid intake, and adding vitamin supplements (Culross, 2008). Since the older adult is at

risk for malnutrition, the extra supplements help meet their nutritional needs when food

intake is inadequate (Culross, 2008). For instance, the mineral calcium helps build bone

but requires vitamin D for adequate absorption (Culross, 2008). Older adults tend not to

get enough sunlight to maintain adequate vitamin D levels hence the need for the

supplement (Culross, 2008). In addition, other changes the older adult may experience

are a slowing of peristalsis, which is a slowing of muscles in charge of moving food to

different digestive stations, deregulation of thirst and appetite, sensory changes use of

medications, sedentary lifestyle, social isolation, loneliness, and depression. These

emotional, physical, and psychological states can lead to malnourishment (Culross,

2008).

The results of inadequate oral health place the elderly at risk for meeting dietary

needs and nutritional health (Sheiham, 2005). Poor dentition resulting in inadequate diet

and nutrition cause the elderly to be more at risk for weight loss, infection, systemic

diseases, and inadequate mastication. (Sheiham, 2005). In addition, poor nutrition may

lead to life threatening conditions including dehydration and malnutrition because the

elderly are already in a delicate balance medically (Munoz, et al., 2009). Additionally, the

elderly are more susceptible to oral conditions including painful mucosal disorders,

xerostomia, and periodontal diseases. The oral health of older adults is complicated

because many become homebound, disabled, and/or institutionalized. Poor oral health is

an overlooked component in the general health of aging adults (Vargas, Kramarow, Yellowitz, 2001).

  Oral Health. The pioneer of oral hygiene was Charles Bass, M.D. He created the slogan, "A clean tooth does not decay, and periodontoclasia does not occur about a clean tooth" (Bass, 1948, p. 63). Dr. Bass was not a dentist but realized oral hygiene was essential for oral health. Dr. Bass provided specific instructions, still considered viable today, on oral hygiene, the proper toothbrush, and floss. He was known for the following quote, "You must clean your teeth right with the right kind of toothbrush and dental floss every night before retiring" (Bass, 1948, p. 63).

  In the case of the elderly in skilled nursing facilities, poor oral health is a modifiable risk factor. Oral health is manageable through education, use of fluoride and antimicrobial mouth rinses, documented brushing by care facility nursing staff, diet, and regular dental check-ups with routine professional debridement of hard and soft deposits of the teeth and gums, commonly called tooth cleanings (Trepanning, 2004). The need for oral care in skilled nursing facilities is becoming more important because the prevalence of residents having more of their natural teeth is increasing. However, oral hygiene self-care is more difficult for this population group because of reduced dexterity, reduced sensory function, cognitive deficiency, as well as communication and behavior problems (Trepanning, 2004). Documented research on oral care for this group has been published on many occasions but suggested procedures for providing oral care have not been thoroughly delineated (Chalmers, 2005). The need for collaborative healthcare to make sure the different areas are assessed for the older adult is important to the future of

healthcare. Once oral health is integrated into strategies for assessing health needs, health planners can greatly improve both general and oral health (Sheiham, 2005).

Baby boomer demographics. The baby boomers is a post-World War II generation boom of people born from 1946-1964. This group of people grew up with Woodstock, the Vietnam War, and John F. Kennedy. Starting in 2006, the first of the baby boomers turned 6o years old and by 2012 the first wave of baby boomers turning 65 will be complete. The number of Americans aged 65 will increase from 1 in 8 to 1 in 5 putting a strain on all public services (Reed et al., 2010; Landau, 2010). By 2030, the number of adults 65 and older will increase to 72 million from 40 million in 2010 (Reed et al., 2010: Landau, 2010). The life expectancy increased by 30 years during the last century from age 47 in 1900 to 74 in 2000 and it continues to increase (Reed et al., Landau, 2010).

This generation is accustomed to being center stage and do not have any intentions of stepping aside to retire. The baby boomers work until physically unable and are capable of transitioning into new positions with integrated technology. The goal for most is to save the world even if they take 40 years off to raise their children. They choose to volunteer and give back to the community when no longer working by mentoring and teaching (Reed, et al., 2010; Landau, 2010). They do not move to a retirement community because they do not consider themselves old and continue to live within the same community to preserve lifelong friendships (Reed, et al., 2010; Landau, 2010). Many aging adults will not have the same health coverage into retirement and will struggle to afford the level of medical and dental care they received before retirement (Reed, et al., Landau, 2010).

Oral disease is an expensive disease to treat when a large portion of the population has different levels of manifested oral diseases left untreated for long periods of time (Sheiham, 2005). *Perceived need* by older adults is considered a major barrier to access to oral care. The average older adult does not carry dental insurance and is restricted to *medically necessary* procedures with Medicaid and Medicare programs even though dental needs are diagnosed for these patients. National averages show a decline in insurance payments increasing with age from 50% for dentate people ages 55-64 years, to 22% for dentate persons ages 65-74, and 14% for dentate persons 75 years or older. These percentages result in dental patients choosing a less expensive form of treatment such as extraction instead of endodontic and prosthetic treatments. The same holds true for the disadvantaged and ethnic minorities. Lack of dental insurance coverage could affect treatment (Griffin, 2012).

Years of research suggest healthy mouths contribute to the body's defense against infection (Heath, 2011; Boyce, DeBiase, Adams, Carter, 2006; Cohen-Mansfield, Jensen, 2005). Poor dental health affects comfort, chewing, communication, smiling, socializing, and self-confidence and can lead to systemic disease and possible death (Heath, 2011). Even with years of research showing how important dental health is to a healthy body, the elderly do not receive dental care once they are living in skilled nursing facilities (Heath, 2011;Boyce, BeBiase, Adams, Carter, 2006;Cohen-Mansfield, Jensen, 2005).

Functional groups. There is greater diversity in the elderly population than in younger cohorts. During the past 50 years, the population consisting of adults ages 50 and older was significantly smaller but now is one of the fastest and largest growing age groups in our population (Ettinger, 2007). The aging population can be divided into three

functional groups: 1) functionally independent older adult, 2) frail older adult, 3) and

functionally dependent older adult (see Figure 3) (Ettinger, 2007). This aging cohort is

extremely heterogeneous falling into many subgroups: the young-old, the old-old, the

healthy, the sick, the frail, the mentally and physically handicapped, the ambulatory, and

the chair-bound or institution-bound (see Figure 3) (Meyerowitz, (1991). People from all

three functional groups may reside in skilled nursing facilities depending on their current

functional and physical state. The diversity of this cohort creates a more complex and

broad focus involving more than diagnosis, treatment, and prevention. Oral health care

providers will need to seek training in gerontology and geriatric dentistry to educate

themselves on the specific complex issues affecting the aging adult; for instances people

with systemic diseases, and medications along with the side effects they can cause.

Consideration should be given to diversity among the aging population when discussing

the oral condition and health of the elderly, prevention of disease, research goals, public

health policy, and socioeconomic status. For instance, the elderly do not necessarily have

bad oral or general health. Oral and general health is the result of an accumulation of life

events and experiences with dental care including caries, periodontal disease, and

iatrogenic disease (Ettinger, 2007). As life expectancy increases, special attention should

be focused on disease prevention in order to improve the QoL in the old.

Functionally independent older adult

Frail older adult

Functionally dependent older adult

Subgroups

Mentally Handicapped

Chair/ Institution bound

Physically Handicapped

Young -Old

Sick

Frail

Ambulatory

Old- Old
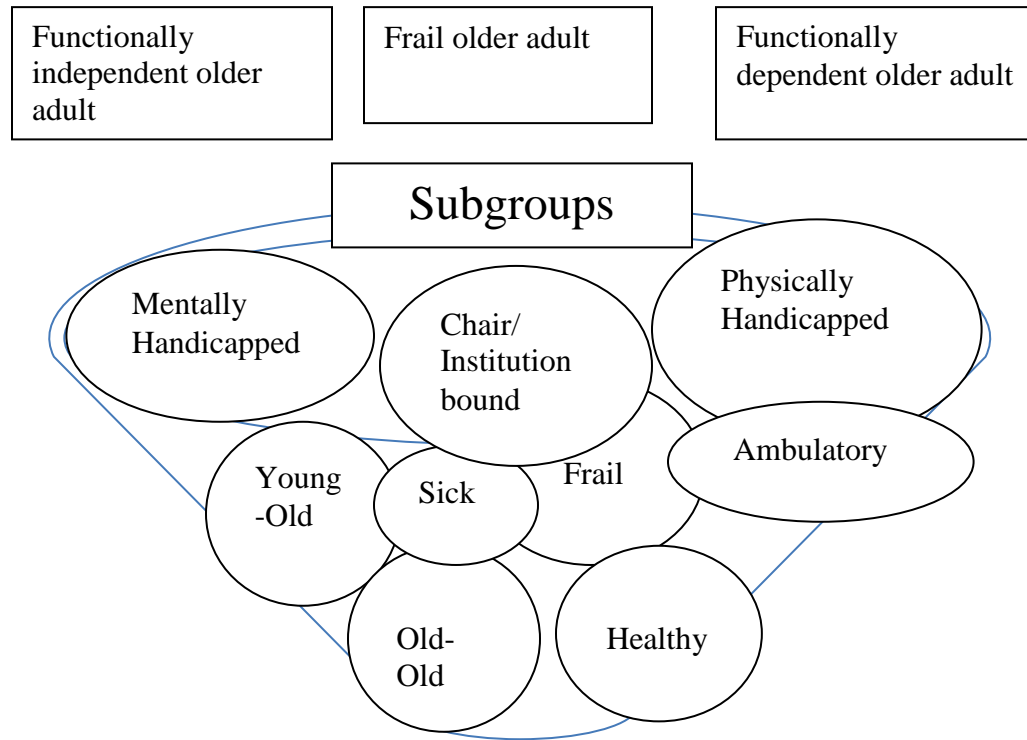
Healthy

*Figure 3.*Diverse Functional Groups of the Elderly

Evaluating for SNF Care. Measures of health status such as diagnosis and medical conditions are limiting indicators of independence and functional capabilities of an individual. For example in the 1960's, measuring ability to perform activities of daily living (ADL) was introduced to assess the level of rehabilitation residents may require once in a care facility. ADL determine the level of care and care plan the aging adult requires. There are eight levels of care possible: 1) Home Health, 2) Assisted Living Facility Type I, 3) Assisted Living Facility Type II, 4) Small Health Care Facility Type N, 5) Intermediate Care Facility/Nursing Facility, 6) Skilled nursing facility (SNF), 7) Hospital, and 8) Hospice (Adult Protective Services Texas, 2011). Adult Protective Services (APS) provides support and guidance to resources such as Home Health when the aging adult is able to stay in their home (APS Texas, 2011). ADL are a standard of care for SNF to assess residents and remains a requirement within the Minimum Data Set

(MDS) in the assessment of SNF residents in regards to possible rehabilitation needs. (See Appendix A).

The Omnibus Reconciliation Act of 1987 (OBRA '87), with the goal of addressing inadequate SNF facilities, require the Federal regulations of nursing facilities to complete the MDS 3.0 within 14 days of admission of a patient to an SNF (Munoz, et al., 2009). The MDS is a comprehensive assessment of the history of residents in order to determine if there is a need to develop a care plan (Munoz, et al., 2009)

The Resident Assessment Instrument (RAI) was developed by the Centers for Medicare and Medicaid Services (CMS) to assess the effectiveness of the care plans developed through the MDS (Munoz, et al., 2009). Critics point out OBRA '87 did not provide adequate training on how to perform an oral assessment. The Office of the Inspector General found the dental section of the MDS was one of the top areas for which a proper care plan was not provided because of errors with the oral assessment. (Dolan, Atchison, & Huynh, 2005). Inadequate training is the reason nursing staff place a low importance to oral assessment and care. Dentists are unlikely to provide dental care to institutionalized adults because of the pressure of private practice, inadequate training in geriatrics, small demand, and poor facility conditions (Dolan, Atchison, & Huynh, 2005).

Still the ability to toilet, eat, transfer, dress, and bathe measured by the ADL within the MDS does not evaluate the QoL of a resident. Researchers have developed measures that tap the dimensions of everyday life as a way of measuring functional status and cognitive ability made possible by the development of Mini Mental State Examination (MMSE), Clock Drawing Task (CDT) and the Functional Independence

Measure (FIM) (Adunsky, A, 2002). For example, the FIM and MMSE are used for

assessing functional status and cognitive abilities (Adunsky, 2002).

Measuring QoL in the SNF could be difficult when the resident exhibits moderate

to severe loss of cognitive function (Gerritsen, L, Steverink, N., Ooms, M., de Vet, C.W.,

Ribbe, M., 2007). MMSE is used to determine cognitive impairment for the different

levels of residents in care facilities **(Kaye et al., 2010).**

QoL (QoL). "QoL is concerned with the degree to which a person enjoys the

important possibilities of life" (Locker, 2007, p. 402). A study of 53 Bulgarian geriatric

patients by Shterevan, 2006 combined clinical and subjective indicators for a

multidimensional assessment of oral health related to QoL. Of the respondents, 64.6%

assessed their oral health as poor; 46.4% indicated problems chewing, biting, or enjoying

their food; 18.6% had problems speaking and pronouncing clearly; 38.8% reported

embarrassment and felt uncomfortable about the appearance of their teeth, gums, or

dentures; 73.2% answered oral health is important to their QoL (Shtereva, 2006). These

results suggest a relationship between QoL and socioeconomic status. Many assessment

tools for QoL have been established and tested for years but validity of these tools is still

questioned (Locker, 2007).

Assessment of QoL. QoL measurements (QLM) tend to be elusive and abstract.

We know intuitively what they mean but they are difficult to define because they are

multidimensional, complex events, and subjective in nature (Locker, 2007). QLMs

constantly evolve because the definition of health today may not be the definition of

health tomorrow (Locker, 2007). There are three reasons why QoL in SNF are a low

priority. First, accepting the way things have been in SNF gives little hope for facilities

improvement therefore a suggested solution is to stay out of the SNF (Williams, 2007).

Second, the environment or culture within the SNF creates boredom, loneliness, and lack

of meaning for the residents. A solution to this is empowering the nurse's aide, realigning

of management hierarchial, modifying residential spaces into smaller group settings, and

creating neighborhoods with more of a household atmosphere (Williams, 2007). Third,

with a multitude of reports of neglect in SNF including but not limited to dehydration,

urinary tract infections, malnutrition, and bedsores of residents, the QoL issues become

less important to the Office of the Inspector General (Williams, 2007). Paradigm shifts

are needed because of the large number of older adults entering SNF. Safety concerns

generally get in the way of QoL improvements forcing the focus on older adults who are

financially able to move to the assisted living apartments because of presumed QoL

benefits (Williams, 2007).

Many measurement tools claim to measure QoL reflecting the values and

concerns of physicians and social scientists rather than the aging adult and what they find

relevant to their circumstances (Locker, Allen, 2007). "Health related QoL" and "QoL"

are two of a plethora of terms used to describe subjective oral health or concerns of an

individual and how oral disease, disorders, and conditions threaten health, well-being,

and QoL. The qualitative portion of this investigation measured QoL with a modified

OIDP integrated with QoL validating questions instead of simply measuring oral health

status (Locker, Allen, 2007).

Table 1

Comparison of Tools Used to Collect Data on QOL

Tools	QLM	QoL	OIDP
Categories	Physical health	Physical health,	Eating food
			Cleaning teeth or dentures
			Sleeping
	Psychological health	Psychological state	Speaking clearly
			Relaxing
	Social relationships	Level of independence	Doing light physical activities, such as household activities
		Social relationships	Going out, for example to shop or visit someone
	Environment	Relationships to environment	

The main distinction between oral health status and QoL is more than measuring

functional status; the latter reflects the values and preferences of the aging adult

distinguishing QoL from all other measures of health (Locker,& Allen, 2007). The

problem with measuring QoL is its uniqueness to individuals. Gill and Feinstein (1994)

identified criteria critical for the assessment of QoL during clinical trials. Guyatt and

Cook (1994) stated the criteria from Gill and Feinstein is too restrictive but both groups

of scientists agree on two extensive overlapping questions needing to be considered.

First, are the items within the measurement tool person-centered, and second, does it

integrate aspects of daily life important to the persons that may be compromised by

various conditions? The OIDP index consists of 10 items with clinical and subjective

indicators combined (Locker & Allen, 2007). This index was modified with the criteria

set out by Guyatt and Cook (1994) rather than Gill and Feinstein (1994) with their more

restrictive and demanding criteria. The seven criteria used to validate the OIDP to

measure a combination of oral health and qualities of life are: 1) Is there a stated aim to

measure oral health QoL or QoL? If it is to measure oral health QoL, are there constructs

defined and domains identified? 2) Is there an alternative construct if the criteria in the

above statement are not met? 3) Do the investigators define the context in which is

measured and used for groups or individuals? 4) Were the questions derived from

qualitative interviews with those involved in the study? 5) Are the aspects of the

questions important to the groups or individuals in the study? 6) Do the questions include

global ratings on aspects of health related QoL? 7) Is the measure validated with oral

health indicators or with broader questions allowing some free response? (Locker, Allen,

2007).

     Oral health and QoL. QoL defined by the World Health Organization (WHO)

is" the individual's perception of their position in life in the context of the culture and

value systems in which they live and in relation to their goals, expectations, standards and

concern's" (Locker & Allen, 2007, p. 409). This definition suggests QoL is an involved

multidimensional issue requiring multi-professional intervention (Locker & Allen, 2007).

The definition of health and QoL vary according to social value and culture. There are

questions as to what perception people have about how oral health affects QoL.

     Healthcare has evolved the last 30 years with increasing usage of the terms

'health-related QoL', 'QoL', 'active aging', 'patient-based outcomes', 'subjective health

status', and 'successful aging' (Locker, Allen, 2007). Healthcare is no longer trying to

prolong life but make it better by recognizing the aging adult's experiences and concerns

are important. Currently there are five areas of perceptions of how oral health affects

QoL surfacing from research along with their overlapping definitions (Locker, 1999).

These include: 1) physical health, 2) psychological state, 3) level of independence,

4) social relationships, and 5) the individual's relationships to salient features of their environment (Locker, 1999).

   Physical health. As defined by the WHO in 1946, health is a state of complete physical, mental, and social well-being, and not merely the absence of disease and infirmity (WHO Geneva, 1946). The proper role of health care is the improvement of health status through the removal of potential barriers to good QoL rather than trying to change QoL itself. Physical health has been connected to oral health with the importance of bacteria and toxic chemicals given off when their growth is not controlled. The oral epithelium forms a protective barrier but the aging adult starts loosing this protective barrier through thinning of the epithelium (Niessen, 1999). The thinning epithelium becomes permeable allowing noxious substances and carcinogens through the epithelium increasing the prevalence of mucosal diseases including an increase in cases of oral cancer (Jainkittivong, Aneksuk, Langlais, 1999). According to a systematic review of the preventive effect of oral hygiene, Sjogren,et al., (2008), found a correlation between oral hygiene, pneumonia, and respiratory tract infection linking the high level of bacteria in dental plaque in the oral cavity to these infections (Bissett,& Preshaw, 2011). The bidirectional link to periodontal disease and diabetes is a foremost example of how oral health effects physical health (Genco, 2009).

   Psychological state. Psychological state in dentistry refers to the affects oral disease places on the elderly if they are unable to eat properly. Meal times are a social time for the aging adult and become an important aspect of daily living and a measurement of a healthy psychological state. People who are edentulous and partially edentulous have difficulty eating a nutritionally balanced diet and may not be able to

share in the normal camaraderie of sharing a meal or special snack. Additionally, the

social stigma associated with missing or no teeth may directly affect the psychological

status of an individual (Justice & Justice, 2009). Bonds with family and friends have a

positive powerful influence on both emotional well-being and physical health (Justice &

Justice, 2009).

Level of independence. Level of independence is the level of self- care or daily

performance for the aging adult (Locker, 1999). Choosing between long-term assisted

living facility and short-term assisted living facility care depends on the level of

independence of the aging adult (Locker, 1999). Abilities to perform daily tasks such as

personal hygiene and eating are considered as well as cognitive abilities when

determining the level of independence of a SNF resident.

Social relationships. An important aspect of social relationships and their

connection to the environment the aging adult lives within is that all five of the

previously mentioned perceptions are connected (Locker, 1999). The aging adult does not

work, does not have an active lifestyle, and has minimal social contacts. Oral disease can

affect the ability to chew, speak, nutrition, and socialization due to embarrassment. Aging

adults thrive on socialization centered on gathering for meals therefore making the ability

to chew, smile, and not feel self-conscious important to a good QoL (Shtereva, 2006).

Research shows a powerful relationship between the health of the aging adult and healthy

social connections with family and friends (Justice & Justice, 2009). These include better

immune response, longevity, decrease in cardiovascular disease, including recovery from

serious disease with quicker healing time after surgeries (Justice & Justice, 2009).

Dr. Andrew Weil writes,

As part of taking a health history, our physicians at the University of Arizona's

Integrative Medicine Clinic ask new patients about their spouses or significant

others, their children and their friends. Why? We are trying to find out if people

have love and connection in their lives. There is now a large body of research

showing bonds with family and friends have a powerful influence on not only

your emotional well-being but also your physical health. (Justice & Justice, 2009,

para.9).

Relationships to environment. The baby boomers do not move to a retirement

community because they do not consider themselves old but will continue to live within

the same community to preserve lifelong friendships (Reed, et al., 2010; Landau, 2010).

When the boomer has to move to another environment, it puts them at risk of isolation

because of the lack of friends and depression (Locker, 1999). They are forced to adjust to

new foods, routines, and lack of privacy (Locker, 1999).

There are many tools used to gather empirical data on QoL as well as oral hygiene

status. Table 2 provides a comparison of such tools. The functional status of daily

performance in relationship to oral health may be determined with the Oral Impacts on

Daily Performance (OIDP) index. The OIDP was developed in the 1990s before terms

such as health-related QoL or QL. The OIDP is distinct as the scoring system is complex

measuring both frequency and severity of impacts. This index considers self-perception

of oral health and its interference in daily activities during a previous 6-month period on

dimensions of pain and discomfort, functional limitations, and dissatisfaction with

appearance (see Table 2).

Table 2

Measuring Subjective Well-being with QoL Validating Questions

Measuring subjective well-being with QoL Validating Questions

Modified OIDP

Category	What is measured?	Example of question
Physical health	Physical pain	To what extent do you feel physical pain prevents you from doing what you need to do?
Psychological health	Emotional well being	To what extent do you feel your life to be meaningful?
Social relationships	Personal relationships	How satisfied are you with your personal relationships?
Environment	Daily activities	How healthy is your physical environment?

The OHI-S has two parts, consisting of the Debris Index and the Calculus Index (see Table 3). The number of tooth surfaces scored is six taken from four posterior and two anterior teeth with specific criteria in case of the absence of any of the required teeth (Green and Vermillion, 1964). Once all tooth all 36 surfaces are evaluated the debris and calculus indexes are calculated separately and then added together to get the final OHI-S index.

Table 3

OHI-S Index

Scores	Criteria for Classifying Calculus	Criteria for Classifying Debris
0	No Calculus	No Debris/stain
1	Supragingival more than one third	Soft debris covering not more than one third of the tooth surface including extrinsic stains.
2	Supragingival calculus covering more than one third but less than two thirds including individual flecks of subgingival calculus around cervical portion or both	Soft debris covering more than one third, but not more than two thirds.
3	Supragingival calculus covering more than two third of the tooth surface or a continuous heavy band of subgingival calculus around the cervical portion or both.	Soft debris covering more than two thirds

Buccal Score + Lingual Score ÷ Total Number of surfaces (calculate for both
Debris /Cal index)
Debris Index + Calculus Index = OHI-S

The Decayed, Missing, and Filled Teeth (DMFT) index is used to determine the

total permanent teeth that have past or present carious lesions. If a tooth is missing due to

gross decay it will also be accounted for in the index. This index has its own evaluation

criteria and is not combined with any other index. Criteria excluding teeth from being

accounted into the index include: unerupted teeth, congenitally missing teeth,

supernumerary teeth, partial eruption, third molars, teeth restored due to trauma, and

abutments on a bridge (Wilkins, 2005). (see Table 4).

Table 4

DMFT Index

Scores	D=Carious tooth, M=Tooth missing F=Filled tooth, T= Total number of teeth	Criteria for Classification of teeth
0	Healthy tooth no Letter classification needed	No caries present. Fluorotic areas, and hard white lesions are to be ignored
1	The "D" of DMFT refers to all teeth with codes 1 and 2.	Caries is present. If the crown is affected, the crown is assigned the score of 1. If the root is affected then the root is assigned 1. Where the crown is entirely destroyed by decay but the root is present, the crown and root both are given a score of 1.
2		Filled teeth with secondary caries
3	The "F" refers to teeth with code 3	Filled teeth without caries. If a tooth is crowned because of a previous carious lesion, it is given a score of 3. If however a crown is present as an abutment or for aesthetic reasons, it is scored as 7 which is not used to calculate the DMFT
4	The "M" applies to teeth scored 4 or 5 in subjects over age 30	A tooth missing because of decay. Only crowns are recorded as 4. The roots of such missing teeth are designated a 7 or 9 which are not used to calculate DMFT
5		A tooth missing for any reason other than decay

Divide the total number of decayed, missing and filled teeth you counted by 28 to find the person's DMFT index ratio. Multiply the resulting ratio by 100 to determine the percentage of decayed, missing and filled teeth.

Modification of the OIDP integrated with specific QoL questions is used for the

measurements of the qualitative scores for QoL. The OIDP was tested and adapted to the

elderly population in Bosnia and Herzegovina (Eric, et al., 2011). The validity was

established through a high correlation between the OIDP and self-reported oral health

(r=0.78). The reliability of the adapted OIDP proved a Cronbach's alpha coefficient of

0.82 (Eric, et al., 2011). To provide criterion validity clinical assessments with the OHI-S

and the DMFT indices are used for quantitative scoring assuming severity can be equated

with importance (Gerritsen, Steverink, Ooms, & de Vet, Ribbe, 2007).

Problem as Developed from Theories and Research

By the year 2030, 72 million people in America will be 65 or older,

approximately one out of every five adults (Reed, et al, 2010; Landau, 2010). This group

of geriatric adults is known as the baby boomers. These boomers, a growing portion of

our population, have retained most of their teeth, maintained their health, taken

prescription medications, attained a higher level of education, and developed high

expectations about their long term healthcare plans (Reed, et al., 2010; Landau, 2010).

Given the growth of these aging baby boomers, long-term care facilities face the task of

caring for the oral health of a group of adults who are dentulous geriatric residents. The

connection between oral health and systemic disease renders quality dental care

important for a satisfactory QoL. The aging adult is likely to develop a chronic disease

such as arthritis, diabetes, or cardiovascular disease (Reed, James, Farber, Nicholas,

2010; Landau, 2010). The rates of occurrence for these chronic conditions increase as age

increases. These conditions can be treated however, the plethora of medications that

cause xerostomia increase the incidence of root caries and oral mucosal disorders

resulting in a negative impact on QoL of the aging adult. There are not enough healthcare

professionals with knowledge of geriatric care including the aging adults special

nutritional, psychosocial, and physical needs to accommodate the group of baby boomers

saturating the healthcare market.

Education of health care providers. There are disconnects between the growing

healthcare needs of older adults, educational institutions training the healthcare provider,

and companies paying for the training (U.S. Department of Health and Human Services

Council on Graduate Medical Educations, 2002). Dental and medical professionals have

the potential to prevent disease and preserve QoL through collaborative health prevention

(Genco & Williams, 2010).

The professional healthcare workforce team required to care for the elderly

include the following list of professionals, physicians, nurses, social workers,

pharmacists, psychiatrists, nutritionists, dentists, dietitians, and physical therapists (Bragg

& Hansen, 2010). This group of professionals is necessary to deliver special well-

coordinated, high quality care for an expanding older population.

Upon admission to a SNF, nurses are the first health care professionals with

whom residents may come into contact. Some nurses are trained in the assessment of oral

conditions, for instance; the identification of partials and dentures, and the condition of

teeth such as healthy, healthy, decayed, broken, or missing, and color of gingival,

whether it is pink or red (Munoz, et al., 2009). Federal regulations require the nursing

staff of the SNFs to complete the MDS within 14 days of admission to their facility

(Munoz, et al., 2009, Pudwell, 2013). Study results suggest the more time spent training

the nursing staff; the better the quality of performance of oral assessments by nurses

(Munoz, et al., 2009, Pudwell, 2013). Research shows caregivers play an important role

in initiating oral care for the residents but find providing oral care more distasteful than

caring for incontinent residents (Nicol, Sweeney, McHugh, & Bagg, 2004; Kullberg et

al., 2010; Frenkel, Harvey, & Newcomber, 2000). Lack of knowledge of oral care,

negative attitude towards providing oral care to others, and limited time to perform oral care are barriers to oral health for the residents of SNF (Nicol, et al., 2004; Kullberg et al., 2010; Frenkel, Harvey,& Newcomber, 2000). (See Appendix A)

Barriers to care. Currently, there is not a dental system coping adequately with the dental needs of the increasing aging population. Existing systems in some areas of the nation are not efficient and too costly, especially for those elderly not financially prepared for the extra cost (Sheiham, 2005). The future is calling for an improvement to assess care for the elderly in order to improve the comfort and QoL for all residents in all institutions (Sheiham, 2005). To improve access to care for the medically compromised, homebound, and institutionalized aging adult a dependable and adequate form of financing for dental services is needed. Prevention and early detection of oral diseases including cancer is the key to future improvements including a adequately trained work force for geriatric patients (Sheiham, 2005).

Barriers to oral care include: cultural; linguistic; financial; lack of transportation to an oral healthcare facility; lack of insurance; long waiting times for appointments. There is a change in the demographics of the United States with the growth of the aging adult population and increasing racial and ethnic diversity (Sheiham, 2005).

The main stakeholders are the residents; however, the nursing staff and guardians are also directly responsible for implementing dental services because they assist the elderly in achieving and maintaining oral health. Quality monitoring and chart auditing is needed in order to assure quality control among the staff at the SNF (Dolan, Atchison, Huynh, 2005). Guardians require education on the importance of oral health and vigilance in maintaining the oral health of their loved ones to help maintain overall

health. Financial investment is required to integrate an oral health program into public policy. Public programs require an initial financial commitment to overcome the barrier of cost (Matear & Barbaro, 2006).

Summary

This study investigated the connection between oral hygiene and QoL as well as the association between oral health and daily performance. Long term assisted living facilities collaborate with nutritionists, occupational therapists, physical therapists, social workers, nurses, nurses' aides, doctors, entertainment coordinators, and make sure their residents are provided with hair and nail appointments on a regular basis. The caliber of resident is about to change with the entrance of the baby boomer. The marketing companies for dental products have already been targeting this generation for several years with products for xerostomia, an increase in xylitol products, and in the number of intraoral cleaning aides available. These residents are proactively reducing oral health risks before they enter a care facility because of their higher dental IQ. This high dental IQ results from the cutting-edge-dental-treatments they have received. Some of the risks boomers have been fighting include: xerostomia, heavy plaque, periodontal disease, root caries, gingival tissue recession, effects of medication on the oral cavity, all of which they are well informed, (Matear & Barbaro, 2006).

Due to a delicate balance of health, nutrition and oral health for the elderly population, it is imperative residents of all assisted living facilities be provided with dental care through the collaboration of medical and dental professionals. Who is responsible for the oral care of the long term living facility residence? Care facilities are required by law to provide good nutrition, grooming, and personal/oral hygiene. The care

facilities are required to carefully track and document bathing, dressing, grooming, transfers, walking, use of toilet, eating, and communicating. The initiative must be taken to have oral care placed on the required tracking documents to guarantee this is taken care of for the residents (Matear & Barbaro, 2006).

The oral health of older adults has improved in recent decades with many adults maintaining their natural teeth throughout their lifetime. However, the burden of oral disease and poor health is borne mostly by individuals of low socioeconomic backgrounds having vast unmet dental needs including the homebound and institutionalized aging adults. Providing adequate oral health requires special attention to access financing for dental services, adequately trained workforce to provide care, and a suitable education to individuals and their care providers.

This study brings awareness to the scientific community of the need for regular dental care in SNFs by showing assess to oral care for the resident has an impact on their daily performance and QoL. There is a need for dental care within the SNFs for all institutionalized elders who do not have access to transportation. There is significance in the role for nurses to provide oral hygiene to the residents in SNFs and receive the education and training to meet the federal requirements for effective oral assessments. (Matear & Barbaro, 2006).

Methodology

Methods Design

The mixed methods approach minimized weaknesses and draws from the strengths of an exclusively qualitative or quantitative research methodology. Use of qualitative and quantitative research is helpful particularly when comparing and validating results while measuring subjective areas of categories by giving more than one angle of results to compare (Bowers et al., 2013).

This study utilized a modified OIDP 10–item, an oral health-related quality of life (OHRQoL) index measuring both frequency and severity scores. The OIDP has been validated and proven reliable in cross-sectional studies nationally in ten different countries (Eric et al., 2011). The QoL validating questions were added to the study tool as a modification to gather qualitative data along with the OHI-S and DMFT indices to garner quantitative data. Additionally, a Clarewood House social worker on staff provided demographics on the residents as well as cognitive scores on nursing home level residents only and participants identified admitting diagnosis. The design allowed data analysis to determine if there is a correlation between oral hygiene and QoL as well as the potential association between OIDP and QoL.

Procedures

The protocol for the IRB process, sample strategies, setting, and implementation as well as proposed data analysis is outlined in the following sections.

Human subjects' protection. IRB approval was acquired from Eastern Washington University because the PI is a graduate student at EWU. The PI requested

Claremont House to allow the EWU IRB to be the principle IRB (see Appendix D). This

approval was required by both facilities for the protection of participants and their

personal information. Prior to gaining consent, all participants were offered an

explanation of the study including a full description of the procedures plus and all

potential risks. Charts of the residents were reviewed and assigned a random number to

help protect each participant's identification. All study data was kept on a password-

protected computer or in a locked desk drawer at the PI's residence, which has an alarm

system.

     Sample. For pragmatic reasons, the PI used a sample taken from a population of

residents at Clarewood House in Houston, Texas. In addition, this facility provided the

PI with a population of older adults who live together in the same facilities under similar

conditions.   Having access to a homogenous sample provides opportunities for

comparison, which was important to this study. The Clarewood House social worker was

in charge of selecting and screening residents for participation in this study. Health

Information Portability Accountability Act (HIPAA) regulations were followed

explicitly.

     Criteria for sample selection.   For this study, inclusion criteria were residents:(a)

living at Clarewood House in Houston Texas, (b) with cognitive function to consent or

(c) with cognitive function whose guardian gives consent, (d)are fluent in English,(e)

have an MMSE Score ≥ 10, and (f) age 60 and older. One exclusion criterion was

residents scoring <10 on the MMSE.   This exclusion increases validity because more of

participants were able to complete the questionnaire and participate with the indices (see

Appendix B).

Sampling plan. Thirty-two residents were enrolled by self-consent within the cognitive level limits. A social worker at Clarewood House chose residents from three different living levels: nursing care, assisted living and independent living. This sample size was chosen because, where appropriate, the central limit theorem would apply.

The PI created 30 study packets and assigned numbers 1-30 to each packet. After the social worker provided the list of resident appointments for the day, the PI assigned a number starting with "1" to each resident on the appointment list. The social worker screened residents for inclusion criteria and provided a limited health history to maintain within HIPPA standards. This number and packet assignment continued until 30 subjects were enrolled. Once study criteria were met, the PI gained consent from all residents whose cognitive abilities allowed self-consent. It is not believed that those not providing consent are significantly different from those providing consent with respect to study variables. Two more residents expressed interest in the study and were allowed to participate after meeting study criteria, changing the total enrolled subjects to 32. Once the oral exams started, there were two study subjects found to be edentulous and were not included into final data analysis.

Description of Setting. Clarewood House in Houston, Texas agreed to allow this investigation to proceed in their facility upon receiving proper documents of approval. This facility provides a variety of living options for its residents with five levels of living arrangement and care choices. The first level of care is referred to as *Independent Living*. The *Independent level* of care is total independence with enjoyment from group trips with the activities coordinator for entertainment, having full access to their cars similar to living in any apartment complex but with the potential for extra help upon request, for

example three meals a day. The second level of care is referred to as *Preferred Living*.

The *Preferred Living* level of care is similar to the Independent level with individualized

extra help with different aspects of daily living. For example the resident may need help

with their laundry and cleaning house plus three meals a day but is capable of living

alone still. The third level of care is referred to as *Assisted Living*. *Assisted Living* level

of care involves medication management and a certain level of monitoring whether it is

24 hours a day or partial day or nights and can include bathing needs. The fourth level of

care is *Extended Care*. The *Extended Care* level involves residents recuperating from a

hospital stay in need of some form of rehabilitation therapy for example physical or

occupational therapy. In addition, the *Extended* Care level also offers full nursing care

needs for patients unable to provide any care for themselves. The final level of care is

referred to as *Special Care*. The *Special Care* level involves the need for 24-hour

individualized care for Alzheimer's' disease, middle to late stage dementia, and full-time

coma care.

This setting allowed full access to a sample plus removed the need for travel time

for residents to be recruited and enrolled. The rehabilitation room at Clarewood House

where residents in Independent Living, Preferred Living, Assisted Living, and Extended

Care levels come for prescribed rehabilitation, and weekly exercise opportunities,

provided a safe and comfortable place with little distractions to perform clinical dental

examinations. All interviews were conducted in the privacy of the subjects' rooms.

Study Variables. In order to answer the proposed research questions,

1. What effect does oral health have on the daily performance in the elderly?

2. Does poor oral hygiene affect QoL in the elderly?

The following variables were addressed in this study.

Demographic data. A chart review of residents provided demographics including age, gender, marital status, ethnicity, and highest completed education conducted by the social worker for Clarewood House.

Oral examination history: The number of preventive and therapeutic visits residents had in the 24 months prior to this study was not available except as self-reported by study subjects. The state of Texas does not require the MDS for SNF residents unless they are in full nursing care. Two subjects fell into this group but the oral exam section of the MDS was not available.

Mental status data. To adhere to HIPAA, MMSE scores were reviewed by the social worker to determine residents' cognitive levels for inclusion or exclusion in the study. Because the state of Texas does not require the MDS or any cognitive testing except for full nursing care residents, the social worker was unable to provide specific MMSE scores in demographic information given to the PI.

The data collected from the resident's chart review provided demographic information, admitting diagnosis, and cognitive status. The relationship between oral health and QoL is considered controversial therefore collecting demographic information and any available state mandated testing scores, (MDS) and (MMSE) provided specific components of oral health important to future research methods with larger populations.

Oral impacts on QoL. The modified OIDP/QoL questionnaire with a 5 point Likert Scale plus two free response QoL questions were used to evaluate QoL. The OIDP was specifically chosen for this investigation since oral impacts on daily performance has been proven a major complication among the older adult contributing to a decline of oral

health and QoL. The oral cavity's present state of health for each resident during chart

review and oral dental exam provided essential information for future intervention needs

with adult dental care services.

Plaque and calculus levels. OHI-S and DMFT indices were chosen to provide

numerical values for the utilization of Spearman's rank correlation coefficients. This

investigation measured the plaque and calculus level of each resident with the OHI-S for

the purpose of quantifying oral hygiene and its relationship to oral health.

Status of dentition. DMFT indices provided detailed information on the presence

of decayed, missing, and filled teeth to demonstrate the potential health risks associated

with unresolved dental needs. Additionally, the DMFT quantified the status of the

dentition as edentulous, partially edentulous, or full dentition.

Instruments. Five instruments combined into one assessment tool were used to

gather data for this study. These included a review of residents' charts for MMSE scores,

demographics, oral examination history, OIDP/QoL, OHI-S, and DMFT dental indices as

noted in Appendix C.

Chart Review. Using a chart review, residents' MMSE tests scores determined

one of two possible exclusions for this study. If a resident was excluded no further action

was needed. If a resident did not meet the exclusion criteria an Inclusion Exclusion form

was used to determine inclusion (see Appendix B). The social worker and PI verified a

resident's ability to consent and complete the Inclusion Exclusion form. Using this form,

the qualifying study participant was assigned a random number. The PI monitored this

form as a method of associating scores with participants as needed for gathering data.

Demographic information including age, gender, marital status, admitting diagnosis,

ethnicity, and highest completed education were extracted using the Study Assessment

Tool. Each section of the measurement tool was represented in columns of an Excel

spreadsheet corresponding to the residents' random number (see Appendix D).

OIDP/QoL. The modified OIDP has been used in research since 1990's (Locker,

& Allen, 2007). In terms of reliability, Cronbach's alpha coefficient was 0.82 and

intraclass correlation coefficient 0.88 which showed strong consistency and strong test

retest success (Eric, et al., 2011). Validity remained strong throughout testing with

subjective variables and different categories of self-report health status with a strong

statistical significance reported in the results (Eric, et al., 2011).

The OIDP used in this investigation measured the frequency and severity of major

oral impacts within the last six months in ten areas; eating food; speaking clearly;

cleaning teeth or dentures; doing light physical activities, such as household activities;

going out, for example to shop or visit someone; sleeping, relaxing; smiling, laughing,

and showing teeth without embarrassment; becoming more emotional or more easily

upset than usual or their mood affected; and enjoying contact with other people, e.g.

relatives, friends, or neighbors (see Appendix A).

Frequency and severity were recorded to calculate the performance score for each

activity evaluated (for example: eating). The total OIDP (summation of performance

scores of all evaluated activities) was divided by the maximum possible score and

multiplied by 100 to provide a percentage. A Likert scale of (0) "never affected", (1) "less

than once a month",(2) "once or twice a month",(3) "once or twice a week",(4) "3–4

times a week", or (5) "every or nearly every day" determined numerical value and scores

ranging from 0 to 5 per performance. The higher the number for the frequency and

severity the more positive the Performance with Impacts (PWIs) outcome which was considered a good score for this investigation.

  Simplified Oral Hygiene Index. The OHI-S is a valid instrument and has been used in research for 30 years with a reliability of α.72 to .94 (Blount & Stokes, 1986; Greene, 1967). Calibration of researchers determined the reliability of this instrument.

  The OHI-S has two parts consisting of the Debris Index or amount of plaque and Calculus Index. The number of tooth surfaces scored was six, taken from four posterior and two anterior teeth. The PI and research assistants handled missing teeth by treating them according to standardized criteria (Green and Vermillion, 1964). The selected teeth were Ramfjord teeth (3, 8, 14, 19, 24, and 30) when missing the first tooth, the next distal tooth was selected in the molar area. If the distal tooth was not present the first tooth to the mesial was selected in the molar area. If a tooth was missing in the anterior area the first tooth across the midline was selected. Three scores were taken from the buccal of the maxillary teeth or cheek side surfaces of the teeth and lingual of the mandibular or tongue side of the teeth equaling a total of three surfaces per tooth. After all 18 surfaces were evaluated, Debris and Calculus indexes were calculated separately and then added to get the final OHI-S index. The calculus was detected both visually and by using an explorer supragingivally.

  The formula was:

Buccal Score + Lingual Score ÷ Total Number of surfaces = Debris/Calculus Index (calculate for each). Debris Index + Calculus Index = OHI-S (see Appendix C).

  DMFT. The DMFT has been used in research since 1938 (Klein, Palmer, & Knutson, 1938). Calibration among researchers allowed for a high reliability as this index

is based on counting teeth and categorizing according to established criteria. This index

has its own evaluation criteria and was not combined with any other index.

Determining the DMFT index involved visual inspection of the oral cavity.

Documentation of the decayed, missing, and filled teeth helped establish a need for dental

care within assisted living facilities. If a tooth was missing due to gross decay it was also

accounted for in the DMFT. Criteria that excluded teeth from being counted into the

index were unerupted teeth, retained primary teeth, congenitally missing teeth,

supernumerary teeth, partial eruption, third molars, teeth restored due to trauma, and

abutments on a bridge (Wilkins, 2005) (see Appendix C).

Utilizing the above criteria, the researchers counted how many teeth had carious

lesions/decay, how many teeth were extracted, and how many teeth had fillings or

crowns. The sum of each count determined the DMFT score. For example: 4 decayed, 8

missing teeth, and 6 teeth with filling or crowns were recorded as DMFT=486. These

indices were recorded as a score of 18 or 4+8+6=18. This score means 18 teeth are

decayed, missing, or filled and 14 teeth are healthy. Scores can range from a score of 0

(all teeth present and without caries) to 28 (every tooth presenting with cavities,

extracted, or fillings (see Appendix C).

Equipment. Participants had their own manila folder with an assigned study

number, consent form, and research data collection papers inside. A disposable tray kit

with a disposable mirror, explorer, napkin/tab paper chain, cup and gauze was assigned to

each participant and reusable protective glasses were available when needed. Hospital

grade disinfectant wipes, antibacterial soap, and mouthwash was available for use as

needed. Most residents wore prescription eyewear and were not in need of protective

eyewear. Researchers were provided with a face-mask, gloves, protective goggles and a headlamp. The rehabilitation room was utilized for the clinical oral exams; this room could be divided up into multiple rooms or opened up to form one large room. For this study a small room with access to a sink with hot and cold water was provided. Two regular chairs with backs and armrests were utilized for subjects able to walk. Those subjects who came to the room in a wheelchair stayed in their wheelchair for the duration of the dental exam and then returned to their rooms.

Implementation protocol. Upon IRB approval, this investigation began with the review of charts by the social worker to determine whether a resident was excluded from the study based on MMSE scores and edentulous status. If a resident was not excluded the social worker began the enrollment protocol by gaining consent from the resident. Demographic data was extracted from patient records included within the chart by the social worker.

Once enrollment began, the social worker and PI determined subject's availability for data gathering by arranging with Clarewood House. Most clinical dental exams were conducted in the rehabilitation room allowing for a comfortable setting with some dental exams conducted in the subjects' rooms as needed. Clarewood House determined Thursdays and Saturdays to be research days. Thursdays were the only days the research assistants were allowed in the facility because Clarewood House required their directors present in the facility when the research assistants were with the PI. On Saturdays the PI always worked alone. Each participant was scheduled an appointment on either Thursday or Saturday. The first appointment started at 9:00 a.m. or 9:30 a.m. and the last appointment started either at 3:00 p.m. or 3:30 p.m. For six days the PI worked alone and

for two days with research assistants for a total of eight days of appointments to complete

the interviews and clinical exams. Each research assistant was available for one Thursday

; on these two days appointments were doubled and the assistant and the PI worked

together to complete 12 clinical exams per day. The PI conducted a few interviews in the

study subject rooms when needed while the assistant conducted clinical exams in the

rehabilitation room.

The two research assistants (Registered Dental Hygienists) were experienced

investigators who provided consistency in data collection. Prior to beginning the oral

examination and interview, the PI conducted a calibration session with the two research

assistants. The PI provided each research assistant with a copy of the study instrument

and guidelines. All researchers used a dentoform to calibrate and assure understanding of

the criteria for gathering DMFT and OHI-S data. A review of dental charting a subjects'

dentition was conducted. Theoretical analysis of this study suggested an interview of the

resident is best practice for gathering data. The PI conducted all face-to-face interviews

for the OIDP and QoL free response questions.

Each interview began with two broad QoL questions: "How would you describe

your QoL?" "How satisfied are you with your oral health?" The PI used a specific script

to continue the interview. To begin the OIDP the PI said,

I am going to ask you some questions about the QoL here at Clarewood House.

We are asking these questions to find out how well you feel you are taken care of

in your home. There is no right or wrong answers to my questions and the whole

discussion concerns what life is like for you here at Clarewood House.

The PI followed with: "I would like you to tell me whether or not problems with your

mouth and teeth (or dentures) have caused you difficulty with each one of these areas in

the past 6 months." (See Appendix C).

The PI repeated the response categories frequently during the interview to

establish good rapport without biasing results, guessing, or abandoning response

categories. Giving subjects enough time to respond was emphasized along with repeating

Likert responses and encouragement. Interviews were conducted on separate days from

clinical exams for most subjects to avoid fatigue or to fit into their schedule. An

estimated 40-90 minutes for each interview allowed subjects to answer the free response

QoL questions without being rushed

The clinical exam training included how to make residents as comfortable as

possible during the exam. Each of the clinical indices in the measurement tool were completed

and data recorded before dismissing each resident. The sequence of completing the indices was

important; because the OHI-S measures plaque depth. The OHI-S was calculated followed by

the DMFT to not disturb any plaque accumulation.

Summary

The PI was provided a chart review from the social worker on staff at Clarewood

House, to gather data on subject's' demographics, history of professional oral care, and

cognitive function. A research team, consisting of the PI and two research assistants,

conducted interviews and collected data from oral examinations of a sample of

Clarewood House residents. A licensed dentist was a part of the research team but chose

not to be involved in the data collection; rather he acted as a supervisor for the registered

dental hygienists keeping within Texas Law. The social worker selected a group of

volunteers at Clarewood House from independent living, assisted living, and full nursing

for study enrollment. Collection of qualitative data and the correlation coefficient

statistical analysis of the participants' OHI-S, DMFT, and OIDP scores attempted to

determine if there is a connection between oral hygiene and QoL as well as the potential

association between oral health and daily performance (OIDP).

Results

Description of Sample

For pragmatic reasons, subjects of this study were residents of Clarewood House in Houston, Texas. After screening for qualification by the PI, two Registered Dental Hygienist Research Assistants, and a Clarewood House social worker, the resulting simple random sample without replacement consisted of 30 (N=30) subjects meeting inclusion criteria. There were two subjects who did not meet the inclusion criteria after the clinical exam because of the number of missing teeth. The MMSE/MDS is not required in the state of Texas unless the SNF resident is in a full nursing facility or the resident is in the full nursing section of a SNF. There were three subjects from the nursing section of Clarewood House with MMSE scores reported. The MDS dental exam was not reported in their records.

Statistical Analysis

The PI managed the data with Excel© and the statistician imported it into Minitab 16© for analysis. Demographic data were gathered, coded, and analyzed as seen in Table 5 for descriptive purposes and are not generalizable. The average age of subjects was 87 with a range from 71 to 100 years. Females made up the majority of the cohort at 73% (n=22), while there were only 27% (n=8) males. The length of time spent in residence at Clarewood House was three weeks to 14 years with an average of four years. Self-reported marital statuses were Single 0% (n=0), Married 17% (n=5), Widowed Living Alone 77% (n=23), and Divorced Living Alone 6% (n=2). The educational background of subjects was diverse with all having at least an 8th grade education. The percentage of nursing home residents with some high school was 3% (n=1), a high school diploma,

37% (*n*=11), some college, 13% (*n*=4), college graduate, 17% (*n*=5), graduate education,

30% (*n*=9). The majority of subjects reported as Caucasian 90% (*n*=27) and remaining

10% (*n*=3) as Hispanic.

Table 5

Demographic Characteristics

Characteristics		%	(N=30)
Age	70-75	7%	(*n*=2)
	76-80	10%	(*n*=3)
	81-85	23%	(*n*=7)
	86-90	27%	(*n*=8)
	91-95	27%	(*n*=8)
	96-100	7%	(*n*=2)
Gender	Female	73%	(*n*=22)
	Male	27%	(*n*=8)
Number Years at	1-5	77%	(*n*=23)
Clarewood House	6-10	13%	(*n*=4)
	11-15	10%	(*n*=3)
	16-20		
Marital Status	Single		
	Married	17%	(*n*=5)
	Widowed Living Alone	77%	(*n*=23)
	Divorced Living Alone	6%	(*n*=2)
Highest level of	< 8th Grade		
Education Completed	Some High School	3%	(*n*=1)
	High School *Diploma*	37%	(*n*=11)
	Some College	13%	(*n*=4)
	College Graduate	17%	(*n*=5)
	Graduate Education	30%	(*n*=9)
Ethnicity	Caucasian	90%	(*n*=27)
	Hispanic	10%	(*n*=3)
	African American		
	Asian		
	Pacific Islander		
	Other		

The subjects' admitting diagnoses were diabetes 24 % (*n=7*), neurological 35% (*n=10*), arthritis 10% (*n=3*), congestive heart failure (CHF) 18 % (*n=5*), high blood pressure (HBP) 11% (*n=3*), cancer 1% (*n=1*), and multiple sclerosis (MS) 1 % (*n=1*). Subjects with neurological included: head injuries, transient ischemic attack (TIA), neuralgia neuritis, and early amyotrophic lateral sclerosis (ALS) for the convenience of reporting on this small study sample. All forms of arthritis were included in the arthritis admitting diagnosis, as were both types of diabetes in the diabetes percentage because specific types were not indicated on the demographics sheet provided by the social worker for Clarewood House. See Figure 4.

Admitting Diagnosis

Cancer 1%
MS 1%
HBP 11%
CHF 18%
Arthritis 10%
Diabetes 24%
Neurological 35%
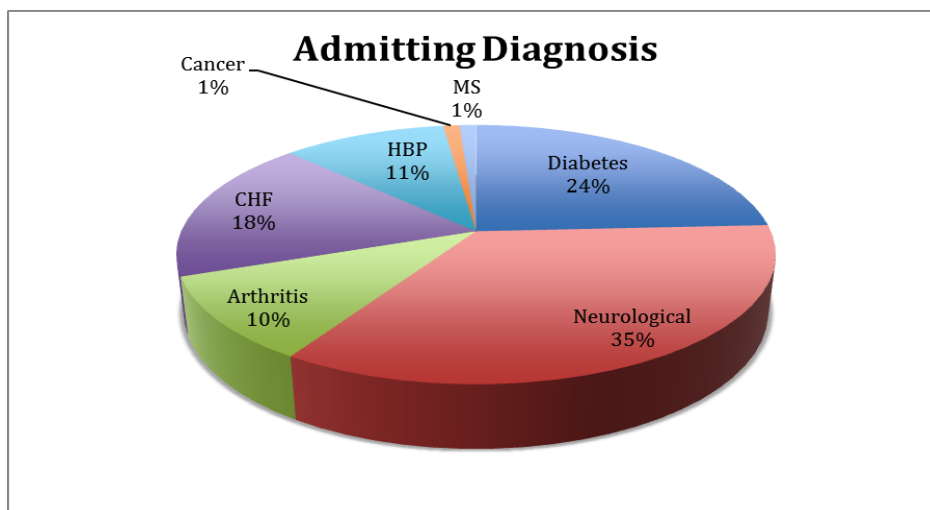
Figure 4

Admitting diagnosis of residents

Data was collected using the OIDP, OHI-S, and DMFT. The OIDP a ten-item survey uses severity and frequency measurements to measure the oral impact on daily life and is an indicator of an individual's QoL. The assessment tool was completed in a face-to-face interview where the PI read the questions and possible responses to the subject. Two QoL free response questions were integrated to strengthen the quantitative aspect of

this study. The OHI-S was developed from the OHI to reduce inspection time and number of decisions. The OHI and OHI-S have two components, the Calculus Index and Debris Index. Both the OHI and OHI-S have been used for more than 30 years worldwide (Greene, 1967). Criteria for assigning a score are the same as the OHI; scores for the calculus and debris were four surfaces from four specific posterior teeth and two anterior teeth. The DMFT is a clinical exam of the mouth with enumeration of decayed, missing, and filled teeth. The exam was visual because there were no radiographs available at the SNF. The DMFT is a reliable instrument widely used in research since 1938 with scores ranging from 0-32 (Klein, Palmer, & Knutson, 1938). The range of teeth numbers used in this study was 0-28 excluding third molars. Implants were not included in the missing (M) criterion in this study.

For the first null hypothesis, oral health does not have an impact on the daily performance in the elderly; Spearman's rank correlation analyzed the relationship between the OHI-S, DMFT, and OIDP. The correlation coefficient is obtained by dividing the covariance of two variables by the product of their standard deviations. A correlation can be taken as evidence for a possible causal relationship, but cannot indicate what the causal relationship may or may not be.

Analysis of the OHI-S and DMFT scores, resulted in a 0.320 Rho ($p= 0.074$), which is not significant between oral hygiene status of the subjects and number of decayed, missing, and filled teeth or current dentition as seen in Table 6.

Table 6

Analysis of OHIS, DMFT, and OIDP using Spearman's Rank Coefficient

	OIDP rank	OHIS rank
OHIS rank	0.371	
	p=0.036 *	
DMFT rank	0.344	0.320
	p=0.054**	*p*=0.074

Cell : Correlation Rho
    p-value
*p<0.05, **strongly suggested not significant

Analysis of the OHI-S and OIDP scores as noted in Table 6 resulted in a statistically significant relationship 0.371 Rho (*p*=0.036) between the oral hygiene status and daily performance for these subjects. A 0.344 Rho (*p*=0.054) statistic for the OIDP and DMFT scores strongly suggests a relationship between the impact on daily performance and status of the dentition but is not significant.

Table 7 shows further analysis of the OIDP and specific elements of the DMFT strongly suggests a relationship between the OIDP and the Missing or M tooth score (*p*=0.059). However, there was no strongly suggested or significant relationship between the OIDP and Decayed or D scores (*p=0.509)* or Filled or F scores (*p*=0.361). The statistically significant relationship of the OHI-S and OIDP as well as the strong relationship between the OIDP and DMFT as well as the OIDP and the Missing or M score in the DMFT causes rejection of the first null hypothesis.

Table 7

Analysis of OIDP and elements of the DMFT using Spearman's Rank Coefficient

	OIDP rank	D	M
Decayed (D)	0.121		
	p=0.509		
Missing (M)	0.337	-0.041	
	p= 0.059*	*p*= 0.825	
Filled (F)	*0.167*	*-0.049*	*0.002*
	p=0.361	*p=0.789*	*p=0.992*

Cell : Correlation Rho
    p-value
*p<0.05

For the second null hypothesis, poor oral hygiene does not affect QoL in the elderly, the OHI-S, DMFT, and OIDP scores were analyzed with Spearman's rank correlation statistic. In addition, qualitative data gathered from two free response QoL questions were thematically analyzed to add depth to the quantitative data analysis. Four themes, described in Table 8, emerged based on responses to the following questions: 1) How would you describe your QoL, and 2) How pleased are you with your oral health? Quantitative data analysis using Spearman's rank correlation as reported in Table 6 and thematic analysis of the qualitative data in Table 8 indicates rejection of the second null hypothesis.

Table 8

Thematic Analysis of Two Open-ended Response Items

Oral health and economic connection	Oral health and physical connection
"Dental work costs a lot of money"…study subject #7 "Deciding what level of treatment according to cost"…study subject #3 "Public health provisions for the older adult"…. study subject #7 "Dental preventative methods cost effective"...study subject #5 "Dental health determines physical health"…study subject #20 "How will I get to the dental office for dental care"…. study subject #13 "Nurses do not have enough time to brush everyone's teeth"…. study subject #17 "Ever since my brother died of oral cancer, I am worried about how to get regular check-ups"…. study subject #18	"Dental pain keeps me from sleeping"…. study subject #26 "The sharp pains throb with my heart beat"…. study subject #30 "All I can think of all day long is how to get the rotten tooth out of my mouth"…study subject #27 "I need relief from the sharp pains so I can sleep"…study subject #27 "Who will pull my tooth now that I am old and in bad health"…study subject#11 "I cannot eat or sleep because of this darn tooth paining me"…. study subject #27 "My hands and arms do not move like they used to which makes it hard to clean my teeth"…study subject #11
Oral health and social connection	**Oral health and psychological connection**
"I have lost too many teeth ever since I moved to the assisted living home and I cannot smile big anymore"…study subject #11 "My daughter travels a lot so its been easier to pull the teeth that hurt instead of fixing them which has left my smile full of gaps"…. study subject #16 "I eat my meals in my room now since I have trouble eating with the few teeth I still have"…study subject #19	"I start forgetting what day it is and get confused easy when I have had pain in my jaw for too many weeks"…. study subject #26 "When I miss my sleep I am dizzy a lot and forget I have moved from my home"…. #26 "I was seeing people in my room when I could not eat or sleep that were not really there"…. study subject #8

Discussion

Summary of Major Findings

Study results caused rejection of both null hypotheses. For this cohort of elderly subjects, oral health may have an impact on their daily performance and poor oral hygiene may affect quality of life. The significant relationship between the OHI-S and OIDP (p=0.036) implies daily impacts and oral disease from plaque and calculus buildup in the mouth. Furthermore the strong relationship between the DMFT and OIDP (p=0.054) eludes to the fact the number and condition of the teeth has a relationship with daily performance. Considering the strong relationship between the Missing (M) in DMFT scores and the OIDP (p= 0.059), the number of teeth has more potential to impact daily performance than whether the teeth are decayed or filled.

Discussion

Oral health and daily performance. The statistically significant relationship between the OHI-S and the OIDP and significant relationship between the M of the DMFT and the OIDP implies maintaining oral health within the SNF is a priority. The lack of correlation between the OHI-S and DMFT strongly suggests the amount of debris on the teeth is not related to the number of teeth and or whether teeth are decayed or filled. A logical conclusion is oral hygiene or presence of plaque and calculus and number of teeth present in the mouth has an impact on daily performance. With the suggestion there is a relationship with daily performance; education intervention among nursing staff is a significant need. According to Pudwill, (2013) nurses felt more comfortable providing oral care after thorough education on the delivery and acknowledged the importance of oral care. This is a potential area where an advanced

dental hygiene practitioner could bridge the gap by providing informational continuing

education classes for the nursing staff of the SNF.

  Oral systemic link. Multiple studies correlate good oral hygiene to maintaining

oral and physical health. A ten year prospective study by Hamalainen, Meurman,

Kauppinen and Keskinen, (2005) linked cardiovascular morbidity, periapical infections,

and periodontal disease to C-reactive proteins (CRP) a serum inflammatory marker, to

mortality. This 2005 study showed subjects with urgent need of dental services were 3.9

times more likely to die early compared to those subjects without urgent oral needs. The

results of the 2005 study show the systemic connection to study subjects with lower

number of remaining teeth and multiple chronic conditions are at risk for higher mortality

rates. Hamalainen et al. (2005) supports the strongly suggested relationship OIDP and

Missing (M) of the DMFT. Referring to Figure 4, the admitting diagnosis found in this

study supports the premise that aged adults with multiple chronic conditions are at risk

for higher mortality rates according to this 2005 study indications.

  Periodontal disease and coronary heart disease may share a similar pathogenic

pathway (Hamalainen, et al., 2005). The lack of a bi-directional relationship between oral

and cardiac health as found by Genco (2009) with periodontal disease and DM does not

mean there may not be other oral systemic relationships. There is good evidence

according to Graves & Cochran (2003); showing cardiovascular disease and periodontal

disease both involve production of C-reactive proteins responsible for tissue degradation

via the inflammatory process, specifically collagen breakdown. This pathway can

eventually lead to tooth loss and myocardial infarction.

  Another system affected by oral health is Respiratory. According to Munoz et al.,

the reduction of oropharyngeal bacteria through oral hygiene on a daily basis improves

oral health. This study group had 17% (*n*=5) who had a dental prosthesis in their mouth

exhibiting heavy plaque and large amounts of calculus buildup. According to Alcarde et

al., (2005), study subjects were at risk for aspiration pneumonia when oral prosthesis

presented with plaque and debris.

The pioneering discoveries of Genco, (2009) have proven the bi-directional

relationship between PD and DM via the inflammatory process specifically destruction of

collagen. The history of periodontal disease and its relationship to DM appears to be

proven by the admitting diagnosis for the SNF residents in this study. Diabetes 24% and

HBP 11% made up 35% of admitting diagnoses relating to the systemic disease

relationship discovered by Genco, (2009). Additionally, 10% had arthritis as an admitting

diagnosis, which is considered an inflammatory systemic disease although there is no

proven link to oral health at this time. Nevertheless, 45 % of the admitting diagnoses

were directly related to an inflammatory response. The 35% neurological admitting

diagnoses may be considered complications of a systemic disease connected to the

inflammatory-systemic connection. For example, neuralgic neuritis causes pain and

numbness in extremities from poor circulation due to atherosclerosis. Congestive heart

failure (CHF) is connected to plaque buildup in arteries, which is connected to the same

oral inflammatory process. The connection between the mouth and the rest of the body is

a complicated relationship and cannot be dismissed as a health determinant.

Nutrition. Kimura et al., (2009), relates the number of missing teeth to malnutrition. Results of this study support the impact on optimal nutrition from difficulty chewing and number of missing teeth. The strongly suggested relationship between the OIDP and the (M) of the DMFT in this study support conclusions by Kimura et al.(2009) and Mojon (1999) that poor dentition is associated with nutritional deficiency. Sheiham, (2005) demonstrated poor dentition places older adults at risk for: poor mastication; weight loss; infection; systemic disease; oral conditions; dehydration and malnutrition. Integration of interprofessional health care teams with oral health providers and nutrition specialists within the SNF has potential to reduce many complications of inadequate nutrition in aging adults resulting from poor oral health. This need for interprofessional teams is evident when referring back to the quote by SS17, "nurses do not have enough time to brush everyone's teeth."

Oral health. As residents move within the functional groups of the SNF their systemic health may erode along with their abilities for self-care. Residents start to lose dexterity and use of oral health aids, such as a manual toothbrush and floss, is compromised. Diminished oral self-care skills result in heavy amounts of debris left on the teeth that can calcify into large amounts of calculus harboring bacteria. This phenomenon may also result from residents' loss of cognitive ability to remember to perform oral self-care on at least a twice-daily basis. The proven assumption that heavy debris would be found in the mouths of this study's subjects and the strong correlation between OHI-S and OIDP indices suggest the need for a change in the oral healthcare model within SNF. With the addition of midlevel providers such as the advanced dental hygiene practitioner and/or the advance dental hygiene therapist, and their collaboration

with dentists and other professionals, problems with access to care could be diminished

resulting in improved oral health for residents of SNF. Integrating these midlevel

provider curriculums into the dental educational system in every state has promise to

meet future oral health needs of SNF residents.

Education of nursing staff. Interceptive education and increased knowledge of

the delivery of oral care for the geriatric population by nursing staff improves delivery of

oral hygiene to SNF residents (Munoz et al., 2006; Pudwill, 2013). Early intervention and

detection as well as prevention help protect the SNF resident from oral diseases including

oral cancer. Reduction of oral bacteria reduces the risk for aspiration pneumonia, caries,

tooth loss, periodontal disease, weight loss, infection, and systemic diseases. According

to Pyle (2003) there is often a delay between research knowledge and its integration into

private practice. Thematic analysis of two open-ended response items as noted in Table 8

describes the continuous message from the residents about their needs. The strong

correlation between the OHI-S and OIDP should motivate the dental community to find

solutions for access to care. For example, new models of health care teams, integration of

financial burden into public health plans, and education of midlevel providers have

potential to improve quality of life and reduce the impact of oral health on daily living for

the aging adult.

Interprofessional education prepares students in the practice of collaborative

geriatrics. Leaders are needed to develop and revise core curricula to include geriatric

didactic and clinical experiences. Educating multilevel expanded duties practitioners in

care of the aged is needed to address the large geriatric population yet to come (Pyle &

Stoller, 2003)

Poor oral hygiene, missing teeth, and QoL. Quantitative data analysis of the

OHI-S, DMFT, and OIDP proposes QoL is affected by oral health for these subjects. As

previously mentioned, analysis of the OHI-S and OIDP indicates oral hygiene plays a

role in QoL. Furthermore the quantity of teeth or lack of teeth has an impact on QoL.

This study had 23% (*n*=7) of the subjects with implants or implant-supported prosthesis

who reported having good quality of life and being happy with their smile. The strongly

suggested relationship between the OIDP and the M for missing teeth within the DMFT

suggests replacing missing teeth allows for fewer oral impacts on daily performance. This

relationship of missing teeth and its strong impact within the OIDP supports previous

research over the last decade (Allen, 2003; Locker, 2005; Tsakos, 2001) According to

Allen (2003); implants and implant-supported prosthesis improve oral health quality of

life and could be considered as a fundable type of treatment in the future. This cohort is a

generation who received some of the first implants placed. In this study group, 23% of

the study subjects having implants could be considered unusual. One third of the

residents having a graduate degree and their presumed socio-economic level coupled with

a high dental IQ could be the reason for the high percent of dental implants.

Aspects of oral health and QoL. Assessment of qualitative aspects of health is

important and not only in determining presence or absence of disease. Thematic analysis

of open ended QoL questions in the OIDP uncovered compelling concerns of these

residents in four areas: 1) social, 2) psychological, 3) physical, and 4) financial.

The social aspect of oral health related to QoL may indicate subjects are

concerned how their smile looks. Study subject (SS) 11 reported: "I have lost too many

teeth ever since I moved to the assisted living home and I cannot smile big anymore". A

major part of geriatric socialization is mealtime, however as SS19 noted, "I eat my meals in my room now since I have trouble eating with the few teeth I still have". This social and emotional effect of having poor oral health prevents these subjects from engaging in social interests resulting in a loss of QoL within SNF.

        The next theme that emerged is the psychological impact of oral health and how it affects QoL. The draining physical aspect of dealing with dental pain spills over into the psychological wellbeing of the subjects. For example SS26 relates, "I start forgetting what day it is and get confused easy when I have had pain in my jaw for too many weeks" or "when I miss my sleep I am dizzy a lot and forget I have moved from my home." Even more distressing is when lack of nutrition and sleep results in psychological deviations such as SS8, "I was seeing people in my room when I could not eat or sleep that were not really there." The integration of the advanced dental hygiene therapist into the SNF staff could deliver early intervention oral care for these residents. Access to preventive, restorative, and palliative dental care in SNF has the potential of reducing the overall negative effect on residents' overall health.

        The physical side of aging and how it affects their oral health and QoL was another emerging theme. Oral pain affects how subjects are able to meet their basic physical needs. For instance SS27 reported, "I cannot eat or sleep because of this darn tooth paining me." Physical aging places burdens on these subjects as they are concerned with who will help them with oral hygiene once their dexterity starts to fail, "My hands and arms do not move like they used to which makes it hard to clean my teeth" according to SS11 or SS17 "Nurses do not have enough time to brush everyone's teeth." Through education, the integration of oral care and its relationship to overall health may be better

understood by SNF nursing staff (Pudwill, 2013). Implementation of oral care into the

daily routines of residents with help from nursing staff should become the standard of

care.

Finally, financial concerns of the subjects proved important. Wondering how they

will get to a dental practice for professional oral care as noted by SS18 and SS13

respectively, "Ever since my brother died of oral cancer, I am worried about how to get

regular check-ups" and "How will I get to the dental office for dental care?" Adding oral

health benefits to Medicare and Medicaid would help ease financial burdens the older

generation feels. New oral health professional workforce models such as the advanced

dental hygiene practitioner, advanced dental hygiene therapist, community dental health

coordinator, and dental health therapist may reduce significant oral impacts on SNF

residents while keeping costs minimal.

This study has shown how poor oral hygiene affects oral health socially,

physiologically, physically and financially. Locker & Allen discovered the prevalence of

these themes in their own studies stating, "Subjective oral health including the functional

and psychosocial impacts could possibly affect the quality of life" (Locker & Allen,

2007). Allison, Locker, and Feine further discussed quality of life as a "dynamic

construct," and therefore is expected to change over time as does life experiences at

different stages of the aging process advances (Allison et al., 1997). Their literature

suggests qualitative data adds strength to the OIDP in reference to the validation criteria

debate between Gill and Feinstein, and Guyatt and Cook (Locker & Allen, 2007). The

conclusion of this debate and evaluation of five (GOHAI, OHIP, OIDP, COHQoL, OH-

QoL) QoL measures documented results suggest a connection between subjective oral

health and quality of life but failed to clearly establish the meaning and significance of

impacts (Locker & Allen, 2007).

Limitations

Demographics of this study may not be indicative of all SNF residents of

Clarewood House because in order to gain access for this study the PI had to meet criteria

for subject inclusion based on mental capacity of each resident and their ability to provide

consent thus limiting sample selection. The PI conducted this study in a large

cosmopolitan city in south Texas with the majority of subjects being Caucasian and the

remaining Hispanic. Other ethnic groups are known to reside in this city however they

were not represented in this cohort perhaps because the facility was a private SNF as

opposed to a state sponsored facility. In addition, for pragmatic purposes the PI chose to

use a sample size to meet the central theorem and conducted this study at one site, a SNF

in a large urban area, thus only allowing results to be generalized to this cohort of SNF

residents.

Radiographs for the DMFT clinical exam would provide more accurate data on

the state of each tooth however the PI was limited because the residents' radiographs are

housed at their dentist's offices and not readily available to the PI. This cohort had a high

number of implants which could be considered unusual for their age group. For this

reason, implants were placed under their own category in the Excel spreadsheet and not

included within the Missing (M) of the DMFT. A new updated version of the DMFT or an

entirely new index could be developed to accommodate and categorize implants as

something other than a missing tooth. This would address the level of dentistry expected

in the baby boomers. The OHI-S is a proven index for conducting clinical dental research

however there is some potential for bias due to the researcher's perception of the amount of debris on tooth. The PI attempted to limit bias by conducting all interviews, calibrating with research assistants, and using statistical tests to limit potential bias in data gathering.

It may be beneficial for future cohort studies to include a QoL index such as the WHOQOL-BREF or QOL scales for nursing homes to strengthen the quantitative data. Quality of life scales for nursing homes was considered for this study but not included because of the small cohort and limited time available. The PI chose to ask two open-ended questions to elicit qualitative data to enrich the OIDP results.

Recommendations/Suggestions for Future Research

The results of this study demonstrate the need for case controlled/longitudinal studies for research in SNF with a large group of study subjects in regards to impacts and relationships to oral health and QoL. A longitudinal multi-site research design may yield results more generalizable to the aging population at large.

Research in prevention of oral disease in the elderly, needs to be included in future health plans like Medicaid/Medicare. Lack of oral care within the retirement plans has contributed to existing access to care problems (Pyle, 2003). To improve and maintain oral health for the aging population, advocates should set a goal to show monies added to our national health care are well-spent. Financial benefits may be far cheaper in the long run considering the proven impact of oral health on systemic health. For example, pneumonia resulting from aspirating bacteria from heavy dental plaque may result in expensive hospital stays.

The dental community must spearhead the movement to address access to care by advocating with senior citizens groups and other national agencies. Securing resources

for education, training, research, and care is a major step toward changes in all health plans to include oral care benefits.

Interprofessional education should focus on the role of the health care team including oral health providers in the practice of geriatrics. The collaboration of researchers in basic science, clinical science, demography, and social science are required to close the disparities gap. Collaborative teaching teams could consist of any number of professional disciplines from medicine, social work, allied health, nursing, pharmacy, nutrition, chiropractic, occupational therapy, law and still others. Development of interdisciplinary teaching and revision of core curricula to include geriatric didactic and clinical experiences acknowledges the need for multilevel practitioners to be educated to serve the future aged adults.

Conclusions

Evidence gathered from this study overwhelmingly exemplifies there is a need for dental care for older adults in the SNF. The 30 years spent confirming the psychometric properties of the OIDP were thorough. Confirmation of its "reliability" and "validity" corroborating the quality of this OHRQoL measurement could now be considered a 'standard of care".   Study after study, Astrom & Okullo, 2003; Eric, et al, 2012; Jung, et al., 2008; corroborated the importance of combining clinical measures with subjective oral health measures. Combining socio-dental indicators with clinical measurement indices strengthens results because clinical measures alone tend to overestimate oral health needs (Jung, et al., 2008). The combination of more comprehensive measures such as the socio-dental indicators, were developed to overcome the overestimation problem (Jung, et al., 2008). Future research needs to look at outcomes of many previous studies to develop new dental models of care. Interceptive oral care programs in SNF must be implemented. The welfare of the residents in this study cannot be expressed any clearer than their personal quotes. Very diverse older adult functional groups need to be given the opportunity to voice their ideas, needs and concerns.

The mixture of two different types of generations including the "Greatest Generation" and the "Silent Generation" has been a part of the changing face of the nursing home into the skilled nursing facilities (SNF). These parents of the baby boomer generation are showing the healthcare community the magnitude of oral health and educational gaps in respect to the lack of evidence-based research in dental geriatrics.

The normal evolution of demographics and epidemiology of a large population boom in a country usually happens over a reasonable amount of time but not with the

baby boomer generation (Landau, 2010). Seventy-six million American babies were born

between 1945-1964. By 2020, 25% will be at least 55 years old. Baby boomers, after

reaching 65 years of age, are expected to live an additional 17-20 more years. This cohort

is three times more likely to report poor QoL because they value healthcare and will

continue to demand quality healthcare (Griffin et al., 2012).

These baby boomers are multi-dimensional diverse functional groups who

demand an integrated approach to care for them, the healthy aging population (Griffin et

al., 2012). Healthcare teams are challenged to develop community programs to promote

preventative care, educate the community about access to care and dental needs of the

older adult, increase the number of healthcare educators, implement advanced providers,

continue systematic collection of research data on the status of oral health in the older

adult and collaborate to provide dental preventative care through medical offices and

pharmacies, joining with established groups, such as Meals-on-wheels for the older adult,

to provide prescription dietary supplements, targeting homebound elderly care,

advocates for the vulnerable elderly, and requiring quality dental care be provided within

the SNF are potential methods of integrating care (Rubinstein, 2005).

Professional health care fields related to geriatrics have been slow to develop and

are inadequate to provide health care to this large cohort. Geriatrics is a health care

sphere where the multilevel expanded duties dental hygiene practitioner could be utilized

to increase access to care, administer government programs, be a SNF oral care specialist,

and advocate for geriatric oral health. Lobbying for dental coverage integral to all health

at a congressional level is the first step towards getting dental benefits added to Medicare.

Dental hygienists, as members of an interprofessional collaborative oral healthcare team,

should play a role in advocating on a local, state, and national level on the importance of

access to oral care.

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Appendix A

MDS Categories, Measurements, and Examples of Questions.

Category	What is measured	Example of Question.
Demographic Information	Categorizing residents	Is the resident of Hispanic or Latino origin or descent
Hearing, Speech, Vision	Ability to Communicate and Visual Abilities	Ability to express ideas and wants, non-verbal and verbal expression
Cognitive Patterns	Memory recall Signs and Symptoms of Delirium	Makes decisions regarding daily tasks
Mood	Energy level Appetite	Feeling tired or having little energy
Behavior	Presence of hallucinations or delusions	Note physical, verbal behavior directed at others and self
Preferences for customary routine, activities, community settings	Assessment of activities and daily preferences	How important is it to you for snacks to be available between meals?
Functional Status	Assessment of Activities of Daily Living (ADL) Assistance	Document balance during transitions and walking
Bladder and Bowel	Continence	Is a toileting program currently being used to manage the resident's urinary incontinence?
Active Disease Diagnosis	Document diseases present	Questions on any active diseases in the last 30 days
Health Conditions	Pain Management Document cough, problems breathing, tobacco use, prognosis	Chest pain when sitting or at rest?
Swallowing and Nutritional status	Swallowing and weight	Document signs and symptoms of possible swallowing disorder
Oral and Dental Status	Assess mucosa, teeth and dental appliances	Any broken or loosely fitting denture or partial
Skins Conditions	Ulcers, wounds	Did the resident have a pressure ulcer in the last 5 days?
Medications	Document all Medications	What medications is the resident taking in the last 5 days

Special Treatments and Procedures	Therapies, vaccines	Over the past 5 years, on how many days did the physicians examine the resident
Restraints	Need for Physical Restraints	Document if restraints are used in bed, chair
Participation in Assessment and Goal Setting	Resident's Goals	Will resident be returning home after stay?

Appendix B

Inclusion and Exclusion Criteria

Participant # _____

Date_____

Primary Investigator_____

Inclusion Exclusion Criteria

Must have all Yes answers for the six inclusion criteria

And

Must have a NO answer for the one exclusion criteria

All criteria will be verified by PI interview chart review.

Inclusion Criteria		
Criteria	Yes	No
Resident of Clarewood House		
Must be age 60 or above		
Cognitive function whose guardian gives consent		
Cognitive function to consent		
Fluent in English		
MMSE Score ≥10		
Exclusion Criteria		
Criteria	Yes	No
MMSE Score<10		

Appendix C

Assessment Tool

Oral Health/QoL Investigation				
Researcher:			**Date of clinical exam:**	
Participant ID #:			**Date of Interview:**	
MDS Oral Exam	**Yes**		**No**	
Access to Dental Care	**Yes**		**No**	
MMSE SCORE	**MMSE <10**			
Admitting Diagnosis				
DEMOGRAPHICS				
Age			**Living in Level**	
Gender	Female		Male	
# of years a resident				
Marital Status	Single		Widowed Living Alone	
	Married		Divorced Living Alone	
Ethnicity	Caucasian	Hispanic	African American	Asian	Pacific Islander
	Other (please write in here)				
Highest Completed Education	<8th	High School	Some College	College Graduate	Graduate Education
Qualitative Questions				
1) How would you describe your QoL?				
2) How pleased are you with your oral health?				

OIDP
I would like you to tell me whether or not problems with your mouth and teeth (dentures) have caused you difficulty with each one of these in the past 6 months.

Domain Severity Questions	0 none	1 very little	2 little	3 moderate	4 severe	5 very severe
Domains Frequency Questions	0 never affected 0 S x F	1 less than once a month 1 S x F	2 once or twice a month 2 S x F	3 once or twice a week 3 S x F	4 3–4 times a week 4 S x F	5 every or nearly every day 5 S x` F
Eating food						
Speaking clearly						
Cleaning teeth or denture						
Doing light physical activities, such as household activities						
Going out, for example to shop or visit someone						
Sleeping						
Relaxing						
Smiling, laughing and showing teeth without embarrassment						
Becoming more emotional or more easily upset than usual (mood affected)						
Enjoying contact with other people, e.g. relatives, friends or neighbors						
COLUMN TOTALS						

OIDP SCORE
The OIDP score is expressed as the sum of the different Performance scores (Performance score = severity score × frequency score) divided by the maximum possible (250), and then multiplied by 100 to provide a percentage score.

Clinical Exam Section																
OHI-S **(Calculus + Debris = OHI-S)**																
HOW TO SCORE Calculus Index	Scores		Criteria for Classifying Calculus													
	0		No Calculus													
	1		Supragingival more than one third													
	2		Supragingival calculus covering more than one third but less than two thirds including individual flecks of subgingival calculus around cervical portion or both													
	3		Supragingival Calculus covering more than two third													
Buccal (B)																
Lingual (L)																
Calculus Index Score	Total Score of B + L /6 = Calculus Index															
HOW TO SCORE Debris Index	Scores	Criteria for Classifying Debris														
	0	No Debris/stain														
	1	Soft debris covering not more than one third of the tooth surface including extrinsic stains.														
	2	Supragingival debris covering more than one third														
	3	Supragingival debris covering more than two thirds														
Buccal (B)																
Lingual (L)																
Debris Index Score	Total Score of B + L /6 = Debris Index															
OHI-S SCORE	Calculus + Debris = OHI-S															

DMFT Index
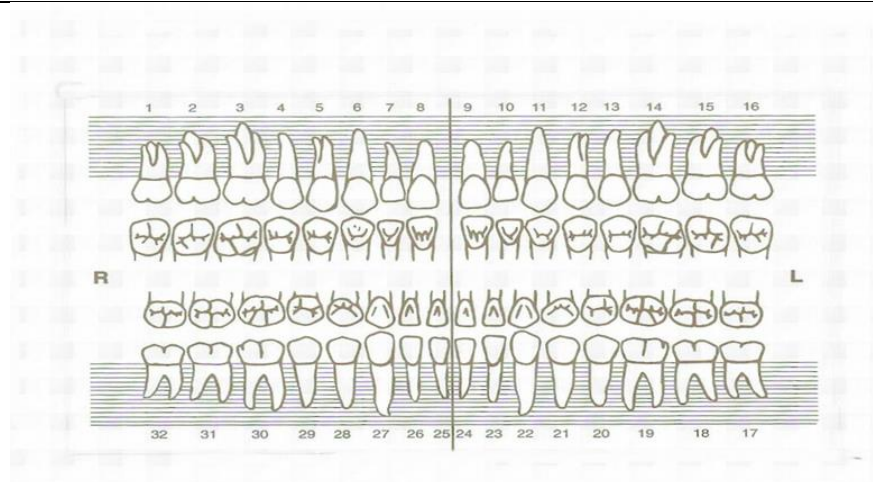
Permanent		
	0	sound
D	1	decayed
D	2	filled & decayed
F	3	filled, no decay
M	4	missing due caries
M	5	missing, other reason

DMFT:

D_____ M _____ F _____ = _____

Total DMFT=_____ $\div$ 28 x 100% = Total DMFT

Appendix D

Letter of Support from Clarewood House

EASTERN
WASHINGTON UNIVERSITY
start something **big**

Letter of Support for Study
The Impact of Oral Health on Quality of Life
in the Aging Population

Cindy Jackson
Administrator of Health Services
7400 Clarewood Drive, Houston, TX 77036
Phone: 713.774.5821 Ext #27
Fax: 713.778.8207
Email: cindy@clarewoodhouse.com

Dear Ruth Galm,
    As Administrator of Health Services for The Clarewood House, I am pleased to give my full support for the study: The Impact of Oral Health on Quality of Life in the Aging Population to be conducted and participants recruited at The Clarewood House.

This study will bring awareness to the scientific community of the need for regular dental care in skill nursing facilities (SNFs) by proving access to oral care for the resident will have an impact on the resident's daily performance and quality of life (QoL). There is a need for dental care within the SNFs for all institutionalized elders who do not have access to transportation. There is significance in the role for nurses to provide oral hygiene to the residents in SNFs and receive the education and training to meet the federal requirements for effective oral assessments.

The Clarewood House is in full support of the principle investigator, Jana Mannen and Eastern Washington University and confirms its interest and active collaboration in this study.

_____   1-7-14
                                     Date

Curriculum Vitae

JANA K. MANNEN, R.D.H., BSDH

HOME ADDRESS: 2310 Cherry Bend Drive
                                        Houston, Texas 77977
                                        Phone: (281) 493-6019
                                        jmannen@eagles.ewu.edu
                                        janamannen@yahoo.com

CITIZENSHIP: United States of America

GRADUATE EDUCATION:

2009-2014   Master of Science in Dental Hygiene
                            Eastern Washington University
                            Cheney, Washington

UNDERGRADUATE EDUCATION:

2006-2008   Bachelor of Science in Dental Hygiene
                            University of Texas Health Science Center
                            Dental Branch-School of Dental Hygiene
                            Houston, Texas

PROFESSIONAL EXPERIENCES:

2014-Present   CE Presenter/Guest Speaker
                            Clinical Dental Hygienist
                            Lepow Dental Associates
                            Houston, Texas

2012-2014   Clinical Dental Hygienist
                            Francis Dunlap, DDS
                            Houston, Texas

2012-Present   CE Presenter/Guest Speaker
                            School of Dental Hygiene/Department of Periodontics
                            UT School of Dentistry
                            Dental Branch
                            Houston, Texas
                            Nitrous Oxide Certification CE

2012-2013   Assistant Clinical Professor Adjunct
         School of Dental Hygiene/Department of Periodontics
         UT School of Dentistry
         Dental Branch
         Houston, Texas

2011-2012   Assistant Clinical Professor
         School of Dental Hygiene/Department of Periodontics
         UT School of Dentistry
         Dental Branch
         Houston, Texas

2010-2011   Volunteer Graduate Student for Practicum Requirements
         School of Dental Hygiene/Department of Periodontics
         UT School of Dentistry
         Houston, Texas

2006-2011   Clinical Research Assistant/Dental Hygienist
         Perio Health Professionals, PLLC
         Michael K. McGuire, DDS.
         E. Todd Scheyer, DDS., MS.
         Periodontal Practice
         Houston, Texas

2008-2012   Clinical Dental Hygienist
         Pedro Trejo, DDS.
         Periodontal Practice
         Houston, Texas

2008-2012   Clinical Dental Hygienist
         C.C. Trejo, DDS.
         General Dentistry
         Houston, Texas

2008-2010   Clinical Dental Hygienist
         Tom Inman, DDS.
         General Dentistry
         Houston, Texas

1985-2006   Dental Assistant
         General and Specialty Dental Practices
         Houston, Texas

LICENSURE:

2008	Western Regional Examining Board

2008-   Texas Dental Hygiene
Present   License #15329
                      Texas State Board of Dental Examiners

CERTIFICATIONS:

2006-   CPR Instructor Certification
Present   American Heart Association

2008-   Nitrous Oxide Monitoring
Present   State of Texas

2008-   Sealant Placement Certification
Present   State of Texas

2008-   Collaborative Institutional Training Initiative (CITI)
Present   Human Subjects Research

PROFESSIONAL ORGANIZATIONS:

2006-   American Dental Hygienists' Association
Present

2006-   Texas Dental Hygienists' Association
Present

2006-   Greater Houston Dental Hygienists' Society
Present   Membership Committee

2009-   American Dental Education Association
Present   Student Member

HONORS AND AWARDS:

2011-   The Greater Houston Dental Hygienists' Society
Present   Recognition of Service for Chairman of Awards

2010   The Greater Houston Dental Hygienists' Society Award
March   Member of the month

2008   The University of Texas Health Science Center at Houston Dental
                Hygienist Alumni Award
                *For Giving Unselfishly to the Promotion and Development of The
                Profession of Dental Hygiene*

2008   Elfenbaum-Kamen Essay Award Contest
                3rd Place Essay Winner, *Journal of Special Care in Dentistry*

2008   Texas Placement Network Scholarship
                Financial need Based Essay Scholarship from Texas Dental
                Hygienists' Association

2008   University of Texas Health Science Center at Houston Endowment
                 Fund Scholarship
                Essay Scholarship from UTHSC-H Dental Branch Dental Hygiene
                Alumni for need based dental hygiene student

2007   B. J. Long Memorial Scholarship
                Essay Scholarship for Leadership Qualities

2006   Phi-Theta Kappa (Honor Students)
                Society for Exceptional Academics Houston Community College

2006   Dean's List Houston Community College
                3.4 GPA or greater for the school year Houston Community College

2005   Girl Scout Leader of the Year
                For Outstanding Leadership and Exceptional Community Service to
                Girl Scouts of America

2004   Volunteer of the Year at Ashford Elementary
                For Outstanding Leadership and Service to Ashford Elementary
                School, Houston, Texas

**UT HEALTH UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT
        HOUSTON DENTAL BRANCH COMMITTEES:**

2011-2013   Dental Hygiene Community Liaison Council,
                UT Health University of Texas Health Science Center at Houston

2011-2012   UT Health University of Texas Health Science Center at Houston
                Dental Hygiene Admissions Board

2008   UT Health University of Texas Health Science Center at Houston,
                 Dental Branch Student Advisory Board

2008   New Building Committee
                UT Health University of Texas Health Science Center at Houston
                Student Advisory Board

COMMUNITY SERVICE:

1999-2012   Girl Scout Leader-San Jacinto Council- Houston, Texas

2006-2012   San Jose Clinic-Volunteer Sealant Day-Houston Community Clinic

2008-2012   Project Cure-Girl Scout/Church-Volunteer sorting of medical
supplies for

                shipment around the world.

2005-2010   Houston Food Bank-Girl Scout/Church-Volunteer sorting of food,
                loading of trucks, packing in bags for give away.

2005-2010   Yahweh-Women's and children's shelter-volunteer to work carnival,
                presented oral hygiene, sort food, made blankets for shelter, sorted
                Christmas gifts for give away, collected and presented the shelter
                with oral healthcare products.

2006-2009   Project 180-Girl Scouts/Church-collection of 4,200 bars of soap for
                Sliver Award to give to the needy, painted bathrooms in Paul
                Revere Middle School, and helped spread dirt on baseball field.

2008   Miles for Smiles-UT Volunteer Children's Restorative Clinic

2008   Veteran Hospital-Volunteer Hygiene Services

2008   U.T. Pediatric Clinic- Volunteer Hygiene Services

PRESENTATIONS:

Service as a panelist or discussant at professional meetings:
2011   *Health Care Team Competition Development.* Warren Morris,
March   D. and **Mannen, J.K.,** American Dental Education Association,
                San Diego, CA.

2008   Health Care Team Competition:
April   Collaborative Team effort to solve case study; each team member
                presented evidence to help solve case study.

Table Clinics:

2008
March

Blended Instrumentation, **Mannen, J.**, Mitchell, P., Oliveaux, J., and Tolia, N., Greater Houston Dental Meeting; Star of the South, George R. Brown Convention Center, Houston, Texas.

2008
February

Blended Instrumentation, **Mannen, J.**, Mitchell, P., Oliveaux, J., and Tolia, N., University of Texas Health Science Center Houston, Texas.

2008
February

Blended Instrumentation, **Mannen, J**., Mitchell, P., Oliveaux, J., and Tolia, N., Texas Student Dental Hygiene Association Annual Meeting, Omni Hotel, San Antonio, Texas.

Continuing Education Courses Presented:

2014
March

Granted Permission by the State of Texas Dental Examiners, CE *Nitrous Oxide Monitoring for Dental Auxiliary,* **Mannen, J.K.,** Patrounova, V.

2013
November

Granted Permission by the State of Texas Dental Examiners, CE *Nitrous Oxide Monitoring for Dental Auxiliary,* **Mannen, J.K.,** Patrounova, V.

2009
February

Collaborative Continuing Education Periodontal Health, **Mannen, J.K,**Demonstrated measurement techniques/Instrumentation Japanese Dentists

Other Presentations:

2013-
December

*Host Response to Periodontal Pathogens, **Mannen, J.K.*** Presentation Interview for Faculty Position.

2013-
March

Mapping the Terrain of Effective Curricular Management, Wetmore, A., **Mannen, J.K.,** Presented at American Dental Education Association, Seattle ,Washington.

2007-
Present

Cardiopulmonary Resuscitation, **Mannen, J.K.** Certification and Recertification of CPR credentials, University of Texas Health Science Center Houston, Texas

2012-
October

Plaque and Disease Control for the Periodontal Patient, Allaire, J. , **Guest Speaker-Mannen,J.K.,** Presented to DHII Students, University of Texas Health Science Center Houston, Texas

2012-
February
Pain Control-Conscious Sedation, **Guest Speaker-Mannen, J.K.,** Presented to DH1Students, UT Health University of Texas Health Science Center Houston, Texas

2011-
October
Plaque and Disease Control for the Periodontal Patient, **Guest Speaker-Mannen,J.K.,** Presented to DHII Students, University of Texas Health Science Center, Houston, Texas

2011-
February
Pain Control-Conscious Sedation, **Guest Speaker-Mannen, J.K.,** Presented to DH1Students, UT Health University of Texas Health Science Center Houston, Texas

2011-
February
Dental Hygiene Diagnosis and Care Planning, **Guest Speaker-Mannen, J.K.,** Presented to DHI Students, UT Health University of Texas Health Science Center Houston, Texas

2010-
November
Oral Photography-Intra and Extra Clinical photography, **Guest Speaker- Mannen, J.K.,** Presented Oral Photograph techniques/lab to DH I Students, UT Health University of Texas Health Science Center, Houston, Texas

2010-
October
Plaque and Disease Control for the Periodontal Patient, **Guest Speaker-Mannen,J.K.,** Presented to DHII Students, University of Texas Health Science Center,Houston, Texas

2010-
April
Whitening Products and Procedure Presentation, **Mannen, J.K.,** Presented Whitening Techniques/Products to Dental Professionals Dr. Michael McGuire, Houston, Texas

2008-
April
Presented Oral Care to Nurses and their Patients. **Mannen, J.K.,** Tran, P. resented Oral Care to Nurses for the Benefit of their Patients, Methodist Hospital, Houston, Texas

2008-
April
Home Health Nurses Presentation for Oral Care in the Nursing Home, **Mannen, J.K.,** Tran, P. Presented Oral Care for Nursing Home patients to a group of nurses and was videotaped by the home healthcare agency for future use by the nurses, Home Healthcare, Houston, Texas

2008
March
Oral Hygiene Education Presentation, **Mannen, J.K.,** M Medik, T., Mitchell, P.A., Tolia, N., Presented Oral Hygiene Education to Students, Rice University Houston, Texas

2008-
March
Oral Care to Nurses and their Patients. **Mannen, J.K.,** Tran, P. Presented Oral Care to Nurses for the Benefit of their Patients Methodist Hospital Houston, Texas

PUBLICATIONS:

Mannen, J., (2012), Oral Health and Stroke. *Dimensions of Dental Hygiene,* 10(7): 50- 52, 55.

Tran, P. and **Mannen, J**., (2009), Improving oral healthcare: Improving the quality of life for patients after a stroke. *Special Care Dentistry. 29,*218-221.