# IMPLEMENTING AN ORAL HEALTH TOOL AND MOTIVATION INTERVIEWING TOOL TO IMPROVE ORAL HEALTH CARE AMONG TYPE II DIABETICS ON A NORTHERN PLAINS RESERVATION

by

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TABLE OF CONTENTS

1. INTRODUCTION ..... 1

Background and Significance ..... 1
Problem Statement and Project Aim ..... 3
Local Setting ..... 3
Local Problem ..... 6
Project Aim ..... 8

2. REVIEW OF LITERATURE ..... 10

Diabetes ..... 10
Oral Health-Related to Overall Health and Diabetes ..... 13
American Indian-Barriers to Oral Health Care ..... 19
Theoretical Underpinning ..... 28

3. METHODS AND PROCEDURES ..... 36

Project Design ..... 36
Participants ..... 36
Materials ..... 38
Procedure ..... 40
Data and Analysis Plan ..... 42

4. RESULTS AND DISCUSSION ..... 44

Preface ..... 44
General Health Questionnaire ..... 45
Oral Health Assessment Tool ..... 51
Decisional Balance Worksheet ..... 54
Exit Questionnaire ..... 58
Discussion ..... 59

TABLE OF CONTENTS CONTINUED

5. RECOMMENDATIONS ..... 63

Integrate Oral Health Screening into Overall Diabetes Care ..... 63
Improve Dental Education and Training of Non-dental Professionals ..... 64
Raise Public Awareness about Oral Health in Type II Diabetics ..... 65
Explore Use of Dental Health Aide Therapists ..... 66
Political Involvement to Change the IHS Budget from a Discretionary Status ..... 67

REFERENCES CITED ..... 69

APPENDICES ..... 82

APPENDIX A: Participant Recruitment Letter ..... 83
APPENDIX B: Participant Consent Form ..... 85
APPENDIX C: General Health Assessment Questionnaire ..... 87
APPENDIX D: Oral Health Assessment Tool ..... 90
APPENDIX E: Decisional Balance Worksheet ..... 92
APPENDIX F: Institutional Review Board Approval ..... 94
APPENDIX G: Tribal Council Approval ..... 96
APPENDIX H: Literature Review Matrix ..... 98

# LIST OF TABLES

Table Page

1. Population Characteristics……..……45
2. BMI of Participants. …….……...46
3. Self-reported Blood Glucose Ranges.....47
4. Co-Morbid Health Conditions. …….……..48
5. Self-report Oral Health Behaviors. …….……49
6. OHAT scores Distribution at Baseline.... …….....53
7. OHAT score Distribution at 3 months.…..…….…….....54
8. Oral Health Habits……..……..55

# LIST OF FIGURES

Figure Page

1. Health Care Access Barriers Model…….…….....20
2. Co-Morbid Conditions…….…….....48
3. Difficulty Accessing Dental.....…….....50
4. Total Toothloss.....….....51
5. OHAT Averages by Session.....52
6. Awareness of Oral Health Important.....58

# ABSTRACT

Type II diabetes and periodontal disease are two common chronic diseases that have been shown to have a physiologically bi-directional relationship. In recent years, type II diabetes and periodontal disease have reached epidemic proportions throughout the United States; disproportionately affecting racial and ethnic minorities such as American Indians. American Indians often have diabetes rates that are two times the general U.S. population and periodontal disease rates that are equally as high. Adding to the oral health disparity in American Indian populations, accessing dental care is often limited making oral health preventive behaviors especially important. This project chose to examine oral health in a group of American Indian adults with type II diabetes focusing on 1) the identification of oral health status using the Oral Health Assessment Tool 2) the facilitation of oral health care to the local Indian Health Service agency and 3) supporting and improving preventive oral health behaviors through motivational interviewing. Participants took part in bi-weekly face-to-face motivational interviewing sessions with their oral health status being evaluated using the Oral Health Assessment Tool concurrently. Participants were referred to the local Indian Health Service agency for dental care based on Oral Health Assessment scores. Scores could range from 0 (good oral health) to 16 (poor oral health). The overall analysis of data found a slight improvement in average Oral Health Assessment Tool scores from *2.75* at baseline to *2.25* at three months. Content analysis of the motivational interviewing sessions found an increased interest among participants to improve oral health behaviors such as brushing for longer periods of time or a desire to quit smoking. The findings of this study are encouraging. While the Oral Health Assessment Tool scores did not improve by leaps and bounds, it does show promise for the use of motivational interviewing to improve preventive oral health behaviors in the American Indian population while also showing the ease of integrating the Oral Health Assessment Tool into general diabetes care.

# CHAPTER ONE

# INTRODUCTION

## Background and Significance

American Indian and Alaska Native (AI/AN) populations experience some of the most significant health related disparities than any other population in the United States. Specific health diseases such as diabetes, alcoholism, unintentional injuries, and suicide are just a few of the top health concerns that adversely impact American Indian/Alaska Native populations at far higher rates than any other race (Warne, 2006). The overwhelming majority of these disparities are both preventable and influenced by behavior and lifestyles choices (Indian Health Service [IHS], 2015). Diabetes, which affects people of every race, gender, age and demographic in this country, is disproportionately seen in AI/AN when compared to other racial/ethnic groups.

According to the Center for Disease Control and Prevention (CDC) (2014), American Indians and Alaska Natives are over two times as likely to be diagnosed with type II diabetes than non-Hispanic whites in this country. At nearly 16.1 percent, American Indians and Alaska Natives have the highest age-adjusted prevalence of diabetes than any other racial group including non-Hispanic whites (Chow, Foster, Gonzalez, & McIver, 2012). In fact, over the past decade, the prevalence of diabetes in the non-Hispanic white population has remained fairly stable at 6 percent, while the prevalence rates of diabetes amongst AI/AN have soared at 12.5 percent (Hutchinson & Shin, 2014). Recent efforts in health care access and health care delivery have been

made in an attempt to alleviate the disparity of diabetes among AI/AN populations. Despite these efforts, however, diabetes has continued to remain a significant burden on the health status of AI/AN.

Between 1999 and 2010, diabetes was the fourth leading cause of death in AI/AN populations. This is a stark contrast to the U.S. general population where diabetes was only the seventh leading cause of all deaths (CDC,2012). Several research studies have also found that complications from diabetes and co-morbid conditions are seen at higher rates in AI/AN populations than U.S. adults with diabetes (O'Connell, Yi, Wilson, Manson & Acton, 2010). American Indians with diabetes tend to experience higher rates of renal disease, amputations, cardiovascular disease, and hypertension (IHS, 1999) (O'Connell et al., 2010). One other complication that is seen in AI/AN diabetic populations is oral disease. While not fully emphasized, oral disease can be a significant contributor to the declining health status of AI/AN diabetics.

In the most recent oral health survey conducted by the Indian Health Service (IHS) (1999), gum disease becomes a significant oral health problem for AI/AN between the ages of 35-44. Infection that initially started in adolescence has typically been allowed to progress to advanced periodontal disease, which ultimately leads to tooth loss and decay. Having diabetes significantly increases the chances of periodontal disease and tooth loss occurring. In a 1999 survey, the IHS found that adults with diabetes were 38 percent more likely to have advanced periodontal disease when compared to those without diabetes. A higher proportion of advanced periodontal disease was seen in diabetic patients with uncontrolled blood sugar rather than those who had good glycemic

control (IHS, 1999). The oral health survey conducted by the IHS speaks volumes about the need for improved oral health efforts in American Indian populations; particularly among those who have type II diabetes.

## Problem Statement and Project Aim

### Local Setting

The declining health pattern of the U.S. population is a phenomenon that has developed over a number of years. Decades of research have traced two ominous but very real characteristics regarding the direction of our nations healthcare system. The first is that the U.S. has the worst rankings in terms of mortality and health status when compared to other developed nations (Davis, Stremikis, Schoen & Squires, 2014). The second, and possibly the most distressing, is that the individuals who occupy the lower ranks of our socioeconomic hierarchy are typically the ones who experience the worst health outcomes and have the highest levels of morbidity and mortality (Palloni & Yonker, 2015). The latter is an extremely unfortunate circumstance since, in the United States, many racial and ethnic minorities disproportionately occupy the lower rungs of our nation's socioeconomic ladder making up over 50 percent of the economically disadvantaged (U.S. Department of Health and Human Services [DHHS], 2011).

Of the 46.5 million people living in poverty in the United States, racial and ethnic minorities, which includes such groups as: African Americans, Americans Indians or Alaska Natives, Hispanics or Latinos, Asian Americans, Native Hawaiians and other Pacific Islanders; made up the bulk of this figure. Out of all minorities surveyed in the

United States Census for 2010, those that self-identified as American Indian or Alaska Native had the highest national poverty rate than any other race at 27 percent (U.S. Census Bureau, 2010).

American Indian or Alaska Native refers to "persons having origins in any of the original peoples of North, South America, and Central America, who maintain tribal affiliation or community attachment" (U.S. Office of Management and Budget [OMB], 1997). Once considered a forgotten and dwindling population, the American Indian and Alaska Native populace has grown at rates twice as fast as the overall U.S. population (U.S. Census Bureau, 2010). According to the 2010 Census, 5.2 million people in the United States self-identified as being either American Indian or Alaska Native; this is a 9.7 percent increase from the 2000 census when only 4.1million people self-identified as being American Indian or Alaska Native. However, despite their growth, American Indians and Alaska Native account for only 1.7 percent of the total U.S. population (U.S. Census Bureau, 2010).

Many of our country's American Indian population reside on Reservations or other trust lands (U.S. Office of Minority Health, 2015). American Indians who live on Federal Reservations face a number of social and economic challenges that are comparable to third world countries (Native American Aid, 2015). For example, isolation and lack of economic opportunity on or near Reservation lands lead to a drastic increase in unemployment that is not seen anywhere else in the United States. Unemployment rates on Indian Reservations can be astronomically high ranging anywhere from 40 to 80 percent. For instance, unemployment on one Reservation within

the Northern Great Plains region had one of the highest unemployment rates at 77 percent (Unemployment on Indian Reservations, 2010). Housing is typically substandard as well, some houses lacking basic necessities such as sewer, running water, electricity, heating or cooling. About 40 percent of on-reservation housing is considered to be, by definition, inadequate (U.S. Commission on Civil Rights, 2003). Overcrowding further complicates the housing issue; it is not uncommon for 3 or more generations to occupy one dwelling at a time. Educational attainment is also severely lacking. Only 17 percent of American Indians have a bachelor's degree and a meager six percent have a graduate degree. This pales in comparison to the Non-Hispanic white population where bachelor degree attainment rates are 33 percent and graduate degree attainment is 12 percent (U.S. Office of Minority Health, 2015). All these socioeconomic factors combine to create a perfect storm for health inequity in American Indian communities.

The circumstances that surround the health status of all people, especially American Indians, are shaped by three interrelated but controllable factors: the distribution of money, power and resources (World Health Organization, 2015). Regrettably, each of these is in significantly short supply for American Indians. The underfunding of the Indian Health Service is a prime example of the resource limitations many American Indians and Alaska Natives face. The Indian Health Service (IHS) is the principal Federal agency charged with "…raising the physical, mental, social, and spiritual well being of American Indian and Alaska Natives" (IHS, 2015). Located under the Department of Health and Human Services, the IHS provides primary health care and disease prevention services to approximately 2.2 million AI/AN belonging to 566

Federally recognized Tribes across 35 states (Sequist, Cullen & Acton, 2011). The IHS has a discretionary budget that operated on just over 4.6 billion dollars in 2015 (IHS,2015). The budget provided to the IHS by the United States Federal government covers only an estimated 59 percent of the identified need for the entire IHS health organization (National Tribal Budget Formulation, 2013). At current funding levels, the IHS budget allows for approximately $3,099 per capita expenditure for patient health services; which is almost $5,000 less than the national per capita expenditure of $8,097 per patient (IHS, 2015).

Even less funding is available to address the oral healthcare needs of AI/AN populations. Dental clinics typically receive a very small portion of the underfunded budgetary amount that is allowed to the Indian Health Service (Brings Him Back-Janis, 2011). With funding levels at their current state, access to oral healthcare becomes a limited commodity. This results in two types of healthcare services: very basic care and the most extremely urgent care (Brings Him Back-Janis, 2011).

Local Problem

"The Northern Plains is one of the largest, most rural and impoverished tribal region in the United States" (Wilson et al., 2014, p.164). Approximately 30,000 American Indians are dispersed over the Northern Plaines region spanning across an impressive 2.8 millions acres (Wilson et al., 2014). Many of the counties located within the Northern Plains region have population sizes of 10,000 or fewer people (U.S. Census, 2009). Montana, one of the states included in the Northern Great Plains region, ranks

48th nationally in population density and averages only 6.5 people per square mile (Census and Economic Information Center, n.d.). It is the fourth largest state in the United States covering 147,040 square miles and is called home by a number of American Indian tribes (Montana Geographical Information Clearinghouse, 2015).

Montana has, within its borders, seven Federally Recognized Indian Reservations that are spread across each end of the state. Like most parts of Montana, many of these Indian Reservations are situated in regions that can be considered extremely isolated. The Indian Reservation of interest for this project, for example, is located in North Central Montana just 40 miles south of the Canadian boarder and at least one hours driving distance from the nearest town with a higher echelon of healthcare; including advanced dental services. Consisting of an area of 675,147 acres, a mere 2,851 people occupy this large expanse of land and are geographically spread between three small communities (Fort Belknap Indian Community, 2014). The majority of the land can be defined as rolling plains and the main industry is agricultural in nature consisting of small cattle ranches, raising alfalfa hay for feed and larger dry land farms. Unemployment rates in this area are as high as 63.7% and the per capita income is $12,049 (Fort Belknap Indian Community, 2014). Educational attainment rates are lower than both the Montana and national averages with only 11.1% achieving a Bachelor's degree or higher, 25.8% with a high school diploma or GED and 15.5% with less than a high school diploma (Fort Belknap Indian Community, 2014). The rural landscape of North Central Montana and the geographical location of this one particular Indian Reservation create a number of barriers to all types of healthcare services including oral healthcare.

Access to oral healthcare is based on the complex function of a number of variables including access to insurance, availability of providers, educational attainment, culture and geographical location of healthcare services (Beedasy, 2010). Underserved areas and vulnerable populations, such as the Indian Tribes of North Central Montana, are negatively impacted by these variables resulting in unmet oral healthcare needs (Institute of Medicine, 2011). Access to oral health insurance, for example, is a major contributor to oral health disparities in many American Indian populations. One study found that American Indians have some of the highest rates of poverty with the lowest rates of health insurance coverage (Call et al., 2006). Geographically, the isolation of living in a rural location along with the maldistribution of providers in these areas further contributes to oral health disparities by influencing oral health services that are available and can be accessed (Beedasy, 2010). For instance, the Reservation of interest for this project has only one dentist to serve the approximately 5,000 people who utilize its services. There was no dental hygienist available or other dental health providers available at the time of this project. Preventive health care, especially preventive oral health care, is difficult to accomplish in this environment and remains the public health challenge of the 21st century for many Native tribes (Robert Wood Johnson Foundation, 2013).

## Project Aim

The purposes of this project were: 1) To use the Modified Oral Health Assessment Tool in order to identify the oral health status of persons with Type II

Diabetes 2) To facilitate participants access to dental care at the local Indian Health Service Agency and 3) To support self-care through motivational interviewing.

Information on the oral health status of American Indians is limited. There are very few comprehensive studies available that address the oral health of American Indians. This is especially true for American Indian adults with chronic diseases such as Type II diabetes. The last known report to review the dental needs of American Indians was published in 1999 by the Indian Health Service (Batliner et al., n.d.). Without proper knowledge of their oral health status, American Indians with type II diabetes are at a greater disadvantage to improve their oral health and ultimately their overall health and quality of life.

# CHAPTER TWO

# REVIEW OF LITERATURE

## Diabetes

Diabetes mellitus is a group of metabolic disorders that are characterized by a chronic hyperglycemic condition that is triggered by defects in the production or use of the hormone insulin (Ozougwu, Obimba, Belonwu & Unakalamba, 2013). Created in the pancreas by beta cells, insulin plays a major role in the metabolism of the body by allowing cells to absorb glucose and use it for energy (National Institutes of Diabetes and Digestive and Kidney Diseases [NIDDK], 2015). When diabetes mellitus develops, insulin secretion, insulin action or both malfunction allowing plasma glucoses levels to rise above normally accepted ranges (Ozougwu, et al., 2013).

Diabetes is categorized into two different types: type I and type II. Type I diabetes, previously called insulin dependent diabetes mellitus (IDDM), results from the autoimmune destruction of insulin producing beta cells in the pancreas causing a lack of insulin secretion (Gillespie, 2006). Type II diabetes, previously referred to as non-insulin dependent diabetes mellitus (NIDDM), is not an autoimmune disorder and is the result of a combination of modifiable and nonmodifiable risk factors. Type II diabetes is characterized by impaired insulin secretion, relative insulin deficiency and inappropriate glucagon secretion in association with peripheral insulin resistance (Mahler & Adler, 1999). Of the two types of diabetes, type II is the predominant form accounting for

nearly 90 to 95 percent of all diagnosed cases of diabetes mellitus (American Diabetes Association, 2015).

Type II diabetes is a serious, lifelong, progressive disease that often begins with insulin resistance. Insulin resistance, while it is not the sole cause of diabetes, sets the stage for the development of the disease (NIDDK, 2015). Insulin resistance is defined by the decreased sensitivity of target tissues, such as the liver and muscles, to the action of insulin (Kaku, 2010). When a lack of response to insulin from target tissues in the body occurs, glucose levels are allowed to rise in the bloodstream. This action, in turn, stimulates the beta cells of the pancreas to increase the production of insulin in an attempt to keep in pace with the apparent demand. Blood glucose levels will remain in a healthy range as long as the beta cells can overcome insulin resistance (Fonesca, 2007). However, if interventions are not taken to reverse insulin resistance, a person has greater potential of developing pre-diabetes and, eventually, type II diabetes.

Pre-diabetes, which affects nearly 86 million Americans, develops when the insulin producing beta cells can no longer produce enough insulin to overcome insulin resistance (CDC, 2015). In the pre-diabetic state, blood sugar levels begin to rise above normal signaling a loss of beta cell function; however, blood sugar levels do not rise high enough to warrant a full diagnosis of type 2 diabetes (CDC, 2015). Once a person has pre-diabetes, the continued loss of beta cell function will usually lead to the development of type II diabetes within 10 years of diagnosis (NIDDK, 2015). Pre-diabetics, as well as those with insulin resistance, can delay or prevent the onset of type II diabetes by engaging in two important behaviors: 1) increasing physical activity and 2) taking weight

loss measures. Each of these actions improves the body's response to insulin and thus reduces the risk of progressing to the development of type II diabetes (American Diabetes Association, 2014) (NIDDK, 2015).

If type II diabetes is allowed to develop and manifest, a person is at increased risk for an array of additional health problems. People with type II diabetes, particularly those individuals with poor glucose control, may develop microvascular and macrovascular complications that can negatively impact their quality of life (Boyle, Thompson, Gregg, Barker & Williamson, 2010). Microvascular complications such as: diabetic retinopathy, diabetic nephropathy and neuropathy can lead to problems like vision loss, renal failure, foot ulcers and limb amputations (World Health Organization [WHO], 2015). Macrovascular complications such as cardiovascular disease (CVD), myocardial infarction and stroke can be seen at increased rates among type II diabetics than most non-diabetics (Fowler, 2008). In fact, diabetes is associated with a two to four fold increase of coronary heart disease and an increase in mortality from coronary heart disease by a factor of three to seven (Haffner, Lehto, Ronnemaa & Pyorala, 1998). Risk for stroke can be increased by as much as 150 to 400 percent in patients with type II diabetes than those without the disease (Fowler, 2008). Periodontal disease, a less emphasized complication of diabetes, is also seen at higher rates in type II diabetes and is rapidly gaining recognition as a major complication of the disease (Dunning, 2009).

## Oral Health – Related to Overall Health and Diabetes

The oral cavity and the plethora of bacteria contained within play an important role in both the maintenance and homeostasis of the body as well as the pathogenesis of many diseases (Atanasova & Yilmaz, 2015). The recognition of the inter-link between general health and oral health is not a new and unique concept. Dating back centuries, ancient civilizations such as those of the Mediterranean had observed that dental issues were often associated with certain health concerns such as reproductive problems in women. Similarly, as early as 460 to 377 B.C., Hippocrates, a Greek physician and pioneer of medicine, recognized the significance of oral health to general health and was known to utilize tooth extraction as a treatment for certain ailments such as joint pain (Atanasova & Yilmaz, 2015). Many centuries later, in the final decades of the 19th century, the understanding of microorganisms began to really evolve when Robert Koch, a renowned physician and scientist, was able to conclusively establish that certain microbes were the cause of a number of specific diseases (Blevins & Bronze, 2010). With the surge in microbial research that occurred over the past 3,000 years, the understanding of microbes, especially oral microbes, has soared. Despite this fact, it was not until the most recent decades that the influence of oral microbes on general health hasbeen thrust into the scientific limelight (Seymour, Ford, Cullinan, Leishman, & Yamazaki, 2007).

To date, a number of national and international health organizations have come to recognize the influence oral health has on general overall health. The World Health Organization (WHO), for example, states, "…oral health is essential [for both] general

health and quality of life" (WHO, 2012). The Office of the Surgeon General echoes similar sentiments and concludes, "…oral health means much more than healthy teeth, and is integral to the general health and well-being of all Americans" (CDC, 2013). A healthy mouth is needed for much more than just a pretty smile, it is also an essential part of proper nutrition and as a means to help ward off certain medical disorders (Office of Disease Prevention and Health Promotion, 2015). Current research makes a convincing case for the importance of good oral health, linking many of our common oral diseases such as: dental cavities, periodontal (gum) disease, oral cancers, oral infectious diseases, and trauma from injuries and hereditary to negative health outcomes for many individuals (Palmer et al., 2015)(WHO, 2012). Periodontal disease, one of the more common oral health issues seen globally, has rapidly become the focus of a number of scientific inquiries for its potential impact on our overall systemic health (Llambes, Aris-Herrera & Caffesse, 2015).

Periodontal disease is a chronic inflammatory disease that destroys the gingiva or tooth-supporting tissues of the oral cavity resulting in a number of complications including gum irritation, alveolar bone resorption, infection and tooth loss (Jeffcoat, Jeffcoat, Gladowski, Bramson & Blum, 2014). Periodontal disease is the most prevalent chronic infection in adults aged 30 to 90, affecting 47.2% of those older than age 30 and 70.1% of those older than age 65 (CDC, 2015). Periodontal disease encompasses two major entities, gingivitis and periodontitis. Both of the major forms of periodontal disease develop when bacterial biofilm on the tooth's surface is allowed to accumulate and invade the surrounding tissue causing the host to mount an inflammatory response

(Llambes et al., 2014)(CDC, 2013). Pro-inflammatory mediators such as prostaglandins, interleukin-1 beta, tumor necrosis factor alpha (TNF-alpha), neutrophils, T-cells and monocytes are all released as a consequence of oral inflammation (Gurenlian, 2006). The products of inflammation released during the immuno-inflammatory response due to periodontal disease are believed to be the main contributors for poorer outcomes in a number of chronic diseases such as cardiovascular disease, rheumatoid arthritis, respiratory diseases, kidney disease and type II diabetes. (Seymour et al., 2007)(Atanasova & Yilmaz, 2015). Type II diabetes is particularly affected by periodontal disease as the two share a unique biological relationship not seen with other chronic illnesses.

Over the past couple of decades a number of longitudinal studies, case reports, cross-sectional studies and systematic reviews have been able to demonstrate a bi-directional relationship between diabetes and periodontal disease (Teeuw, Gerdes & Loos, 2010). As with most micro- or macro- vascular complications that disproportionately develop with type II diabetics, the cornerstone of preventing periodontal disease in type II diabetes rests on good glycemic control (Llambes et al., 2015). The prevalence of periodontal disease is 4.8 times higher among diabetics, affecting approximately 22 percent of all diabetic patients (Wang et al., 2014). While the exact mechanism of how diabetes and periodontal disease affect each other is not completely known, there are a number of biological mechanisms proposed that may help explain the increased incidence and severity of periodontal disease in individuals with diabetes (Gurenlian, 2006). Evidence suggests that periodontal disease and diabetes

influence each other through: 1) microvascular disease 2) changes in components of gingival crevicular fluid 3) changes in collagen metabolism 4) an altered host response 5) altered subgingival flora 6) genetic predisposition and 7) nonenzymatic glycation (Southerland, Taylor & Offenbacher, 2005).

One of the more popular hypotheses proposes that an exaggerated pro-inflammatory response to periodontal disease occurs on behalf of the diabetic host (Gurenlian, 2006). To illustrate, research has been able to establish that pro-inflammatory mediators are released in response to the invasion of bacteria at the peridontium. Gingival crevicular fluid reflects this assertion by containing increased levels of inflammatory markers along with glucose content; this is particularly true among poorly controlled diabetics (Gurenlian, 2006). The inflammatory mediators and glucose content combine to promote periodontal destruction and bacterial presence within the periodontal pocket resulting in worsening periodontal disease including greater bone or tooth loss (Mohammed, 2013). Sequentially, the presence of periodontal disease allows for a unique opportunity for bacteria to gain access to the systemic circulation through the damaged gingival tissue (Mohammed, 2013). Researchers theorize that once periodontal bacteria gains access to the systemic circulation via the periodontal microcirculation, an exaggerated, systemic pro-inflammatory state results on behalf of the diabetic host (Lamster, Lalla, Wenche, Borgnakke & Taylor, 2008). Inflammatory cytokines produced during this invasion, particularly TNF-alpha and interleukin's 6 and 1, act as insulin antagonists causing increased insulin resistance of the host. Increased insulin resistance further contributes to impaired glycemic control, which ultimately

affects other tissues and organs including the oral cavity. Consequently, a vicious cycle of physiological damage and hyperglycemia ensues (Lamster, Lalla, Wenche, Borgnakke & Taylor, 2008)(Dunning, 2009).

With scientific research supporting a biological and bi-directional relationship between diabetes and periodontal disease, oral health needs to become a routine part of diabetes management; this includes proper screenings and education (Dunning, 2009). The recently released *White Paper* (2015), commissioned by the National Interprofessional Initiative on Oral Health, recognized that:

> "To reduce the burden of oral disease, the efforts and skills of both primary care providers and dentists, and their respective teams, will be required. In this new partnership, the role of the primary care provider and team is to assess and reduce risk, screen for signs of early oral disease, implement preventive measures and identify patients in need of dental care" (Qualis Health, 2015, p.18).

The authors of the *White Paper* (2015) suggest two very important factors relating to a change in the delivery of our overall care. The first is the cessation of the compartmentalization of the oral cavity from the rest of the body needs to occur in the primary care setting; the second is there needs to be an increase in the implementation of preventive oral measures such as risk assessment and oral health screenings in primary care. Presently, there are a number of tools available to properly conduct oral health assessments. However, many of these screening tools, such as the plaque index or gingival index, require a more specialized body of knowledge in dentistry in order to be effectively utilized (Chalmers & Pearson, 2005). The Oral Health Assessment Tool (OHAT), a simple eight category oral health-screening tool that has been modified from

the Kayser-Jones Brief Oral Health Status Examination (BOHSE), does not require a specialized knowledge base and can be used by various medical professionals.

The OHAT focuses on eight aspects of the oral cavity. These include: 1) lips 2) tongue 3) gums and tissues 4) saliva 5) natural teeth 6) dentures 7) oral cleanliness and 8) dental pain. As a screening tool, the OHAT has shown great promise as a feasible, interdisciplinary instrument to be implemented by a multitude of caregivers (Chalmers, King, Spencer, Wright & Carter, 2005). In 2003, the OHAT was included in the *Best-Practice Oral Health Model for Residential Care* study in Australia. This study was conducted to investigate three distinct study aims regarding oral health care among residential care patients and their caregivers. One aim of the study specifically focused on testing the validity and reliability of the use of the OHAT between different caregivers, who ranged from personal care attendants to registered nurses. Upon completion of the six month, 455 participant study, the authors were able to show substantial inter-carer category reliability and validity regarding OHAT scores (Chalmers et al., 2005). The results of the *Best Practices* study suggests that the OHAT can be used with confidence among different caregivers especially nurses.

While the OHAT has primarily been utilized in residential care facilities, in particular those with dementia, it offers a possible solution to improving oral health among other vulnerable populations. The use of this simple tool can significantly change the face of oral health care among the American Indian population; a group of people who face numerous barriers to oral health care.

## American Indians-Barriers to Oral Care

In order to truly appreciate the complexities of oral care in American Indian populations, one needs to consider the multitude of factors that influence their access to care. As a rule of thumb, many of the factors that influence general healthcare access for American Indian populations also influence their access to oral health care. Socioeconomic status, facility staffing, geography, culture and funding issues are just a few of the many issues that shape oral health care across Indian Country (American Dental Association, 2011). The Health Care Access Barriers (HCAB) model proposed by Carrillo and colleagues (2011) provides a practical framework for taking into account these factors and identifying the numerous barriers to oral health care many American Indians may face.

The HCAB model describes three categorically modifiable barriers in relation to healthcare access. These include financial, structural and cognitive barriers. These three barriers influence each other and are associated with three distinct health care characteristics: decreased screenings, late presentation to care, and lack of treatment (Carrillo et al., 2011). All combined, these factors ultimately contribute to poor health outcomes and health disparities. Figure 1 illustrates the components of the health care access barriers model and how they influence health outcomes and health disparities.

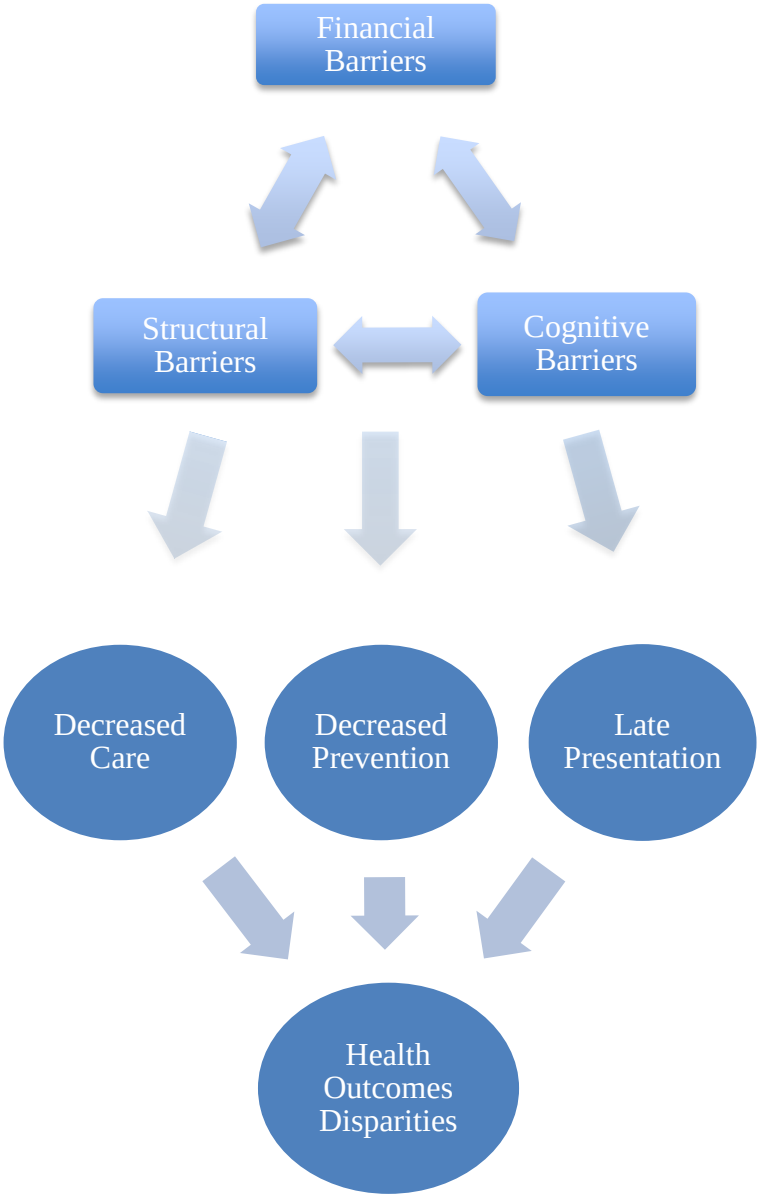



Figure 1. The health care access barriers (HCAB) model. (Adapted from Carrillo et al., 2011).

According to the HCAB model financial, structural and cognitive barriers intermingle to result in healthcare deficits. Each of these barriers encompasses a number of specific circumstances that can influence healthcare access (Carrillo et al., 2011). One of the first barriers mentioned by the HCAB model is financial barriers. These barriers consist of two distinct dynamics: the cost of care and the health insurance status of the population (Carrillo et al., 2011). In American Indian populations the funding of already minimally available healthcare services is a constant concern and an ever-present issue. While healthcare costs have soared over the past few decades, the Federally appointed budget of the Indian Health Service has not kept pace with inflation nor has it increased to support the demographic growth of Indian Tribes (Malerba, 2013). In fact, while other Federally funded programs such as Medicare, Medicaid and the Department of Veterans Affairs have seen their budgets increase to account for both inflation and the increased number of people eligible for their services, the IHS budget has remained basically stagnant (Westmoreland & Watson, 2006). Furthermore, since the start of the sequestration of a number of Federal budgets by the Federal government, the Indian Health Service has suffered even more financial losses. In fact, sequestration of the IHS budget has resulted in a 5 percent reduction in funds (Malerba, 2013). Presently it is estimated that the IHS functions at just barely 59 percent of the total actual need.

When the already historically troubled budget of the IHS is faced with more budgetary cuts and does not increase over time to cover rising healthcare costs, a number of problems occur. First decreased availability of funds forces the IHS to ration the

amount of services it provides as well as limit the per capita amount it spends on its beneficiaries (National Tribal Budget Formulation, 2013). For instance, dental services within the IHS currently receive only a small portion of the underfunded IHS budget. Ninety percent of what little funding is allotted to the dental clinics is able to provide only basic and emergency care services (National Tribal Budget Formulation, 2013). Preventive and restorative services, as well as health promotion, are often non-existent due to funding issues. This may be reflected in the higher prevalence of tooth loss in the American Indian populations (IHS, 1999). Among adults, tooth extraction is a common method for treating decay when financial resources are limited (IOM, 2011). Furthermore, contract health services, the department intended to provide medical or dental specialties that are not offered by the IHS are often reduced to "life and limb" care only, leaving a number of needed medical/dental services unavailable (Malerba, 2013, p.19). Second, when the fiscal budget of the IHS does not increase to reflect rising healthcare costs, many of the preventive oral technologies that may be available to other populations are not widely disseminated and applied to American Indian patients (Patrick et al., 2006). One author who has researched health disparities in American Indian populations observed:

> "…as a society we continue to struggle with the challenge to allocate human and financial resources effectively to reduce social disparities in oral health. The inverse care law operates here. That is, those who most need care do not get it" (Patrick et al., 2006, p. 3).

Unfortunately, those who utilize the Indian Health Services seldom have insurance to help supplement what the IHS cannot provide. Lack of dental insurance or

minimal dental coverage is considered to be a significant barrier to oral health care and is a main contributor to poor oral outcomes (IOM, 2011). Approximately 130 million people in the United States had no dental coverage as of 2012. American Indians have some of the highest rates of lacking medical/dental insurance than the general U.S. population. Less than four in ten non-elderly American Indian and Alaska Native adults (36%) have private health insurance coverage; this is compared to over six in ten (62%) nonelderly U.S adults who have private insurance coverage (Artiga, Arguello & Duckett, 2013). Dental insurance rates among American Indians may be even less given that research has shown for every person without medical insurance there are approximately 2.8 people without dental coverage (Delta Dental, 2010). While definitive data on dental insurance rates among American Indians are not currently available, it would not be unreasonable to assume that they trend in the same direction as health insurance rates.

Adding to the financial barriers to health care access are structural barriers. Structural barriers are those barriers that can be found within the medical institution or organization (Carrillo et al., 2011). According to Carrillo and colleagues (2011) structural barriers are numerous and can include:

- Availability of a medical/dental home
- Waiting time
- Operating hours of the healthcare facility
- Transportation to health care facilities
- Continuity of care
- Telephone access of providers

- Retention and recruitment of providers

Native American populations are often affected by a number of the aforementioned structural barriers. Two of the primary structural barriers that affect oral health in American Indian populations are lack of the dental workforce, and geographic isolation of Indian Reservations.

Recruitment and retention of medical/dental providers to the Indian Health Service is often difficult and remains a large challenge for the organization (Sequist, Cullen & Acton, 2011). The majority of professional dentists (92%) work in private practice while eight percent work in other capacities. Of those eight percent a mere 0.8 percent of professional dentists work in Federal Services such as the Indian Health Service (IOM, 2011). The lack of providers is extremely prevalent across Indian Country. In 2014 it was estimated that more than 2.4 million Native Americans lived in counties that were considered dental care shortage areas; this is almost half of the total American Indian population (PEW Charitable Trusts, 2015). In general, there is 1 dentist in the IHS system for every 2800 individuals; this is compared to 1 dentist for every 1500 individuals in the general population (Nash & Nagel, 2005). A study conducted on the Pine Ridge Reservation reflects this assertion when it was found that only nine total dentists served a population of over 28,000 people. This amounted to a ratio of 31 dentists per 100,000 people a number far lower than other areas of the United States such as Connecticut where the ratio is 66.3 dentists per 100,000 people (Batliner et al., n.d.). Much like dentists, other oral health professionals such as dental hygienists are also more concentrated in the private sector versus other occupational settings (IOM, 2011).

Reasons for the lack of dental providers in the Indian Health Service are numerous. For one, the limited funding available for oral health care directly affects the quality of care health professionals are able to provide. The inability to provide proper and necessary care leads to frustration on behalf of the health care provider resulting in higher than normal turnover rates (U.S. Commissions on Civil Rights, 2004). An increase in provider turnover carries a number of consequences that directly affect healthcare access and quality. These include: decreased continuity of care, overworked staff leading to provider burnout, increased job vacancies and increased wait times (U.S. Commission on Civil Rights, 2004). A second contributor to the lack of dental providers within the Indian Health Service is the isolated locations of many of the hospitals and clinics. Demographics of today's dental providers show that dentists are disproportionately distributed in urban versus rural areas (American Diabetes Association, 2011)(IOM, 2011). Unfortunately, most IHS facilities are located in what can be considered rural or frontier areas such as Montana or Alaska. Dental professionals are often unwilling to move to these geographically remote tribal communities where everyday conveniences are lacking (U.S. Commission on Civil Rights, 2004).

Geographic location affects more than just the number of providers willing to work on Indian Reservations. The rural landscape of many Reservations makes accessing healthcare services difficult. Not unlike other rural areas across the nation, many American Indians who reside on Reservations experience a number of barriers to accessing oral healthcare such as greater travel times to care facilities, inhospitable climates and impassable roads (Skillman, Doescher, Mouradian & Brunson, 2010)(U.S.

Commission on Civil Rights, 2004). Adding to already difficult exterior circumstances, the low economic status of many American Indian communities, some of whom have per capita incomes as low as $12,000, often results in problems with patients finding adequate transportation to IHS facilities (U.S. Commission on Civil Rights, 2004). Without proper transportation, accessing oral healthcare for many individuals becomes limited, further contributing to oral health disparities in American Indian populations.

Compounding the many financial and structural barriers to oral health care in American Indians populations are cognitive barriers. Cognitive barriers are more abstract in nature and typically encompass issues such as: the patient's beliefs, the complex patient-provider relationship and the knowledge about disease process (Carrillo et al., 2011). One of the major cognitive barriers to healthcare for many American Indians is the mistrust they may harbor of both healthcare providers and the federal organization charged with providing them care…the Indian Health Service (Guadagnolo et al., 2009).

The mistrust American Indians experience toward the Indian Health Service and its subsequent providers is deeply rooted in their historically rocky relationship with the federal government and the dominant white culture. American Indians have had to endure centuries of:

> "…disenfranchisement; extermination of tradition, language and land rights; broken treaties; sterilization of Native American women; placement of Indian children in Indian boarding schools; and other experiences of oppression…" (U.S. Commission of Civil Rights, 2011, p.29).

all at the hands of the federal government. The combined maltreatments of American Indian people throughout history have resulted in deeply rooted feelings of unresolved

anger, grief and distrust that have managed to bleed across into today's generations (Sotero, 2006). Theories suggest that feelings of distrust, especially toward healthcare systems and providers, negatively affect a person's willingness to access healthcare services (Armstrong et al., 2006). While there are limited studies examining this phenomenon in American Indian populations, one of the few studies available on this topic found that low trust/confidence in health care providers was a significantly reported barrier to American Indian patients seeking general medical care (Guadagnolo et al., 2009).

This brings us to the final cognitive barrier to be addressed, which is the lack of oral health education that may exist in American Indian populations. In 2010, Wells and colleagues (2010) conducted a survey study that found there was relatively low oral health knowledge among a group of American Indian adults in North Carolina. The U.S. Department of Health and Human Services (2003) statement, *A National Call to Action to Promote Oral Health,* cites that without proper understanding of the importance of oral health, or knowing what signs are indicative of a serious oral health issue, many Americans will continue to experience poor oral health-related quality of life. Wells and colleagues (2010) make this same assertion in their 2010 study.

For many American Indians, access to proper oral health care is a complex interaction between a number of financial, structural and cognitive barriers. Unfortunately, American Indians are deeply affected by a number of these barriers resulting in a high rate of unmet oral health needs. In populations where oral health access is limited the focus needs to be placed on preventive services and strategies. Research has consistently shown that the most cost-effective way to achieve optimal oral

health is through prevention, education and behavior modification (American Dental Association, 2013).

## Theoretical Underpinning

As described in previous sections, type II diabetes is often described as a "chronic" and "progressive" disease process (Kaku, 2010). This assertion translates to a lifetime of living with a disease that will continually worsen. Given the dismal description of the disease, many patients may adopt an apathetic approach to diabetes and diabetes self-management (Spero, 2013). To illustrate, a qualitative meta-synthesis of 21 studies found that patients diagnosed with diabetes had a tendency toward avoidance and hindering of diabetes self-care (Stiffler, Cullen & Luna, 2014). Many diabetic patients were recorded as saying:

> "…[I] wouldn't mind lifestyle changes if the disease would actually get better and go away, but when diabetes is around for good, what is the point?" (Stiffler, Cullen & Luna, 2014, p. 17).

Further analysis of the studies found that patients with diabetes often reported being overwhelmed and frustrated with the many treatment aspects of diabetes such as diet, exercise, monitoring blood sugar levels and taking medications (Stiffler, Cullen & Luna, 2014). Other studies have found similar attitudes regarding diabetes self-management practices among diabetic patients, many citing the interruption of their day-to-day activities by diabetes self-care activities as a major roadblock to proper diabetes self-management (Shaw, Brown, Khan, Mau & Dillard, 2012). However, as many medical professionals consistently agree, while diabetes can be difficult to manage it can be

managed successfully resulting in decreased diabetic complications, slowed disease progression and improved health outcomes (International Diabetes Federation, 2011).

The importance of self-management for diabetes was noted as early as the 1930s (Norris, Engelgau & Narayan, 2001). In recent years, diabetes self-management has been considered to be critically important in reducing not only the human burden associated with the disease but also the economic burden (International Diabetes Federation, 2011). As has been well established through decades of research, unmanaged diabetes can manifest into a number of micro- and macro-vascular complications that negatively affect quality of life (Boyle et al., 2010). Living with diabetes and the subsequent complications that may follow can carry a hefty financial burden that can be equally as debilitating as the disease itself. People with diagnosed diabetes have, on average, medical expenditures that are 2.3 times higher than what expenditures would be in the absence of the disease (American Diabetes Association, 2013). The lifetime medical spending for a person diagnosed with diabetes at age 40 is estimated to be approximately $211,400. This amount is much higher when one is diagnosed at a younger age and if they are of the female gender (Zhuo et al., 2014). To illustrate, in 2012, hospital inpatient stays were responsible for a bulk of diabetes medical expenditures with cardiovascular complications being the primary cost (American Diabetes Association, 2013). The key factor in the development of diabetes complications and their ensuing costs is glycemic control. This fact further illuminates the importance of supporting comprehensive diabetes self-management (Caro, Ward, & O'Brien, 2002).

Diabetes self-management is complex and requires the diabetic patient to make a number of daily health decisions as well as perform a series of personal care activities (Powers et al., 2015). Comprehensive diabetes self-management education and support are vital foundational components necessary to help people with diabetes navigate their day-to-day activities and improve overall health outcomes (Powers et al., 2015). As mentioned above, these activities often include: glucose self-monitoring, eating a diet low in saturated fats, monitoring carbohydrate intake, medication adherence, physical activity and diabetic foot care (Toobert, Hampson & Glasgow, 2000). Now, with current research and recommendations, proper oral health care is another component to be added to the long list of diabetes self-management activities a diabetic must perform (Gillis, 2010). Unfortunately, diabetic patients are often left with the daunting task of navigating the many complexities of diabetes self-management on their own. Furthermore, healthcare providers, including nurses, may neglect to provide adequate education about certain aspects of diabetes self-management because they may view it as less important. Oral health care, for example, is virtually ignored as an important component of diabetes self-management (Huang et al., 2012).

One of the many barriers to quality oral healthcare includes lack of attention and inadequate education by health care professionals to their patients (Dolce, Haber & Shelly, 2012). Historically, oral health promotion and disease prevention have not been a top priority for many medical professionals, including nurses, either in practice or during their educational attainment (Dolce, Haber & Shelley, 2012). This appears to be a global trend as surveys of medical professionals from Europe, North America and the Middle East report low awareness of the importance of oral health in diabetes (Dale &

Lindenmeyer, 2014). To illustrate this assertion, a number of survey studies conducted in the United States found that most certified diabetes educators (CDEs) did not routinely provide oral health education to people with diabetes due to either a lack of time, a lack of knowledge related to the subject or both (Yuen, Onicescu, Hill & Jenkins, 2010).

With the apparent absence of an adequate oral health infrastructure, health care providers may not always have the proper knowledge to appropriately discuss oral health with their diabetic patients making this a neglected area of routine diabetes care (Lopes, Southerland, Buse, Malone & Wilder, 2012). Consequently, without comprehensive diabetes self-management education which includes oral health care, many diabetics will experience a knowledge gap about the oral health-diabetes relationship placing them at even greater risk for the eventual development of diabetes complications (Strauss et al., 2013). Nurses are in a unique position to play a significant role in facilitating both access to care and providing appropriate education and training on all aspects of diabetes self-management including oral care (Dolce, Haber & Shelley, 2012).

The omission of oral health education in many diabetes self-management programs has many diabetic patients experiencing what is termed a knowledge deficit. A knowledge deficit, as defined by the North American Nursing Diagnosis Association, is: "…the absence or deficiency of cognitive information related to a specific topic" (Knowledge, n.d). Where knowledge is lacking a self-care deficit will exist. Having a knowledge deficit is contrary to the goals of diabetes self-management education. The main goals of diabetes self-management education are to inform, strengthen and empower diabetic patients to perform comprehensive diabetes self-care (Funnell et al., 2010). As healthcare professionals who provide direct care to a number of diabetic

patients, nurses have a responsibility to act where a self-care deficit may exist (Simmons, 2009) (Wilson, Baker, Nordstrom & Legwand, 2008). Dorothy Orem, a 1970s-nursing theorist, proposed the Self-Care Deficit Nursing Theory (SCDNT) as a framework to guide nurses on influencing self-care in their patients. Considered to be a grand nursing theory, Orem's SCDNT has consistently been utilized in diabetes self-management education as a means to improve the self-care behaviors of diabetic patients (Surucu & Kizilci, 2012) (Kumar, 2007).

The SCDNT sets forth a number of propositions that are relevant to diabetes self-management. These include:

- Self-care is the responsibility of the individual
- People who participate in self-care possess the relevant knowledge and skills to do so but they often need health professionals to supplement their self-care abilities
- Deficits in self-care result from a lack of knowledge about the situation
- Self-care behaviors, which meet the patient's self-care requisites, lead to improved life, health and well being (Wilson, Baker, Nordstrom & Legwand, 2008).

The crux of Orem's theory is self-care. According to Orem, self-care is:

> "…the practice of activities that an individual initiates and performs on his or her own behalf to maintain life, health, and well-being" (Kumar, 2007, p.104).

The ultimate goal of Orem's theoretical framework is for the individual to achieve an optimal level of self-care. However, when a self-care deficit occurs, an individual is

unable to maintain continuous and effective self-care (Nursing Theory, 2015). A deficit can be attributed to a number of factors such as a lack of knowledge, lack of judgmental skills or time management, inadequate health services or insufficient financial resources such as health insurance (Fleck, 2010). In the case of diabetic patients, a lack of knowledge is a main contributor for a decrease in oral health status and oral health care, resulting in an oral self-care deficit (Strauss et al., 2013). According to Orem's theory, when a person becomes limited in meeting self-care demands and a deficit occurs, nurses must provide "therapeutic assistance" (Thompson, 2013). Nurses can provide therapeutic assistance via five methods. Nurses can:

- Act or do for patients
- Guide patients
- Support patients
- Modify an environment and encourage personal development in order to help patients meet future demands
- Educate patients (Thompson, 2013)("Nursing Theory", 2015)

Literature consistently supports the use of patient education to improve quality of life and, in the short term, physiological measures for people with diabetes (Lorig & Gonzalez, 2000). However, the traditional method clinicians utilize to deliver healthcare education may not be the best possible approach for eliciting changes in healthcare behaviors.

Traditionally, patient education has been clinician-centered and prescriptive in nature. Clinicians have typically provided direct advice to patients utilizing a

unidirectional form of communication in order to persuade patients to comply with professional recommendations (Williams & Bray, 2014). This classic model of health education delivery has been shown to be largely unsuccessful, especially when trying to elicit positive healthcare changes (Weinstein, 2002). With research suggesting a lack of benefit to the traditional model of healthcare education delivery in order to elicit positive healthcare behaviors, a new method of instruction is needed. One empirically supported method of fostering health behavior change is a person-centered communication model known as motivational interviewing (Bray, Catley, Voelker, Liston & Williams, 2013).

Motivational interviewing can be a beneficial tool when trying to elicit positive lifestyle changes and when trying to engage patients in self-care practices. Motivational interviewing is a behavioral counseling technique that has been gathering increased interest in the health care setting since its introduction in 1983 as a treatment for problem drinking (Markland, Ryan, Tobin & Rollnick, 2005). Considered to be a patient-centered approach, motivational interviewing is a psychosocial intervention used to motivate individuals to make behavioral changes by focusing on aspects of care that may be important to the patient (Martins & McNeil, 2009). The main goal of motivational interviewing is to guide the patient to achieve positive health behaviors through support and education rather than simply prescribing behavioral health changes (Markland et al., 2005).

In the area of oral care, motivational interviewing has been shown to improve the oral health status in a number of populations. One of the first studies to show its efficacy was conducted by Weinstein and colleagues (2004) in a group of Punjabi speaking mothers. Weinstein et al. (2004) was able to show a decrease in early childhood caries

among children whose mothers were exposed to motivational interviewing sessions about the disease versus mothers who were given traditional health education. Later, in 2009, Almomani and colleagues were able to show improved brushing behaviors among severely mentally ill individuals who were exposed to motivational interviewing sessions in conjunction with health education sessions (Almomani et al., 2009). Like Weinstein and Almomani, similar results have been achieved when motivational interviewing has been applied to adults with chronic periodontal disease (Williams & Bray, 2014). When utilized, motivational interviewing has been able to create positive oral health behaviors and improve overall oral health status for a number of populations.

Motivational interviewing is conducted using a number of strategies and techniques. Each of these techniques is intended to allow the patient to explore problem behaviors and help then understand any ambivalence they may experience regarding change (Weinstein, 2002). One approach that can be utilized is the decisional balance strategy. This strategy is a written exercise that asks clients to evaluate their current behaviors by writing down the pros and cons of their actions (Sobell & Sobell, 2008). While limited quality measure information of the Decisional Balance Worksheet are available, the few studies that have utilized the Decisional Balance Worksheet have been able to show its ability to accurately predict patient's motivation to change problem behavior (Collins et al., 2014). For example, one study of treatment-seeking smokers, found the decisional balance worksheet to be a reliable and predictively valid measure of motivation to change (Collins et al., 2014).

# CHAPTER THREE

# METHODS AND PROCEDURES

## Project Design

This project utilized a descriptive observational design. Oral health studies of American Indian populations are seldom conducted; therefore information regarding oral heath status is limited. This project will allow for the analysis of naturally occurring oral health behaviors, attitudes and characteristics. The author worked within a rural Tribal Organization in real life situations to gain understanding of oral health status and behaviors in an American Indian population diagnosed with type II diabetes.

## Participants

A convenience sample of sixteen participants (11 female, 5 male) was initially recruited from the local, tribally run, special diabetes program. Of the 16 participants who originally volunteered and signed a consent form, three (2 female, 1 male) failed to show for their initial oral health session or complete the General Health Questionnaire. Another male participant completed the General Health Questionnaire and only one oral health session before dropping from the project for an unspecified reason. After multiple failed attempts to contact the missing participants, they were excluded from the project and no data were collected or included in the findings.

The remaining participants totaled 12 (3 male and 9 female). Their age ranged from 31 to 75 plus years old with the majority of participants being in the 55 to 64-age

range. All participants (100%) were local tribal members who self-identified as being American Indian. In order to be considered for participation in the project, participants had to be 18 years of age and older, English speaking, self-report a diagnosis of type II diabetes and an enrolled patient of the Tribally based special diabetes program. Prospective participants were excluded from the project if they were non-English speaking, did not participate in the diabetes program, did not self-report a diagnosis of type II diabetes and were not enrolled in the special diabetes program. All 12 remaining subjects who volunteered met the inclusion criteria and were assigned to the same intervention.

Participants for the project were recruited utilizing three methods of advertisement. First, advertisement flyers (Appendix A) for the project with contact information were strategically placed in buildings that were considered to be high traffic areas for diabetic patients which included the local Tribal Office building and the Tribal Diabetes offices. Second, the special diabetes program sent advertisement mailers to a number of their enrolled participants which included times and dates to arrive at the diabetes offices in order to learn more about the project if they were interested. The author was available at the diabetes offices during the indicated dates and times to discuss the project in detail with prospective participants and answer questions as necessary. Those who volunteered to be apart of the project were given a consent form to sign (Appendix B) and were subsequently scheduled for their first oral health session with the author. Finally, workers at the special diabetes program functioned as outreach workers making diabetes patients aware of the project and providing those interested with the

necessary contact information. If the patient wished to be apart of the project they were given a consent form to sign and were then contacted by the author for further explanation of the project and to schedule their first oral health session. Consent forms were signed and filed prior to being contacted by the author.

## Materials

Three tools were utilized during each session for data collection. They included the following: 1) A General Health Assessment Questionnaire 2) the Oral Health Assessment Tool and 3) the Decisional Balance Worksheet. An exit questionnaire was included at the conclusion of the project to evaluate usefulness of the project, benefits of improving oral health behaviors and understanding of the importance of oral health prior to initiation of the project.

The author constructed a General Health Assessment Questionnaire (Appendix C) that contained a total of 15 items focusing on both demographic information and oral health care behaviors. Demographic information on the General Health Assessment Questionnaire included: age, gender, height/weight, self-reported blood glucose range and list of other medical conditions besides diabetes. Questions relating to oral health behaviors included: number of times a day teeth are brushed, method of cleaning teeth, time since last dental visit, reason for last dental visit and if they had any difficulty accessing dental services within the past 12 months. An open-ended question was included at the end of the questionnaire to allow the participants to share any other information they felt was relevant for the author to know.

A measure of oral health status of participants was obtained using the modified Oral Health Assessment Tool (OHAT) (Appendix D). The OHAT is a category specific screening tool that focuses on eight different areas of the oral cavity. The OHAT requires the inspection of the: 1) lips 2) gums, palate and inside of cheeks 3) natural teeth 4) dentures 5) quality of tooth hygiene 6) tooth pain 7) saliva/dry mouth and 8) tongue. Each category is scored from zero to two allowing for a total score of 16. For each of the eight categories, three columns delineated the score of: 0=No problem, 1=Minor problem, and 2=Major problem. In several of the scoring columns some oral symptoms are in bold print and others are in bold print while also being underlined. Symptoms in bold print identified a problem and symptoms that were both bold and underlined signified a major problem. OHAT score range from 0 (very healthy) to 16 (very unhealthy) (Chalmers et al., 2005).

The Decisional Balance Worksheet (Appendix E) was used to assess patient's motivation to change. The Decisional Balance Worksheet is an open-ended 2x2 matrix that allows individuals to visualize and assess their perceived advantages (pros) and disadvantages (cons) of behaviors and explore any anxiety they may experience to making a change (Collins et al., 2014). The Decisional Balance Worksheet, which was modified by the author to focus on oral health, offered four specific oral health practices for participants to choose to engage for the duration of the project with one "other" category allowing participants to select an oral health behavior that was important to them. The oral health options included: 1) chew sugar free gum with xylitol 2) Quit smoking 3) brush twice a day for 3-minutes each time 4) floss daily and 5) other. After

selecting the oral health behavior they would like to focus on, participants would fill out the Decisional Balance Worksheet writing their responses to each of the following sections of the matrix: pros to making a change, cons to making a change, pros to not making a change, and cons to not making a change.

## Procedure

Approvals from Montana State University's Institutional Review Board (Appendix F), the local Tribal Health Department and Tribal Community Health Committee (Appendix G) were obtained prior to initiation of the process improvement project. This project posed no risk to the human participants and all identifying information was removed for data analysis. Project volunteers were informed that participation was optional and they may withdraw at any time without any consequence or disruption of routine care at the special diabetes program. Participants provided written, informed consent prior to participation.

A convenience sample of N=12 adults who self-reported a diagnosis of type II diabetes and were enrollees of the local special diabetes program on a Northern Plains Indian Reservation received oral health assessments. Participants came from two different communities in order to participate in the project. The *Basic Screening Survey Examiner Training Video*, released by the Association of State & Territorial Dental Directors (n.d), and the *Smiles for Life 3rd* Edition (n.d) web-based training were used to train the author on performing a basic oral health screening. The author further

participated in online training regarding Motivational Interviewing through *Medscape* as well as reviewing, *Motivate Your Dental Patients: A Workbook*, by Weinstein (2002).

The author followed standard safety precautions when performing the oral health assessments using disposable gloves between each participant. A penlight was used to help with visualization of each participant's oral cavity and was cleaned with alcohol wipes after each assessment. All oral health sessions were conducted in a private room at the special diabetes facility during regular program working hours. Participants were intended to be seen during regularly scheduled appointments with the nurse of the special diabetes program; however, just prior to the start of the project the special diabetes nurse resigned her position. The special diabetes program was unable to fill the nursing position before the beginning of the project and for the duration of the project. As a result, participants were given regularly scheduled appointments with the author only.

The oral health-screening project was conducted between the months of June 2015 through August 2015. Participants were scheduled bi-weekly oral health sessions with the author starting the week of June 1, 2015. Activities conducted during each oral health session were the same for every participant. First an oral health assessment was conducted utilizing the OHAT this was followed by a brief motivational interviewing session utilizing the Decisional Balance Worksheet and a brief oral health education session. During the motivational interviewing session the author and the participant would review the Decisional Balance Worksheet and fill in the worksheet together. The

author would ask the participant the following questions when trying to review current behavior:

> "What are some of the good things about your [insert risky/problem behavior]. Now, what are some of the less good things about your [insert risky/problem behavior]."

After the participant discussed the pros and cons of their behavior, the author would provide a summary statement and the participant and author would then discuss what it would take for the participant to change their behavior. Participants were encouraged to talk freely during the motivational interviewing sessions and express ideas or concerns. Following completion of the final oral health sessions, which concluded August 24th to August 28th, a voluntary exit questionnaire was administered to participants. Questions were aimed at evaluating participant attitudes about the usefulness of both the OHAT and motivational interviewing sessions as well as determine participant awareness of the importance of oral health on diabetes prior to the project.

## Data Analysis Plan

Descriptive statistics were used to summarize demographic data such as age, gender and body mass index. Frequency counts were used to describe general health and oral health behaviors such as blood glucose ranges, co-morbid health issues in addition to type II diabetes, reason for last dental visit and perception of difficulty accessing dental care. Aggregate data for the general oral health behavior and OHAT is also described as frequency counts. Content analysis of the Decisional Balance Worksheet was conducted to determine major themes among participants and determine improvement of oral health

behaviors. The exit questionnaire was also analyzed using both descriptive statistics and content analysis.

# CHAPTER FOUR

# RESULTS AND DISCUSSION

## Preface

Following completion of data collection, additional information became apparent. First, the actual user population of the local Indian Health Service is 4,700 for both primary healthcare and dental care. This number encompasses not just local Tribal members who reside on the Reservation, but also Tribal and non-Tribal members who may reside in the bordering towns and other Indian Reservations that are eligible to utilize the IHS facility. Second, at the time of the project there were a total of three dentists and no dental hygienists on staff at the local Indian Health facility. Despite having three dentists, only one dentist was directly involved in patient care from the months of May 2015 to August 2015. The one available dentist provided services between two separate communities on the Indian Reservation. Routine appointments were not available and the dental clinic was forced to provide services to only walk-in services for both communities. Finally, all participants (100%) who completed the project reported they did not have dental insurance and they relied solely on the Indian Health Service for dental care. Two participants (17%) were enrolled in Medicare, one participant (8%) had private health insurance without dental coverage and eight participants (67%) utilized the IHS for all forms of healthcare.

For the months of April to August the IHS captured a total of 1,517 dental visits. The primary reasons for dental visits were as follows: 1) Patient re-visit 2) Intraoral-periapical 3) Limited oral evaluation and 4) First visit of fiscal year.

## General Health Questionnaire

### Sample Profile

Table 1 describes the characteristics of the participants. Analysis of the General Health Questionnaire revealed nine women (75%) and three men (25%) within the study. A lower percentage of older adults were found, than was initially expected. The majority of participants (50%) were age 55 to 64 and 25% were age 65 and older category. Seventeen percent were in the age range of 45 to 54 and 8% were age 25 to 34.

| **Population Characteristics** | | |
|---|---|---|
| **Age Range** | **N=12** | **Percentage** |
| 18 to 24 | - | - |
| 25 to 34 | 1 | 8 |
| 35 to 44 | - | - |
| 45 to 54 | 2 | 17 |
| 55 to 64 | 6 | 50 |
| 65 to 74 | 1 | 8 |
| 75 years or older | 2 | 17 |
| **Gender** | | |
| Female | 3 | 25 |
| Male | 9 | 75 |

Table 1. Characteristics of participants

Table 2 describes the distribution of body mass index (BMI) measurements. BMI is categorized into four categories: underweight, normal and healthy weight, overweight and obese. BMIs 18.5 and below are considered underweight, BMIs 18.5-24.9 are normal and healthy weight, BMIs 25.0-29.9 are overweight and BMIs 30.0 and above are obese. Nine participants (82%) were in the obese category, one (9%) participant was considered to be overweight and one (9%) was normal. The mean BMI for eleven participants was 34.42(*SD=5.59*). The BMI was not calculated for one participant who did not share a current weight.

| **Body Mass Index of Participants** | | |
|---|---|---|
| **Body Mass Index** | **N=11** | **Percentage** |
| **Below 18.5 Underweight** | - | - |
| **18.5-24.9 Normal or Healthy weight** | 1 | 9 |
| **25.0-29.9 Overweight** | 1 | 9 |
| **30.0 and Above Obese** | 9 | 82 |

Table 2. Distribution of body mass index

Table 3 describes self-reported blood glucose ranges. Blood glucose levels ranged from 70 to greater than 215. Glucose control can be described in terms of excellent, good and poor control. For this study, excellent glucose control included blood glucose ranges from 70 to 110. Good glucose control included blood glucose ranges from 111 to 180. Poor control included blood glucose ranges that were greater than 181. Fifty percent of participants self-reported blood glucose levels ranging from 111 to 150, followed by 17% of participants who reported blood glucose levels ranging from 151 to

180. Each of the remaining blood glucose ranges: 70 to 110, 181 to 215 and greater than 215 had one participant (8%) self-reporting within these ranges. Overall, 67% of participants were in the good glucose control range, 8% (1) of participant was in the excellent control range and 16% (2) self-reported poor glucose control ranges. Only one participant (8%) did not know their last blood glucose and was unable to give a blood glucose range.

| **Participant Self-Reported Blood Glucose Range** | | |
|---|---|---|
| **Blood Glucose Range** | **N=12** | **Percentage** |
| **69 or below** | - | - |
| **70 to 110** | 1 | 8 |
| **111 to 150** | 6 | 50 |
| **151 to 180** | 2 | 17 |
| **181 to 215** | 1 | 8 |
| **215 and greater** | 1 | 8 |
| **Don't know** | 1 | 8 |

Table 3. Blood glucose ranges of participants

Table 4 shows the rate of co-morbid health conditions in addition to diabetes for all participants. Nine participants (75%) reported having two or more additional health issues other than diabetes, two participants (17%) reported one additional health issue in addition to diabetes and one participant (8%) reported no additional health issue (Table 4).

| Co-Morbid Health Conditions | | |
|---|---|---|
| **Other Health Issues** | **N=12** | **Percentage** |
| **2 or more** | 9 | 75 |
| **1 only** | 2 | 17 |
| **None** | 1 | 8 |

Table 4. Rate of co-morbid health condition

Figure 2 illustrates the itemization of concomitant health issues reported. The most frequent co-morbid health conditions that affected a number of the participants were: hypertension reported by eight participants (67%), hyperlipidemia reported by four participants (33%) and hypothyroidism reported by two participants (17%). Other less reported health issues were renal failure, abdominal aortic aneurysm, one kidney, osteoporosis, nephrolithiasis, congestive heart failure, arthritis and asthma. It is important to note that each of the co-morbid health conditions is a serious and costly health problem.

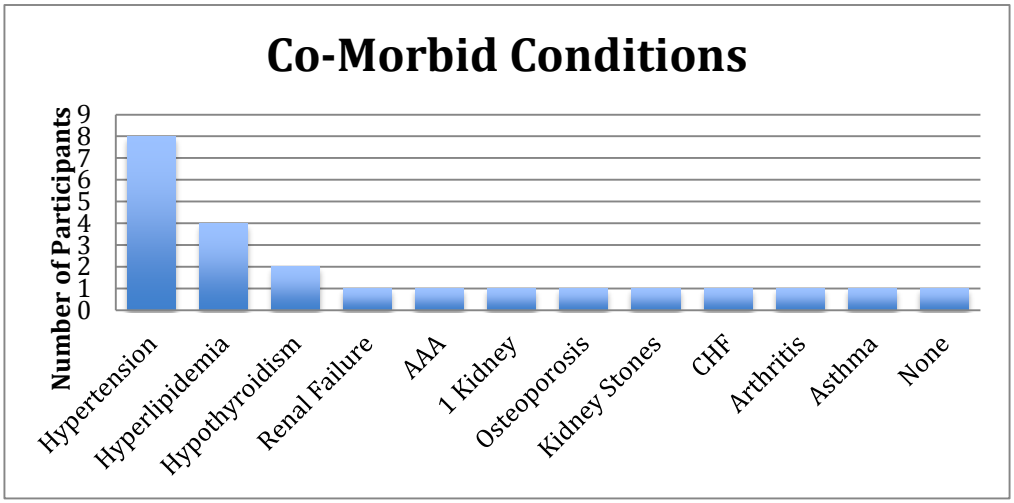



Figure 2. Other reported health conditioners

Oral Health

Table 5 describes the results of the oral health directed questions of the General Health Assessment. Oral health questions on the General Health Questionnaire found that majority of participants (7) brushed twice a day (58%) with 4 participants (33%) brushing only once a day. One participant (8%) who had no natural teeth and wore dentures reported never brushing. The primary method of participants (7) cleaning teeth was flossing and brushing with toothpaste (58%), a three participants brushed only once a day (25%) or utilized other methods (2, 17%) which included soaking dentures and utilizing toothpaste and denture cream.

| **Self-Reported Oral Health Behaviors** | | |
|---|---|---|
| **Oral Health Behaviors** | **N=12** | **Percentage** |
| **Times/day brush teeth** | | |
| **Never** | 1 | 8.3 |
| **Once a day** | 4 | 33.3 |
| **Twice a day** | 7 | 58.3 |
| **>Twice a day** | 0 | 0 |
| **Method of cleaning teeth** | | |
| **Toothpaste only** | 3 | 25 |
| **Floss and Toothpaste** | 7 | 58.3 |
| **Soak Dentures** | 1 | 8.3 |
| **Toothpaste and Denture Cream** | 1 | 8.3 |

Table 5. Current self-reported oral health behaviors (some percentages are 99.9 due to rounding).

Evaluation of dental visits indicated that majority of participants had seen the dentist within the two years. Eleven of the twelve participants reported seeing a dentist within the past two years. While equal numbers of participants had seen the dentist from 1 year to 2 years (n=1, 8%) or 2 years and greater (n=1, 8%). Most participants (n=8, 67%) reported the reason for most recent dental visit was because they had a dental problem with three participants (25%) going for a routine check-up. One participant (8%) had a follow-up from a previous dental issue. Five participants (42%) reported it was difficult to see the dentist within the past year while seven participants (58%) reported no difficulty accessing dental care (Figure 3).

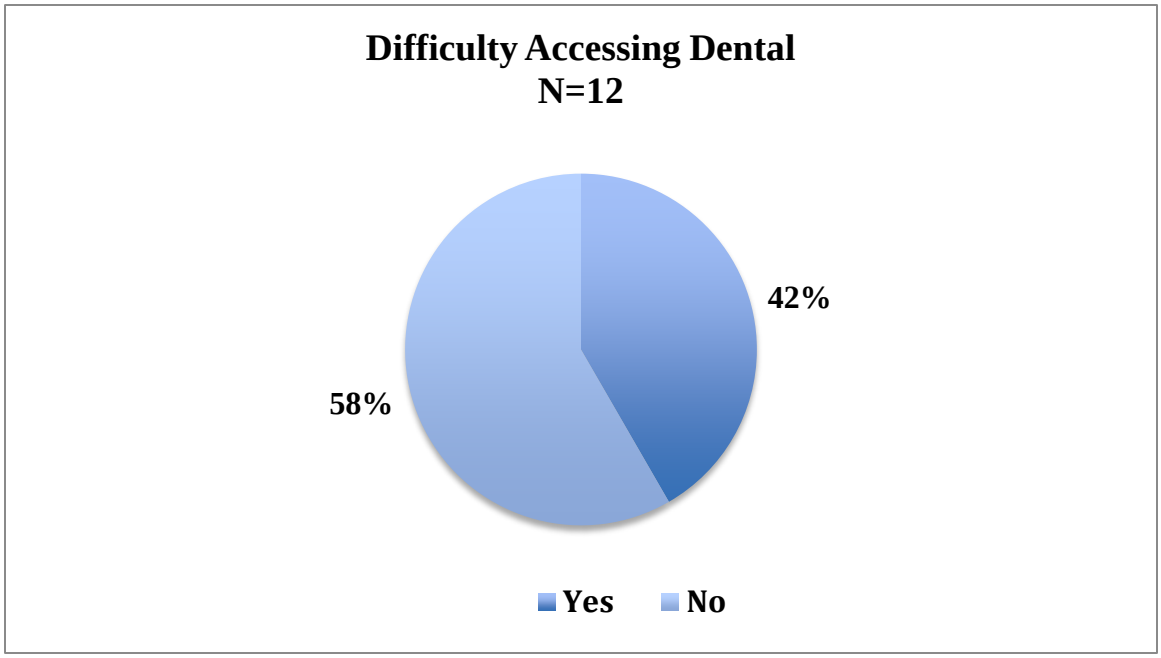



Figure 3. Patient perception of difficulty accessing dental care.

Eleven participants (92%) experienced tooth loss. One participant (8%) was edentulous with a complete set of dentures. One participant (8%) had no missing teeth, one participant (8%) had four missing teeth, one participant (8%) had five missing teeth,

one participant (8%) had fifteen missing teeth and one participant (8%) had 29 missing teeth with a full set of upper dentures and a bottom set of partials. Two participants (17%) were missing one tooth, another two participants (17%) were missing three teeth and another two participants (17%) were missing sixteen teeth. The average tooth loss among participants was 10.4 teeth. Figure 4 illustrates total tooth loss.

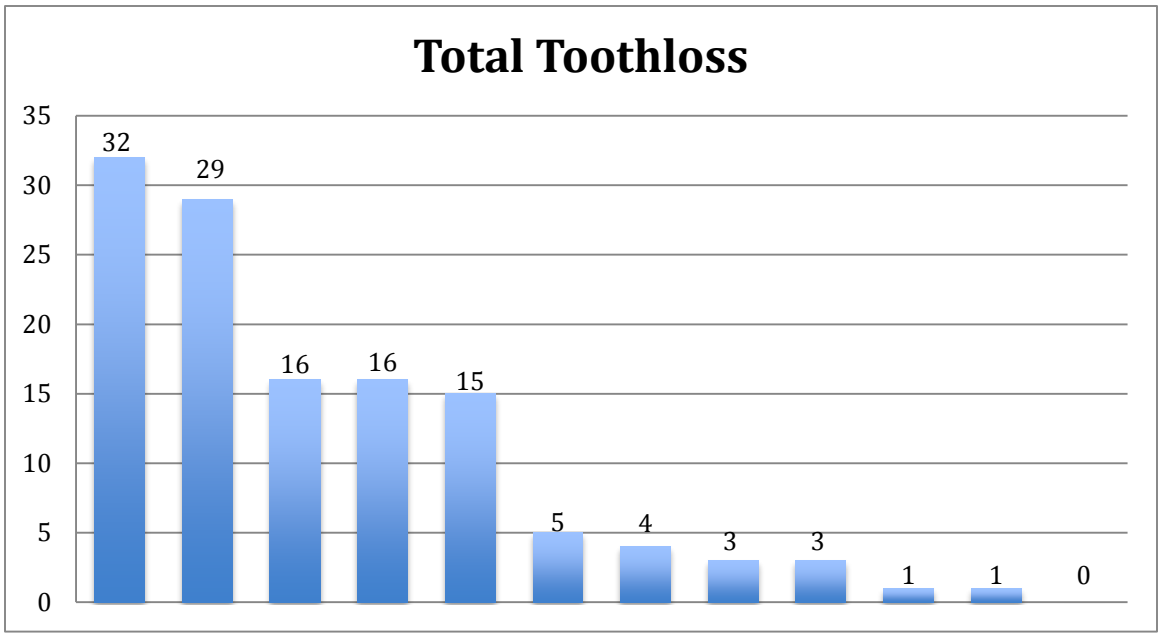



Figure 4. Total tooth loss among participants

Oral Health Assessment Tool

Analysis of the Oral Health Assessment Tool found an average score of 2.63(*SD=2.17)* among participants. Throughout the 3-month project a total of six participants (50%) were identified as needing a dental referral, five of the six participants (42%) received a referral and one participant (8%) refused to have a referral placed. Six participants (50%) were not in need of an immediate referral. Of the five participants who received referrals, three (60%) were unable to be seen by a dentist during the project

and two (40%) had dental issues that were addressed and subsequently improved. Figure 5 illustrates OHAT averages by session over time. Trends show a slight improvement of mean OHAT scores by end of the three-month project. Mean OHAT scores were 2.75 at baseline and 2.25 by completion of the project at three months.

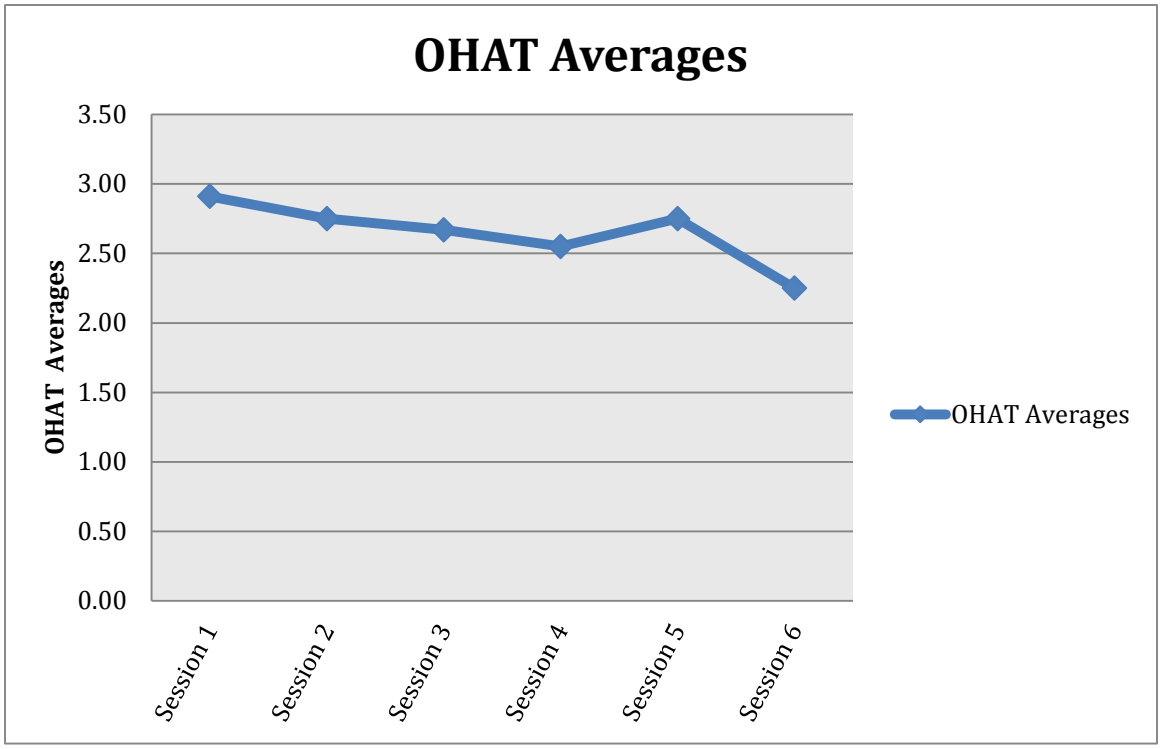



Figure 5. OHAT Averages by Session

Table 6 shows the distribution of OHAT scores at baseline. Majority of participants (over 50 percent) had a score of zero for most categories of the OHAT except for areas of natural teeth and quality of tooth hygiene. Seven participants (63.6%) experienced at least one to three decayed or broken and/or very worn down teeth. Only four participants (36.4%) had no decay or broken or worn down teeth. In the category of quality of tooth hygiene, ten participants (90.9%) experienced some form of tarter and/or

plaque in at least one to two areas of the mouth or dentures. Tooth pain was another significant issue with three participants (27.3%) experiencing nonspecific verbal reports of pain of the mouth.

| **OHAT Score Distribution at baseline (N=11)** | | | | | | |
|---|---|---|---|---|---|---|
| **Category** | **Score** | | | | | |
| | **0** | | **1** | | **2** | |
| | **n** | **%** | **n** | **%** | **n** | **%** |
| Lips | 10 | 90.9 | 1 | 9.1 | - | - |
| Gums, palate, inside of cheeks | 8 | 72.7 | 2 | 18.2 | 1 | 9.1 |
| Natural Teeth | 4 | 36.4 | 7 | 63.6 | - | - |
| Dentures | 9 | 81.8 | 1 | 9.1 | 1 | 9.1 |
| Quality of tooth hygiene | 1 | 9.1 | 10 | 90.9 | - | - |
| Tooth pain | 8 | 72.7 | 3 | 27.3 | - | - |
| Saliva/dry mouth | 10 | 90.9 | 1 | 9.1 | - | - |
| Tongue | 9 | 81.8 | 2 | 18.2 | - | - |

Table 6. Distribution of OHAT scores at baseline based on 11-participants due to 1 participant with missing data.

Table 7 shows the OHAT distribution at the end of the 3-month project. Improvements were seen in all categories with fifty percent or more of participants being in the zero category. Lips and saliva/dry mouth were improved to twelve participants (100%) having no issues. Natural teeth improved with six participants (50%) having decayed or broken teeth improved from baseline. Tooth pain also improved with eleven participants (91.7%) now experiencing no verbal or other signs of tooth pain. Gums, palate and inside of cheeks also saw improvement with ten participants (83.8%)

now having no issues with this area; one participant (8.3%) had a biopsy of a small lesion that was no longer visible.

| OHAT Score Distribution at 3-months (N=12) | | | | | | |
|---|---|---|---|---|---|---|
| **Category** | **Score** | | | | | |
| | **0** | | **1** | | **2** | |
| | **n** | **%** | **n** | **%** | **n** | **%** |
| Lips | 12 | 100 | - | - | - | - |
| Gums, palate, inside of cheeks | 10 | 83.3 | 1 | 8.3 | 1 | 8.3 |
| Natural Teeth | 6 | 50 | 5 | 41.7 | 1 | 8.3 |
| Dentures | 10 | 83.3 | 1 | 8.3 | 1 | 8.3 |
| Quality of tooth hygiene | 1 | 8.3 | 11 | 91.7 | - | |
| Tooth pain | 11 | 91.7 | 1 | 8.3 | - | - |
| Saliva/dry mouth | 12 | 100 | - | | - | - |
| Tongue | 11 | 91.7 | 1 | 8.3 | - | - |

Table 7. Distribution of OHAT scores after 3-months. (Some percents equal 99.9 due to rounding).

## Decisional Balance Worksheet

Table 8 describes the distribution of oral health habits participants chose to focus on for the duration of the project. Analysis found that four participants (33%) chose to focus on quitting smoking, followed by three participants (25%) who chose to focus on brushing twice a day for three minutes each time. Two participants (17%) chose the "other" category each focusing on issues specific to their lifestyle. These included: 1) brush dentures with a soft toothbrush daily and 2) decrease soda intake. Another two participants (17%) cited they did not need to make any changes to their oral health

behaviors and one participant (8%) chose to focus on chewing sugar free gum with xylitol.

| Oral Health Habits | | |
|---|---|---|
| **Habit** | **Number Participants** | **Percentage** |
| Chew sugar free gum | 1 | 8 |
| Quit smoking | 4 | 33 |
| Brush twice daily/3 min | 3 | 25 |
| Floss daily | 0 | 0 |
| Other | 2 | 17 |
| Don't need a change | 2 | 17 |

Table 8. Distribution of oral health habits selected to improve

Content analysis of each group found a desire for a number of participants to improve oral health habits. Analysis of the chew-sugar-free-gum-with-xylitol group found that, while unable to clearly identify a benefit to chewing this type of gum, believed it could help clean teeth. By the end of the project the participant stated "…I have begun chewing gum [with xylitol] more often after meals." The only con the participant could identify for making the change was the slightly increased cost of gum with xylitol. The participant was unable to identify pros or cons to not making the change.

In the quit smoking group, participants could identify a number of pros for making the change such as: better cardiovascular health, having whiter teeth, saving money, decreased second hand smoke for their grandchildren and smelling better. The main cited cons for quitting smoking were fewer than benefits and mainly included: nicotine withdrawal/cravings and increased appetite. The only pro cited for not quitting smoking was the absence of nicotine withdrawals. The main cons noted for not making the change to quit smoking included: increased asthma exacerbations, spending more money and smelling bad. By the end of the project, two participants from this group reported they had received a prescription for nicotine patches to begin home use. However, they had yet to start using the patches. One participant had started discussing quitting smoking with their significant other while the final participant felt she was unable to consider quitting.

Analysis of the brush-twice-daily-for-three-minutes group found a number of identified benefits to brushing longer. Pros to making the change included: better oral hygiene, decreased cavity development, decreased tartar build-up and keep remaining teeth. Cons to making the change were few and only included spending more money on toothpaste by increasing brushing to twice a day. All participants were unable to identify pros to not making the change. Main cons identified to not making the change included: increased cavity development and loss of teeth sooner than expected. Each of the three participants reported increasing the amount of time spent on brushing their teeth. By the end of the project one participant stated she had "…has been timing her brushing to three minutes fairly consistently." Another participant utilized the song method and would

"…hum a song while brushing to increase her brushing time." The final participant from this group did not use a timer or the song method. However, she/he did report that she/he was spending longer intervals on brushing. Two of the three participants cited that their mouth felt cleaner with one citing decreased dry mouth since increasing brushing time.

The two participants in the other category chose to focus on one of the following oral health behaviors: brush dentures with a soft toothbrush and decreasing diet soda intake. The participant who chose to brush dentures with a soft toothbrush didn't "…see any real benefits to brushing dentures." However, he said he would try brushing his dentures. The participant did not identify cons to brushing his dentures, nor was he able to identify pros to not making the change or cons to not making the change. The participant who chose to focus on decreasing his/her diet soda intake cited several pros to making the change. These included: decreasing cavities, keeping remaining teeth and losing weight. The only con the participant could cite for making the change was possibly finding a new habit. Pro for not making the change was being able to continue to drink diet soda. The major con to not making the change was the inhibition of his/her ability to get healthy. By the completion of the project, this participant had decreased their diet soda intake from seven a day to one or two a day. He also reported "…drinking water after meals and rinsing mouth with water after every meal."

The final two participants, one male and one female, felt they were doing everything they could to take care of their teeth and did not see any behaviors they needed to improve.

Exit Questionnaire

The exit questionnaire was optional and administered at the end of the project. A total of ten participants (83%) completed the questionnaire and two (17%) did not complete the questionnaire. Examination of the completed questionnaires found that ten respondents (83%) considered the project to be useful. Nine participants (75%) and ten participants (83%) believed there were benefits to improving both oral health behaviors and seeking oral health treatments respectively. One participant (8%) felt improving oral health behaviors was not beneficial. All participants who responded to the exit questionnaire (n=10, 83%) planned to change their oral health habits based on the information they learned during the project. A number of participants (n=6, 50%) were not aware of the importance of oral health in relation to overall systemic health while 33 percent (n=4) felt they were knowledgeable in this area (Figure 6).

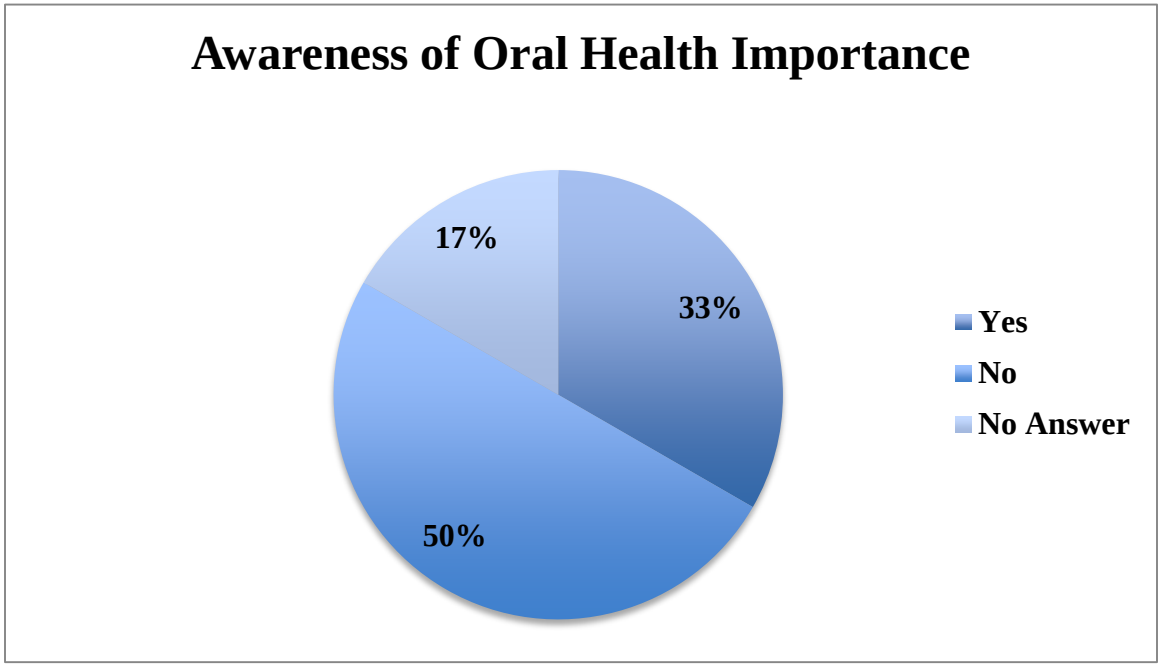



Figure 6. Self reported awareness of oral health importance.

Content analysis for reasons participants may delay seeking oral health treatment included: difficulty obtaining dental appointments, procrastination and money issues for other services such as dentures.

## Discussion

Traditionally, the OHAT has only been used in elderly individuals with dementia. However, as research studies have shown, OHAT is the most useful in populations that are not far in the disease process (Chalmers, King, Spencer, Wright & Carter, 2005). Furthermore, many of the categories screened on the OHAT are oral health issues that may be commonly seen in persons with type II diabetes such as dry mouth, decay or caries and tartar buildup (Southerland, Taylor & Offenbacher, 2005)(Mohammed, 2014). Data from this project suggests that utilizing the OHAT to assess oral health status in type II diabetics, in conjunction with a motivational interviewing tool such as the Decisional Balance Worksheet, can help improve oral health behaviors and awareness ultimately improving oral health status. To the best of the authors' knowledge, this project is the first of its kind by utilizing the OHAT in an American Indian population with type II diabetes.

There are a number of limitations to this study that need to be considered. First, participants were part of a convenience sample with a disproportionate number of females compared to males. Groups that are chosen via convenience sampling are subject to a number of contaminating influences outside of the control of the researcher. These polluting factors may undermine the validity of the research and the subsequent results (Farrokhi & Mahmoudi-Manidabad, 2012). For example, participants who

offered to self-enter into this project may already have a motivation to change problem behavior prior to any intervention that was utilized in the project. Additionally, this project did not utilize a control group to determine the effectiveness of the oral health sessions against participants who are not subject to the oral health interventions.

Secondly, the sample was small in number to accommodate for the workload of a single author. Research suggests that in order to determine a meaningful enough change in a study, the sample should be adequate in size (Biau, Kerneis & Porcher, 2008). Results from larger sample sizes are typically given more credit than those from smaller studies due to the risk of reporting exaggerated treatment effects in the smaller study (Biau, Kerneis & Porcher, 2008). A larger study sample could affect the results found within this project and possibly make the results more generalizable to the target population.

Third, the project was conducted over a three month time period in the summer months. The amount of time the project was conducted may not have allowed enough time to see a significant improvement in OHAT scores or changes in participants' oral health behaviors. A number of studies that have investigated motivational interviewing have conducted studies for longer than a three-month time frame. This typically allows for a longer amount of time to properly integrate and evaluate the intervention. For example, Weinstein and colleagues (2004) performed a study with motivational interviewing for a minimum of six months followed by a one-year follow-up.

Fourth, the project was conducted with participants of a special diabetes program. The main goal of this program is to help diabetics control glucose and cholesterol levels in order to reduce the prevalence of cardiovascular disease and cardiovascular events.

While oral health is not the main concern of the program, they do encourage their members to receive annual oral examinations and will provide referrals for persons who do not have a recent exam. This may account for the relatively good control of self-reported blood glucose levels among this group of participants in addition to the lower overall OHAT scores.

Finally, all medical information such as blood glucose level, co-morbid health conditions and answers to the general health questionnaire were all self-report data except for OHAT scores which was based on the author's observations. Utilizing self-report data involves trust on behalf of the author in receiving accurate information from all participants. Currently, there is little consensus regarding the accuracy and validity of self-report data especially with areas such as healthcare utilization and the performing of typical health behaviors (Chan, 2009). Several studies on self-report data have found an increase in recall accuracy errors regarding both healthcare usage and the frequency with which certain health behaviors are performed when the subject is exposed to long recall periods (Chan, 2009). Short recall periods often offer more accurate information in these situations (Short et al., 2009). However, self-report data of demographic variables such as age and sex are not influenced by outside variables and remain significantly accurate (Chan, 2009).

This project reported on the effectiveness of motivational interviewing and the use of the OHAT in a group of American Indians with type II diabetes. Future studies are needed in this area to further explore the findings in this project and determine if the utilization of the OHAT and motivational interviewing can effectively and efficiently improve oral health status and behaviors. A randomized controlled trial with a larger,

more representative sample of participants would be ideal as a future research endeavor. Additionally, this project was conducted within a special diabetes program that was separate from a primary care clinic. A project that utilized the OHAT for type II diabetics in the primary care setting, such as an Indian Health Service clinic, would be the next step to properly determine the feasibility and effectiveness of integrating the OHAT into primary diabetes care.

# CHAPTER FIVE

# RECOMMENDATIONS

## Integrate Oral Health Screening into Overall Diabetes Care

Dental disease is one of the most prevalent and preventable chronic health issues of the 21st century (Grant Makers In Health, 2012). Unfortunately, having type II diabetes places a person at greater risk for developing oral health issues especially periodontal disease. Diabetes mellitus is considered to be an established risk factor for periodontitis and often contributes to worsening progression of the disease (Lalla & Papapanou, 2011). Consequently, poor oral health such as periodontal disease can exacerbate type II diabetes by increasing insulin resistance (Dunning, 2009). If periodontal disease is allowed to develop and manifest, a systemic inflammatory response on behalf of the host will ensue and can lead to increased insulin resistance along with decreased glucose control possibly contributing to diabetes complications (Lamster et al., 2008).

Years of research have been able to firmly establish that good oral health is important for overall health and quality of life. For patients with chronic diseases such as type II diabetes, oral health complications can contribute to adverse health outcomes and increased healthcare spending (Qualis Health, 2015). For these reasons, oral health screenings should be incorporated into overall diabetes care at the primary care level. Several executive summaries have been released within the past few years that support

the integration of oral health screenings into routine medical care. One executive summary released in 2015 expressed it best by stating:

> "It is time to include preventive oral health care in the delivery of routine medical care and achieve the promise of comprehensive, whole-person care for all" (Qualis Health, 2015, p. 5).

## Improve Dental Education and Training of Non-dental Professionals

Millions of Americans have unmet oral health needs. Racial and ethnic minorities, particularly American Indians and Alaska Natives, are disproportionately affected oral health disparities than other populations (Dolce, Haber & Shelley, 2012). Tooth decay and periodontal disease are just two of the many chronic oral health issues that are seen at higher rates in American Indians. Oral health disparities are the result of the complex interlinking of a number of barriers; one of which is the lack of attention to oral health by nondental health professionals (Dolce, Haber & Shelley, 2012).

For decades, nurses, physicians and pharmacists have been exposed to limited education and training on oral health care (IOM, 2011). Improving the knowledge base of nondental professionals can help to combat oral disease by: 1) improving access points to the oral healthcare system for patients and 2) by expanding the oral health prevention workforce (Qualis Health, 2015). In areas where access to oral health care is limited, the use of nondental healthcare professionals can be utilized to improve preventive oral health services as well as increase oral health literacy. In particular, nondental healthcare workers such as public health nurses and other preventative programs can incorporate

oral health exams, risk assessments and preventive services into their routine exams and wellness visits in order to improve oral health access (IOM, 2011).

## Raise Public Awareness About Oral Health in Type II Diabetes

There is an established need for increased efforts to educate the general public about oral healthcare and dental disease. A recent national survey conducted by the American Dental Association found such significant gaps in oral health knowledge among general consumers that they gave the nation a grade of "D" (Grant Makers In Health, 2012). Patients with type II diabetes did not fair any better on oral health knowledge, as one study found a significant knowledge deficit regarding the effects of oral health on diabetes in a group of diabetics with periodontal disease (Strauss et al., 2013).

A major reason for the lack of knowledge regarding the effects of oral health on diabetes is the lack of oral health education that is provided to diabetic patients. Present research has found that oral health education is not included in many structured diabetes education programs and is often neglected by providers (Mohamed, 2014). Illustrating this point, a number of survey studies of Certified Diabetes Educators (CDEs) within the United States found that many CDEs often excluded oral health education from diabetes management (Yuen, Onicescu, Hill & Jenkins, 2010). Unless diabetics realize the necessity and benefits of accessing dental services and actively engaging in oral health prevention they will not be able to achieve comprehensive diabetes self-management, improve quality of life and improve health outcomes.

## Explore the Potential for Dental Health Aide Therapists

For many American Indian communities oral health professionals are constantly in short supply. Provider shortages are one of the main factors influencing oral health disparities in American Indian communities. When there is a lack of oral health providers, oral healthcare is severely affected resulting in either very basic oral care or emergency only services. All other aspects of oral health care such as prevention and education are almost nonexistent. In order to move oral healthcare in these communities from reactive care to more proactive care, alternative sources of providers need to be considered and explored.

Dental Health Aide Therapists (DHATs) are mid-level oral health providers that have been utilized with much success in remote areas such as Alaska (Murat, 2013). DHATs are capable of providing both preventive and routine services such as community oral education services, basic restorations and uncomplicated extractions (W.K. Kellogg Foundation, 2013). Dental Health Aid Therapists provided care to nearly 40,000 Alaska Natives who would otherwise receive only intermittent oral health care; however, with the introduction of DHATs many Alaska Natives are now able to access regular dental health care (W.K. Kellogg Foundation, 2013). The DHATs of Alaska are beginning to make great strides in combating dental disease for residents of some of the most remote tribes of Alaska.

While DHATs are making oral healthcare in Alaska more accessible, they are not without controversy. As of 2015 the American Dental Association did not support the t

raining or use of DHATs stating that DHATs provide unsafe and second rate care and that it cannot support "…non-dentists to perform surgical procedures" (American Dental Association, 2015)(Murat, 2013). Two independent evaluations of DHATs in Alaska, however, have found that they are providing not only comprehensive care but also high-quality appropriate care making DHATs a viable and valuable option for filling oral health provider gaps that may exist (Commonwealth Fund, 2010).

## Political Involvement to Change the IHS Budget from a Discretionary Status

Technically, a number of American Indians have access to free health care through the Indian Health Service. However, funding for the Indian Health Service is often so severely below the actual need that healthcare services are not adequately available. As a result, healthcare quality and access becomes a fleeting reality. The principal reason for the Indian Health Services' funding troubles is rooted in the relationship between the American Indian populations and the United States government.

The Indian Health Service is the result of a long history of treaties and legislation establishing a trust responsibility on behalf of the federal government to provide healthcare as well as other social services to American Indian populations in exchange for land and natural resources (Warne, 2006). The trust responsibility of the federal government is supposed to guarantee adequate healthcare for American Indians, however, this obligation is not being properly fulfilled (Warne, 2006). At present the Indian Health Service is considered to be a discretionary budget. The discretionary status of the IHS budget means the funding allotted to the organization is done so at the "discretion" of

both Congress and the President (Westmoreland & Watson, 2006). The unfortunate reality of discretionary budgets is that appropriations are not guaranteed and can range anywhere form no funding at all to receiving the entire needed amount. In the end, if Congress so chooses they are not required to fund a discretionary program (Westmoreland & Watson, 2006). Additionally, approved funding for discretionary budgets can rise, stay stagnant or decrease with each year. The Indian Health Service has consistently had their budget remain almost completely stagnant over the past few decades, barely rising with the increasing costs of healthcare. The uncertainty of the Indian Health Service's budget is a far cry from the funding of other federal programs that are graced with the designation of being a mandatory budget.

Mandatory budgets are exactly as they suggest, they are mandatorily funded by Congress and are not subject to budgetary cycles; mandatory budgets are guaranteed in advance of annual appropriations. In addition, mandatory budgets rise each year with inflation accounting for both the cost of care and the possible increase in the number of eligible users (Malerba, 2013). Medicare, Medicaid and the Department of Veterans Affairs are all examples of mandatory budgets that have increased substantially over the years while the Indian Health Service has increased at a much slower rate (Westmoreland & Watson, 2006). Ironically, given the legal obligation of the federal government to American Indian populations as evidenced by centuries-old treaties, they are the only population in the United States that are born with a legal right to healthcare services and yet their main source of healthcare is subject to being a discretionary status (Warne, 2006). The Indian Health Service needs to be moved from the discretionary funding status to mandatory funding based on the legal obligation of the federal government.

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# APPENDICES

# APPENDIX A

## PARTICIPANT RECRUITMENT LETTER

# Fort Belknap Indian Community

R.R. 1, Box 66
Fort Belknap Agency
Harlem, Montana 59526
PH: (406) 353-2205
FAX: Council - (406) 353-4541
FAX: Departments - (406) 353-2797

Fort Belknap Indian Community
(Tribal Govt.)
Fort Belknap Indian Community
(Elected to administer the affairs of the community and to represent the Assiniboine and the Gros Ventre Tribes of the Fort Belknap Indian Reservation)

Date: May 14, 2015

Dear Healthy Heart Participant:

The Healthy Heart Program in conjunction with Jennifer Show BSN/RN, a Graduate Student at Montana State University, is looking for volunteers to participate in an Oral Health project for persons with Type II diabetes. If you are interested in participating please come by the Healthy Heart Program on Tuesday, May 19th and Thursday, May 21st between regular working hours of 8:00 a.m. and 5:00 p.m. for more information and consent form. If you have any questions please feel free to contact the Healthy Heart Program at (406) 353-8537.

Your participation would be greatly appreciated!

Sincerely,

Jennifer Show BSN/RN
Graduate Nursing Student

# APPENDIX B

## PARTICIPANT CONSENT FORM

**SUBJECT CONSENT FORM FOR PARTICIPATION IN HUMAN RESEARCH AT MONTANA STATE UNIVERSITY**

Project Title: Implementing an Oral Health Assessment Tool and Motivation Interviewing Tool as a Possible Means to Improve Oral Health Care Among Type II Diabetics in a Small Northern Plains Tribe.

You are being asked to participate in a process improvement project that is in collaboration with the Tribal Health's Healthy Heart Program trying to improve the oral health of persons with type II diabetes.

Good oral health has been shown to help improve blood sugar control and overall well-being of persons with diabetes type II. The purpose of this project is to gather information about oral health practices as well as assist patients to get the proper oral health care as needed based on assessment. Participants are self-selected from the Healthy Heart Program.

Participation is voluntary. If you decided to participate you will be asked to meet with the Graduate nurse, Jennifer Show, who will perform a General Nursing Health Assessment along with an Oral Health screening followed by a short counseling/education session about oral health care.

There is no known risk to participation in this project. Benefits from this project include: Improved understanding of oral health care in relation to blood glucose control as well as improving overall access to available dental care.

There is no cost to participate. The only possible repercussion is it may increase time spent at regularly scheduled appoints through the Healthy Heart Program. Participants may ask, and are encouraged to ask, questions of the Graduate Nurse as well as the Healthy Heart Program Director.

All patient information is confidential, coded and de-identified. The participating Reservation community will not be specifically named when reporting the project findings. All data will be reported as aggregate data.

Participant Signature_____

Project Director_____

Date: _____

Montana State University Institutional Review Board,
Immunology & Infectious Diseases Dept.
Technology Blvd., Room 127 Bozeman, MT 59717
Phone: 406-994-6783

APPROVED
MSU IRB
04/22/2015
Date approved

# APPENDIX C

## GENERAL HEALTH ASSESSMENT QUESTIONNAIRE

**General Health Assessment Questionnaire**

This is a general health questionnaire regarding your current health and health practices. Answer the question as best as possible. Participation is voluntary and you can choose to not answer any question that you do not want to answer and you can stop at anytime.

I. Gender

a. Male

b. Female

II. Age

a. 18 to 24

b. 25 to 34

c. 35 to 44

d. 45 to 54

e. 55 to 64

f. 65 to 74

g. 75 years or older

III. Do you know your:

a. Ht: Yes____ No_____

b. Wt: Yes____ No_____

c. My height is ___feet ___inches; my weight is ____ pounds

IV. Besides diabetes, do you have any other health problems (Please explain):

V. Last known blood sugar _____

a. 69 or below

b. 70 to 110

c. 111 to 150

d. 151 to 180

e. 181 to 215

f. Greater than 215

g. I don't know

VI. How often do you brush your teeth

a. Never
b. Once a day
c. Twice a day
d. More than twice a day

VII. What method do you use to clean your teeth

a. Brush with toothpaste only
b. Floss and brush with toothpaste
c. Other (Please explain):

VIII. How long has it been since you last visited the dentist

a. Less than 6 months
b. 6 months to 1 year ago
c. More than 1 year but less than 2 years
d. More than 2 years ago

IX. What was the reason for your last dental visit

a. Went for a check-up, exam or cleaning on my own
b. Called by the dentist for a check-up, exam or cleaning
c. Had a dental problem
d. Follow-up for a previous examination or check-up

X. During the past 12 months was there a time you needed dental care but could not get in to see the dentist at that time

a. Yes
b. No
c. Choose not to answer

Is there anything else you would want like to share with me?

# APPENDIX D

## ORAL HEALTH ASSESSMENT TOOL

## Oral Health Assessment Tool (OHAT) - Modified
## Mouth Care Without a Battle©

Person Assessed:_____ Assessed by:_____ Date: _____

*For each category, circle the one best description. Then, in the column marked score, write the points for the assessment. Add the points in the bottom row. Problems **underlined and in bold** are indications for immediate referral to a dentist, as they may represent a serious condition. For nursing home residents, problems in **bold** may require documentation on the MDS 3.0 and may trigger the Dental Care CAA, regardless of the total score.*

| Category | 0 = Healthy | 1 = Minor Problems | 2 = Major Problems | Score* |
|---|---|---|---|---|
| Lips | Smooth, pink, moist | Dry, chapped, or red at corners | **New or growing lump, ulcer, or lesion; white, red, and/or ulcerated patch; bleeding and/or ulcer at corners** | |
| Gums, palate, and insides of cheeks | Pink, moist, smooth, no bleeding | Dry, shiny, rough, red, and/or swollen area; **one small ulcer, lesion, and/or sore spot under dentures** | **Swollen, tender area around a tooth or tooth root (suspected abscess); swollen and/or bleeding ulcer; white, red and/or ulcerated patch; small pimple-like area with pus; widespread redness under dentures** | |
| Natural teeth | No decay or broken or worn down teeth | 1-3 decayed or broken and/or very worn down teeth | **One or more very loose teeth; 4 or more decayed or broken or very worn down teeth; fewer than 4 teeth** | |
| Dentures | No broken areas; teeth, dentures are regularly worn, and dentures are labeled with name | **1 broken area or tooth; denture loose, but adhesive not needed; denture uncleanable; denture not labeled with name;** dentures only worn for 1-2 hrs daily | **More than 1 broken area or tooth; denture so loose adhesive needed;** denture missing or not worn | |
| Quality of tooth hygiene | Clean and no food particles or tartar in mouth or on dentures | Food particles, tartar, and/or plaque in 1-2 areas of the mouth or on small area of dentures; bad breath (halitosis) | Food particles, tartar, and/or plaque in most areas of the mouth or on most of dentures; severe bad breath (halitosis) | |
| Tooth pain | No behavioral, verbal, or physical signs of dental pain | **Nonspecific verbal and/or behavioral signs of pain such as pulling at face, chewing lips, or not eating; unexplained aggression** | **Physical signs of pain (swelling of cheek or gum, broken teeth, ulcers); verbal and/or behavioral signs of pain specific to the mouth** | |
| Saliva / dry mouth | Moist tissues, watery and free flowing saliva | Dry, sticky tissues, little saliva present; person complains of dry mouth | Tissues parched and red; very little/no saliva present; saliva is thick | |
| Tongue | Normal, moist, roughness, pink | Patchy, fissured, red, coated | Patch that is red and/or white, ulcerated, and/or swollen | |
| | | | Total Score | |

Modified from Kayser-Jones et al., Gerontologist 35:814-24, 1995, and Chalmers et al., J Gerontol Nurs 30(11):5-12, 2004.

# APPENDIX E

## DECISIONAL BALANCE WORKSHEET

# Decisional Balance Worksheet

When we think about making changes, most of us don't really consider all "sides" in a complete way. Instead, we often do what we think we "should" do, avoid doing things we don't feel like doing, or just feel confused or overwhelmed and give up thinking about it at all. Thinking through the pros and cons of both changing and not making a change is one way to help us make sure we have fully considered a possible change.Pick one of the following habits to consider in making a healthy change: 1) Chew a sugar-free gum with xylitol 2) Quit smoking 3) Brush twice a day for 3-minutes each time 4) Floss daily 5) Other.

| | Benefits/Pros | Costs/Cons |
|---|---|---|
| Making a Change | | |
| Not Changing | | |

Adapted from http://www.motivationalinterviewing.org/content/decisional-balance-worksheet

# APPENDIX F

## INSTITUTIONAL REVIEW BOARD APPROVAL

MONTANA STATE UNIVERSITY

# INSTITUTIONAL REVIEW BOARD

**For the Protection of Human Subjects**
**FWA 00000165**

960 Technology Blvd. Room 127
c/o Immunology & Infectious Diseases
Montana State University
Bozeman, MT 59718
Telephone: 406-994-6783
FAX: 406-994-4303
E-mail: cherylj@montana.edu

*Chair:* Mark Quinn
406-994-5721
mquinn@montana.edu
*Administrator:*
Cheryl Johnson
406-994-6783
cherylj@montana.edu

**MEMORANDUM**

**TO:** Jennifer Show and Elizabeth Kinion

**FROM:** Mark Quinn Mark Quinn CJ
Chair, Institutional Review Board for the Protection of Human Subjects

**DATE:** April 23, 2015

**SUBJECT:** *"Implementing an Oral health Assessment Tool and Motivational Interviewing Tool as a Possible Means to Improve Oral Health Care among Type II Diabetics in a Small Northern Plains Tribe"* [JS042215]

The above proposal was reviewed by expedited review by the Institutional Review Board. This proposal is now approved for a period of one-year.

Please keep track of the number of subjects who participate in the study and of any unexpected or adverse consequences of the research. If there are any adverse consequences, please report them to the committee as soon as possible. If there are serious adverse consequences, please suspend the research until the situation has been reviewed by the Institutional Review Board.

Any changes in the human subjects' aspects of the research should be approved by the committee before they are implemented.

It is the investigator's responsibility to inform subjects about the risks and benefits of the research. Although the subject's signing of the consent form, documents this process, you, as the investigator should be sure that the subject understands it. Please remember that subjects should receive a copy of the consent form and that you should keep a signed copy for your records.

In one year, you will be sent a questionnaire asking for information about the progress of the research. The information that you provide will be used to determine whether the committee will give continuing approval for another year. If the research is still in progress in 3 years, a complete new application will be required.

# APPENDIX G

## TRIBAL COUNCIL APPROVAL

# Fort Belknap Indian Community

Fort Belknap Agency
656 Agency Main Street
Harlem, Montana 59526-9455
PH: (406) 353-2205
FAX: Council - (406) 353-4541
FAX: Departments - (406) 353-2797

Fort Belknap Indian Community
(Tribal Govt.)
Fort Belknap Indian Community
(Elected to administer the affairs of the community and to represent the Assiniboine and the Gros Ventre Tribes of the Fort Belknap Indian Reservation)

May 14th, 2015

To: Jennifer Show

Fr: Fort Belknap Tribal Council

Re: MSU Study

We welcome your study of "Implementing an Oral Health Assessment Tool and Motivational Interviewing tool as a possible means to improve Oral Health Behaviors Among Type II Diabetics in a small Northern Plains tribe" here on the Fort Belknap Reservation. We understand with this project you will collaborate with the Healthy Heart Project program. We are looking forward to your study and the outcome of this innovative Assessment Tool you will convey to the Fort Belknap Community. Thank you for selecting the Fort Belknap Tribe.

Sincerely,

Mark L. Azure, President

CC: Doreen Bell, Healthy Heart Program Project Manager

# APPENDIX H

## LITERATURE REVIEW MATRIX

Literature Review Matrix

| Citation | Design | Method/Sample | Measurement | Interventions | Rationale | LOE |
|---|---|---|---|---|---|---|
| Almomani, F., Williams, K.B., Catley, D., & Brown, T. (2009). Effects of an oral health promotion program in people with mental illness. *Journal of Dental Residency*, 88(7), 648-652 | Randomized Controlled Trial | 60 individuals with mental illness | Plaque scores, oral health knowledge and self-regulation were analyzed at baseline, 4 and 8 weeks. | Individuals were randomly assigned to motivational interviewing sessions plus oral health education or oral health education alone. | This RCT demonstrates the overall effectiveness of motivational interviewing over traditional education signifying its usefulness in the general population. | I |

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|---|---|---|---|---|---|---|
| American Diabetes Association [ADA]. (2013). Economic costs of diabetes in the U.S. in 2012. *Diabetes Care*, 36, 1033-1046 | Prevalence-based approach to estimate costs | Analyzed prevalence of diagnosed diabetes by age group, sex, race/ethnicity. Used combined U.S. Census Bureau population numbers | Demographics of the U.S. population in 2012, diabetes prevalence, epidemiological data, health care cost and economic data | None | Provides estimated economic costs of diabetes in 2012 and the societal burden it can cause | III |
| Armstrong, K., Rose, A., Peters, N., Long, J. A., McMurphy, S., & Shea, J. A. (2006). Distrust of the Health Care System and Self-Reported Health in the United States. *Journal of General Internal Medicine*, *21*(4), 292–297. | Random-digit-dialing telephone survey | 961 adult residents of the United States | Distrust of the health care system and self-reported health status | None | Provides insight into the distrust of the general public in their health care systems and how this affects self-reported health status | III |

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|---|---|---|---|---|---|---|
| Atanasova, K. & Yilmaz, O. (2015). Prelude to oral microbes and chronic disease: Past, present and future. *Microbes and Infection*, 17, 473-483 | Professional review | Critical review of | None | None | Provides historical information on the discovery of oral microbes leading to present information on the influence of oral microbes on chronic diseases such as cancer, rheumatoid arthritis and diabetes. | IV |

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|---|---|---|---|---|---|---|
| Batliner, T., Brinton, J.T., Daniels, D.M., Wilson, A., Gallegos, J., Janis, M., Lind, K.E., Glueck, D.H., & Albino, J. (n.d.). *An Assessment of Oral Health on the Pine Ridge Reservation.* W.K. Kellogg Foundation | Observational study using convenience sampling | Convenience sample of 292 participants: 135 adults and 157 children. | Analyzed decayed and filled teeth, missing teeth, oral lesions, and prevalence of periodontal disease. Demographic information also examined. | None | Provided some background information on the oral health of American Indians. Offers insight into a study similar to the current project. | III |

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|---|---|---|---|---|---|---|
| Beedasy, J. (2010). Rural designations and geographic access to tertiary healthcare in Idaho. *The Online Journal of Rural Research and Policy*, 5(2), 1-21 | None | Utilized dimensions of geographic access and U.S. Census data. | None | None | Provides great background information relevant to the rurality of Montana Reservations and the barriers associated with being in a rural area. | III |
| Biau, D.J., Kerneis, S. & Porcher, R. (2008). Statistics in brief: The importance of sample size in the planning and interpretation of medical research. *Clinical Orthopaedics and Related Research*, 466(9), 2282-2288 | Professional Review | Review of information regarding sample size and what should be considered for researchers to avoid a Type II error | None | None | Provides information regarding the importance of sample size in a study | III |

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|---|---|---|---|---|---|---|
| Blevins, S. & Bronze, M. (2010). Robert Koch and the 'golden age' of bacteriology. *International Journal of Infectious Diseases*, 14(9), e744-e751. | Professional review | Historical review of the discovery of bacteriology | None | None | Provides background information regarding the discovery of bacteria and its link to the cause of disease. | IV |
| Boyle, J.P., Thompson, T.J., Gregg, E.W., Barker, L.E. & Williamson, D.F. (2010). Projection of the year 2050 burden of diabetes in the US adult population: Dynamic modeling of incidence, mortality, and prediabetes prevalence. *Population Health Metrics*, 8:29 | Population health metrics study | Series of dynamic models to project future burden of diabetes on the U.S. | Used data on prediabetes and diabetes, forecasted incidence, current U.S. census projections of morality and migration | None | Provides information on current cost of diabetes and the projected increase of the epidemic by 2050. | III |

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|---|---|---|---|---|---|---|
| Bray, K.K., Catley, D., Voelker, M.A., Liston, R. & Williams, K.B. (2013). Motivational interviewing in dental hygiene education: Curriculum modification and evaluation. *Journal of Dental Education*, 77(12), 1662-1669 | Multi-modal methods | Multi-modal methods were used to assess the implementation and outcomes of the comprehensive curricular modification. | Faculty, curriculum, student and patient outcomes via descriptive and inferential statistics | Faculty subject to one and a half day training on motivational interviewing and students subjected to MI training | Provides information on the benefit of motivational interviewing in oral health. | III |

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|---|---|---|---|---|---|---|
| Brings Him Back-Janis, M. (2011). A dental hygienist who's a Lakota Sioux calls for new mid-level dental providers. *Health Affairs*, 30(10), 2013-2016 | Professional narrative | Professional narrative of the oral health status of the Pine Ridge Indian Reservation and the many barriers to access they may experience. | None | None | Provides insight into several socioeconomic barriers to oral healthcare that exist for one Northern Plains Reservation. The same barriers seen in this Reservation are often seen in other Reservations across the Northern Plains region. | IV |

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|---|---|---|---|---|---|---|
| Call, K., McAlpine, D., Johnson, P., Beebe, T., McRae, J., & Song, Y. (2006). Barriers to care among American Indians in public health care programs. *Medical Care*, 44(6), 595-600 | Stratified random sample survey of Minnesota healthcare enrollees | Statewide survey included 1281 American Indian and white enrollees; 572 parents child enrollees analyzed using logistic regression models | Perceived barriers to care, trust and confidence in providers and perceived discrimination. | None | Identifies several barriers by a group of American Indians to accessing healthcare programs. Provides survey data illustrating perceived feelings of discrimination and mistrust on behalf of American Indian patients. | III |
| Caro, J., Ward, A., & O'Brien, J. (2002). Lifetime costs of complications resulting from type 2 diabetes in the U.S. *Diabetes Care*, 25(3), 476-481 | Cohort simulation study | Cohort of 10,000 diabetics using a Monte Carol technique | Measured risk of complications and direct medical costs of treating each complication | None | Provides monetary projections of the cost of diabetes and its subsequent cost for the diabetic patients over a 30 year time period. | III |

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|---|---|---|---|---|---|---|
| Carrillo, J.E., Carrillo, V.A., Perez, H.R., Salas-Lopez, D., Natale-Pereira, A., & Byron, A.T. (2011). Defining and targeting health care access barriers. *Journal of Health Care for the Poor and Underserved*, 22, 562-575 | Professional analysis | Describes the Health Care Access Barriers model | None | None | Provides and explanation of the HCAB model for analyzing and reporting barrier to healthcare | IV |
| Centers for Disease Control and Prevention. Introduction: CDC health disparities and inequities report. MMWR 2013;62(Suppl 3):3-5 | Professional analysis | National statistical and projection data | None | None | Provides statistical information and data nationally for health disparities and inequalities in the United States for 2013 | III |

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|---|---|---|---|---|---|---|
| Chan, D. (2009). So why ask me? Are self-report data really bad? In C. Lance & R. Vandenberg (Eds). *Statistical and Methodological Myths and Urban Legends: Doctrine, Verity and Fable in Organizational and Social Sciences* (pp. 309-336). New York, NY: Routledge | Systematic Review | None | None | None | Systematic review of self-report data and its reliability and validity in studies despite the belief that self-report data is ultimately flawed | I |

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|---|---|---|---|---|---|---|
| Chalmers, J.M., King, P.L., Spencer, A.J., Wright, F.A., & Carter, K.D. (2005). The oral health assessment tool-Validity and reliability. *Australian Dental Journal*, 50(3), 191-199. | Convenience sample of 21 residential facilities in Australia | 455 residents from 21 residential facilities completed all study phases. | OHAT score distribution for individual categories over the 6-month study period along with inter-carer reliability. | 21 residential facilities used the OHAT at baseline, 3 months, and 6 months to assess intra- and inter-carer reliability and concurrent validity. | This article speaks to the reliability and validity of the OHAT across all healthcare workers after its' simplification from the BOHSE developed by Kayser-Jones. | III |

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|---|---|---|---|---|---|---|
| Chalmers, J.M. & Pearson, A. (2005). A systematic review of oral health assessment by nurses and carers for residents with dementia in residential care facilities. *Special Care Dentistry*, 25(5), 227-233. | Systemic Review of 306 RCTs, non-RCTs, cohort studies, case-controlled studies, time series studies, uncontrolled studies, descriptive studies and opinions from respected authorities. | Search of electronic databases limited to articles in English from 1980 to 2002. Key words were supplemented with a secondary search of the references cited in the identified studies | None | None | This article highlights the reliability of the BOHSE among nurses and other care givers. The OHAT is modified from the BOHSE suggesting there should be high reliability and validity with its use as well. | I |
| Chow, E., Foster, H., Gonzalez, V., & McIver, L. (2012). The disparate impact of diabetes on racial/ethnic minority populations. *Clinical Diabetes*, 30(3), 130-133 | Advocacy article | None | None | None | Background information providing current statistics on type II diabetes in the American Indian population and other ethnic populations. | IV |

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|---|---|---|---|---|---|---|
| Collins, S.E., Kirouac, M., Taylor, E., Spelman, P., Grazioli, V., Hoffman, G., Haelsig, L., Holttum, J., Kanagawa, A., Nehru, M., & Hicks, J. (2014). Advantages and disadvantages of college drinking in students' own words: Content analysis of the decisional balance worksheet. *Psychology of Addictive Behaviors*, 28(3), 727-733. | Randomized controlled trial | Participants (N=760) were 4-year undergraduate college students randomly selected from the university's registrar's list. | Participants were measured on sociodemographic data, the Timeline Followback Questionnaire and the Decisional Balance Worksheet. | Students were randomly assigned to participate in one of two brief motivational interviewing sessions. One involved the Timeline Followback Questionnaire and the other was the use of the Decisional Balance Worksheet. | This article establishes the apparent usefulness of the Decisional Balance Worksheet as an accurate means of assessing a person's willingness to change current behaviors. | I |
| Dale, J., & Lindenmeyer, A. (2014). Oral health: A neglected area of routine diabetes care?. *British Journal of General Practice*, doi: 10.3399/bjgp14X677301 | Professional Reveiw | Professional review of literature | None | None | Provides information on the importance of considering oral health and preventing oral disease as a part diabetes management | IV |

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|---|---|---|---|---|---|---|
| Dolce, M.C., Haber, J., & Shelley, D. (2012). Oral health nursing education practice program. *Nursing Research and Practice*, vol.2012, Article ID 149673, 5 pages, doi:10.1155/2012/149673 | Professional Review | None | None | None | Provides background information on the lack of emphasis of oral health in general medical training programs such as nursing and primary care | IV |
| Dunning, T. (2009). Periodontal disease-The overlooked diabetes complication. *Nephrology Nursing Journal*, 36(5), 489-496 | Professional Review | Professional review of literature identifying that various explanations for the association between diabetes and periodontal disease. | None | None | This article reinforces the relationship between oral health and diabetes and further outlines the possible mechanisms that cause this bi-directional association. | IV |

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|---|---|---|---|---|---|---|
| Farrokhi, F. & Mahmoudi-Hamidabad, A. (2012). Rethinking convenience sampling: Defining quality criteria. *Theory and Practice in Language Studies*, 2(4), 784-792 | Comparability Study | Theoretical evaluation of convenience sampling to develop conditions for making convenience sampling more valid | Individual scores and group statistics were measured and compared | None | Provides background information regarding convenience sampling and the issues associated with this type of sampling procedure | IV |
| Fonseca,V.(2007). Early identification and treatment of insulin resistance: Impact on subsequent prediabetes and type 2 diabetes. *Clinical Cornerstone*, 8(Suppl 7), s7-s18. | Professional reveiw | Review of literature on insulin resistance and clinical trials of lifestyle changes. | None | None | Provides information of prediabetes and insulin resistance, | IV |

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|---|---|---|---|---|---|---|
| Fowler, M.J. (2008). Microvascular and macrovascular complications of diabetes. *Clinical Diabetes*, 26(2), 77-82. | Professional review | Review of literature on microvascular and macrovascular complications of diabetes | None | None | This article provides in depth information regarding microvascular and macrovascular complications that diabetics are at risk for developing. | IV |

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|---|---|---|---|---|---|---|
| Funnell, M. M., Brown, T. L., Childs, B. P., Haas, L. B., Hosey, G. M., Jensen, B., Maryniuk, M., Peyrot, M., Piette, J.D., Reader, D., Siminerio, L.M., Weinger, K., & Weiss, M. A. (2011). National Standards for Diabetes Self-Management Education. *Diabetes Care*, *34*(Suppl 1), S89–S96. http://doi.org/10.2337/dc11-S089 | Professional review of standards | Review of the National Standards for diabetes self-management education | Review of 10 National Standards for diabetes self-management education | None | Provides information on the overall standards and goals to diabetes self-management education. | IV |
| Gillespie, K.M. (2006). Type 1 diabetes: Pathogenesis and prevention. *Canadian Medical Association Journal*, 175(2), 165-170. | Professional review | Review of the pathophysiology of type 1 diabetes including genetic, environmental and epidemiological information. | None | None | Used for pathophysiological information on type I diabetes | IV |

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|---|---|---|---|---|---|---|
| Gillis, M. (2010). A place for oral health in diabetes management. *Journal of Canadian Dental Association*, 76(2), a24-a26 | Professional opinion | Provides information from the World Diabetes Congress and the International Diabetes Federation | None | None | While a professional opinion, this article offers guidelines from the World Diabetes Congress that recommends primary care providers should be asking patients about receiving professional oral health care and screening for symptoms or oral symptoms. | IV |
| Grant Makers in Health. (2012, September). *Returning the mouth to the body: Integrating oral health & primary care* (Issue Brief No. 40). Washington, DC: Author | Executive Summary | Professional statement and review of literature on oral health | None | None | Provides information on the argument that oral health needs to be integrated into primary care. | IV |

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|---|---|---|---|---|---|---|
| Guadagnolo, B.A., Cina, K., Helbig, P., Molloy, K., Reiner, M., Cook, E.F., & Petereit, D.G. (2009). Medical mistrust and less satisfaction with health care among Native Americans presenting for cancer treatment. *Journal of Health Care for the Poor and Underserved*, 20(1), 210-226. | Prospective survey study | 165 cancer patients (52 Native American, 113 Whites). | Socio-demographic data along with mean scale scores for mistrust and satisfaction were analyzed by race. Multi-variable models were utilized to adjust for income, education level and distance from cancer institute. | 9-item Likert-type survey modified from the Medical Mistrust Index. Seven-item Likert-type survey was used to measure patient satisfaction with healthcare. | Exhibits medical mistrust as a major barrier to healthcare. This seems to be particularly true in American Indian populations and results in lower satisfaction with healthcare. | III |
| Gurenlian, J. (2006). Inflammation: The relationship between oral health and systemic disease. *Access*, 1-10. | Professional Review | Professional review of scientific evidence of the inflammatory process in the body and the role of inflammation in oral and systemic health. | None | None | Provides information on the proposed connection between oral inflammation and systemic response by the host. Give background information of the scientific evidence | IV |

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|---|---|---|---|---|---|---|
| Haffner, S., Lehto, S., Ronnemaa, T., Pyorala, K. & Laakso, M. (1998). Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction. *The New England Journal of Medicine*, 339(4), 229-234. | Cross-sectional study | Compared 7 year incidence of MI among 1373 nondiabetic subject against 1059 diabetic subjects | Rates of myocardial infarction over a seven year period | None | This article offers information regarding MI and its increased risk in diabetic patients focusing on the need for treating cardiovascular risks in diabetics. | III |

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|---|---|---|---|---|---|---|
| Huang, D.L., Chan, K., & Young, B. (2013). Poor oral health and quality of life in U.S. older adults with diabetes. *Journal of American Geriatric Society*, 61(10), doi:10.1111/jgs.12452 | Cross-sectional study | Nationally representative sample of 70,363 older adults with diabetes | This study examines the association between HRQOL, dental status and receipt of dental care among U.S. older adults aged ≥65 years with diabetes mellitus using Behavioral Risk Factor Surveillance System (BRFSS) data. | None | This article shows how oral health can affect the quality of life of those persons with diabetes, particularly those >65, indicating the need for increased education regarding the importance of oral health in this sensitive population. | III |

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|---|---|---|---|---|---|---|
| Hutchinson, R. & Shin, S. (2014). Systematic review of health disparities for cardiovascular diseases and associated factors among American Indian and Alaska Native populations. *Plos One*, 9(1), e80973, doi:10.1371/journal.pone.0080973 | Systemic review of literature | A total of 203 were reviewed from PUBMED, Medline, the CDC MMWR and the Indian Health Service | Addressed obesity, hyperlipidemia, diabetes, cardiovascular disease, stroke, myocardial infarction and metabolic syndrome | None | Provides systemic reviews of the significant number of health diseases that disproportionately affects American Indians than other races. | I |

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|---|---|---|---|---|---|---|
| Jeffcoat, M. K., Jeffcoat, R. L., Gladowski, P. A., Bramson, J. B., & Blum, J. J. (2014). Impact of periodontal therapy on general health: evidence from insurance data for five systemic conditions. *American journal of preventive medicine, 47*(2), 166-174. | Retrospective intervention cohort study | Review of medical costs and impatient hospital admissions during 5 years after periodontal treatment for individuals with T2D, CAD, CVD, RA and pregnancy. | Dental insurance claims, mean total of inpatient and outpatient coverages and annual number of hospitalizations per thousand clients | None | Cohort study suggesting the potential benefits of periodontal treatment as a means to decrease medical costs and complications of other systemic health conditions. | III |
| Kaku, K. (2010). Pathophysiology of type 2 diabetes and its treatment policy. *Journal of the Japan Medical Association*, 53(1), 41-46 | Professional review | Professional review of literature on type II diabetes. | None | None | Provides information regarding the pathophysiological features of type II diabetes. Good background information explaining type II diabetes. | IV |

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|---|---|---|---|---|---|---|
| Kumar, C.P. (2007). Application of Orem's self-care deficit theory and standardized nursing languages in a case study of a woman with diabetes. *International Journal of Nursing Terminologies and Classifications*, 18(3), 103-110 | Case study | Case study of the application of Orem's Theory for a person with type II diabetes | Health assessment data relevant to the client's management of diabetes | Utilizing Orem's theory as a guide, the client and the CNS planned for projected health outcomes. | This case study provides both background information on Dorthea Orem's self-care deficit theory and its applicability to a person with type II diabetes. | III |
| Lalla, E. & Papapanou, P. (2011). Diabetes mellitus and periodontitis: A tale of two common interrelated diseases. *National Review of Endocrinology*, 7, 738-748. | Systematic review of literature | Review of literature focusing on diabetes and periodontitis | None | None | This study conducted systematic review of literature describing the mechanism by which diabetes and periodontitis affect each other. | I |

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|---|---|---|---|---|---|---|
| Lamster, I.B., Lalla, E., Borgnakke, W.S., & Taylor, G.W. (2008). The relationship between oral health and diabetes mellitus. *The Journal of the American Dental Association*, 139: 19s-24s. | Systematic review of literature | Review of literature identifying oral conditions affected by diabetes mellitus as well as literature concerning periodontitis as a modifier of glycemic control | None | None | Systematic review of articles reviewing the various oral health complications of patients with diabetes mellitus and vice versa; suggesting that addressing oral health can have a significant impact on the oral and general health of patients with type II diabetes | I |
| Llambes, F., Arias-Herrera, S., & Caffesse, R. (2015). Relationship between diabetes and periodontal infection. *World Journal of Diabetes*, 6(7), 927-935 | Professional review | Professional review of literature on diabetes, periodontal disease and its systemic effecs | None | None | Provides a professional review of background and scientific evidence regarding the interrelationship between periodontitis and diabetes. | IV |

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|---|---|---|---|---|---|---|
| Lopes, M.H., Southerland, J.H., Buse, J.B., Malone, R.M., & Wilder, R.S. (2012). Diabetes educators' knowledge, opinions and behaviors regarding periodontal disease and diabetes. *The Journal of Dental Hygiene*, 88(2), 82-90 | Survey study | Convenience sample of 298 CDEs who attended the AADE | Descriptive statistics were generated for demographic profiles, CDE knowledge about periodontal disease and systemic health, attitudes and opinions of CDEs regarding the link between periodontal disease and diabetes, and rating their education and training. | 33-item questionnaire with open and closed-ended and Liker-scale questions. | This article helps to support the position that periodontal disease is not a part of overall diabetes education and management. | III |
| Lorig, K. & Gonzalez, V. (2000). Community-based diabetes self-management education: Definition and case study. *Diabetes Spectrum*, 13(4), 234 | Pre-test/post-test case study | A total of 109 participants were recruited for the study. | Demographic data, health behaviors, self-efficacy, health status and health care utilization. | Participants were part of a community-based diabetes self-management program | This study shows that while education is a crucial part of comprehensive diabetes care, the manner in which education is delivered can make a significant difference in affect health behaviors. | III |

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| Mahler, R.J. & Adler, M.L. (1999). Clinical review 102: Type 2 diabetes mellitus: Update on diagnosis, pathophysiology, and treatment. *Journal of Clinical Endocrinology & Metabolism*, 84(4), 1165-1171 | Clinical review | Review to summarize the current knowledge to provide a rational basis for treatment of type 2 diabetes | None | None | This review provides background information regarding the pathophysiology of type 2 diabetes and the need for a multilevel approach to controlling diabetes. | IV |
| Malerba, M. (2013). The effects of sequestration on Indian health. *Hastings Center Report*, 43(no 6), 17-21 | Professional Review | Review of current legislation sequestering the budget of the Indian Health Service and the subsequent effects of having a further reduced budget. | None | None | Provides historical background of the legal responsibility of the government to provide healthcare for American Indians as well as the current discretionary status of the Indian Health Service budget. | IV |

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| Markland, D., Ryan, R., Tobin, V., & Rollnick, S. (2005). Motivational interviewing and self-determination theory. *Journal of Social and Clinical Psychology*, 24(6): 811-831. | Professional Review | Professional review of literature on Motivational Interviewing and self-determination theory | None | None | Provides background information of Motivational interviewing, its development and use in different chronic issues. | IV |
| Martins, R.K. & McNeil, D.W. (2009). Review of motivational interviewing in promoting health behaviors. *Clinical Psychology Review*, 29: 283-293. | Systematic Review of literature | 37 total articles reviewed for analysis of MI in the promotion of health behaviors | None | None | This article was a systematic review of various studies conducted using MI as a means to elicit behavioral health change. The authors reviewed numerous studies and found that MI positively influences health behaviors. | I |

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| Miller, W.R., & Rose, G.S. (2009). Toward a theory of motivational interviewing. *American Psychologist*, 64(6): 527-537 | Professional Review | Historical review of the development of motivational interviewing and motivational interviewing research over the past three decades | None | None | This historical review analyzed research that supports the use of MI as a legitimate psychotherapeutic method. It is evidence-based and applicable across a wide variety of problem areas and learnable by a broad range of professionals. | IV |

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| Mohamed, K. (2014). Diabetes mellitus: Considerations for the dental practitioner. *Primary Care Dentistry*, 41(2), 146-154 | Professional Narrative | Article did not describe specifics regarding the search for literature | None | None | This is a professional narrative from a Senior House Officer in Oral and Maxillofacial Surgery stressing the importance of proper oral health management of those patients with type II diabetes along with suggestions for dental treatment. | IV |
| Murat, C. (2013). In Alaska, reaching into remote corners to provide dental care. *Health Affairs*, 32(11), 2047-2050 | Professional narrative | Professional narrative of a dental therapist delivering care in Alaska | None | None | This article offers the dental therapist as a viable option to the limited access to dental care many American Indians experience. | IV |

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| Nash, D.A. & Nagel, R.J. (2005). Confronting oral health disparities among American Indian/Alaska Native children: the pediatric oral health therapist. *American Journal of Public Health*, 95(8), 1325-1329 | Professional Review | Outlines problems with dental disease and access in American Indian and Alaska Native children. Discuss the use of the pediatric oral health therapist. | None | None | This article further supports the use of dental health therapists for improving oral health disparities in American Indian and Alaska Native populations. | IV |
| Norris, S.L., Engelgau, M.M. & Narayan, K.M. (2001). Effectiveness of self-management training in type 2 diabetes. *Diabetes Care*, 24(3), 561-587 | Systemic review of randomized controlled trials | Searched English language medical literature published 1980-1999. Utilized Medline, Educational Resources Information Center (ERIC), Nursing and Allied Health databases. 72 RCTs met all inclusion criteria. | None | None | This systemic review provides evidence for the efficacy of proper diabetes self-management as means to improve glycemic control of persons with type II diabetes. | I |

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| O'Connell, J., Yi, R., Wilson, C., Manson, S.N., & Acton, K.J. (2010). Racial disparities in health status: A comparison of morbidity among American Indian and U.S. adults with diabetes. *Diabetes Care*, 33(7), 1463-1470 | Comparison study | American Indian adults age 18-64 (30,121) with diabetes using the Indian Health Service and similar data from the U.S. population (1,500,002) | Compared morbidity among American Indian and U.S. adult with diabetes | None | Provides the incidence of diabetes complications and the rate it affects American Indians versus the general U.S. study population. | III |
| Ozougwu, J.C., Obimba, K.C., Belonwu, C.D., & Unakalamba, C.B. (2013). The pathogenesis and pathophysiology of type 1 and type 2 diabetes mellitus. *Journal of Physiology and Pathophysiology*, 4(4), 46-57 | Professional literature review | Review of information on type 1 and type 2 diabetes. | Emphasis on etiology, pathogenesis and pathophysiology | None | Provides background information into the pathophysiology, etiology and pathogenesis of diabetes type 1 and type 2. | IV |

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| Palloni, A. & Yonker, J. (2015). A search for answers to continuing health and mortality disparities in the United States. *Journal of the American Society on Aging*, 38(4), 12-18 | Professional review | Review of most recent findings regarding health and mortality disparities by race and ethnicity | Historical data on life expectancy, mortality gradients in the US and education health gradients | None | Provides background information on healthy inequality and how education and income-status affects mortality. | IV |

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| Palmer, S. C., Ruospo, M., Wong, G., Craig, J. C., Petruzzi, M., De Benedittis, M., Ford, P., Johnson, D.W., Tonelli. M., Natale, P., Saglimbene, V., Pellegrini, F., Celia, E., Gelfman, R., Leal, M.R., Torok, M., Stoumza, P., Bednarek-Skublewska, A., Dulawa, J., Frantzen, L., & Ferrari, J.N. (2015). Dental health and mortality in people with end-stage kidney disease treated with hemodialysis: A multinational cohort study. *American Journal of Kidney Diseases*, 66(4), 666-676 | Prospective multinational cohort | Convenience sample of 4,205 adults 18 years of age or older who had been treated with long-term hemodialysis. | Demographic data, dental characteristics, oral hygiene habits. Cardiovascular mortality at 12 months after dental assessment. | None | This study provides valuable information regarding the influence oral health has over people with end-stage kidney disease. This further enhances the theory that oral health significantly affects overall systemic health and disease. | II |

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| Patrick, D., Lee, R., Nucci, M., Grembowski, D., Jolles, C., & Milgrom, P. (2006). Reducing oral health disparities: A focus on social and cultural determinants. *BioMed Central Oral Health*, 6(Suppl 1), 1-17 | Expert opinion | None | None | None | Offers background information regarding the complex social and cultural circumstances that may lead to oral health disparities particularly among minority populations. | IV |

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| Powers, M., Bardsley, J., Oypress, M., Duker, P., Funnell, M., Fischl, A., Maryniuk, M., Siminerio, L., & Vivian, E. (2015). Diabetes self-management education and support in type 2 diabetes: A joint position statement of the American Diabetes Association of diabetes educators, and the Academy of Nutrition and Dietetics. *Diabetes Care*, 38, 1-11 | Position statement | Review of literature and professional opinion | None | None | Position statement provides support for the use of diabetes self-management education for persons with type II diabetes. Helps to support Orem's self-care theory. | IV |

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| Sequist, T., Cullen, T., & Acton, K. (2011). Indian health service innovations have helped reduce health disparities affecting American Indian and Alaska Native people. *Health Affairs*, 30(10), 1965-1973 | Professional review | Professional review of the Indian Health Service and the evaluation of what may be needed to improve health equity. | None | None | Provides background information on the Indian Health Service, strategies to improve health and the challenges to improving health. | IV |
| Seymour, G., Ford, P., Cullinan, M., Leishman, S. & Yamazaki, K. (2007). Relationship between periodontal infections and systemic disease. *Clinical Microbiology and Infection*, 13(Suppl. 4), 3-10 | Professional review | Review of scientific literature supporting the hypothesis of a relationship between periodontal disease and CVD. | None | None | Provides four possible hypotheses explaining the interaction of oral infection to other chronic illnesses, particularly CVD. Offers explanation of the systemic inflammation model, the most popular model of oral infection and diabetes. | IV |

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| Shaw, J.L., Brown, J., Khan, B., Mau, M.K., & Dillard, D. (2013). Resources, roadblocks and turning points: A qualitative study of American Indian/Alaska Native adults with type 2 diabetes. *Journal of Community Health*, 38, 86-94 | Qualitative study | Three focus groups and five interview with 13 AI/AN adults | Measured resources and perceived roadblocks to diabetes self-management | None | Reveals information on perceived roadblocks to diabetes self-management as well as perceived resources | III |

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| Short, M.E., Goetzel, R.Z., Pei, X., Tabrizi, M.J., Ozminkowski, R.J., Gibson, T.B., DeJoy, D.M. & Wilson, M.G. (2009). How accurate are self-reports? An analysis of self-reported healthcare utilization and absence when compared to administrative data. *Journal of Occupational and Environmental Medicine/American College of Occupational and Environmental Medicine*, 51(7), 786-796 | Cross sectional design | Subjects were employees who completed an HRA for the LightenUP program in either 2006, 2007, or both years and for whom healthcare utilization claims data were available from their insurance carrier or absenteeism records were available from Dow's human resources database | The following seven outcomes were analyzed: 1) monthly doctor visits, 2) monthly ER visits, 3) monthly inpatient admissions, 4) yearly doctor visits, 5) yearly ER visits, 6) yearly inpatient admissions, and 7) yearly absent days | None | Self-report data were more accurate with shorter recall periods versus longer recall periods. Furthermore, accuracy of self-report data regarding healthcare visits significantly declined with age. | III |

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| Simmons, L. (2009). Dorthea Orem's self care theory as related to nursing practice in hemodialysis. *Nephrology Nursing Journal*, 36(4), 419-421 | Literature review | Review of literature to studies involving adults receiving hemodialysis and self-care, management publications | None | None | Provides background information to Dorthea Orem's self-care deficit theory and its application to patients in the dialysis setting. | IV |
| Skillman, S.M., Doescher, M.P., Mouradian, W.E. & Brunson, D.K. (2010). The challenges to delivering oral health services in rural America. *Journal of Public Health Dentistry*, 70, S49-S57 | Professional Review | Literature review and personal communication | None | None | This article provides basic information regarding the challenges people face in rural areas with accessing oral health care | IV |

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| Sotero, M. A. (2006) Conceptual Model of Historical Trauma: Implications for Public Health Practice and Research. *Journal of Health Disparities Research and Practice*, 1(1), 93-108 | Professional Review | Literature review and analysis of theoretical framework of historical trauma theory | None | None | Gives background information on American Indians rocky relationship with the federal government and how historical trauma can translate into mistrust in the medical system. | IV |
| Southerland, J., Taylor, G. & Offenbacher, S. (2005). Diabetes and periodontal infection: Making the connection. *Clinical Diabetes*, 23(4), 171-178 | Professional Review | Professional review of population-based and mechanistic studies regarding the effects of periodontal infection and hyperglycemia on the human host. | None | None | This review focuses on the relationship between diabetes and periodontal infection addressing recommendations for management and treatment. | IV |

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| Stiffler, D., Cullen, D., & Luna, G. (2014). Diabetes barriers and self-care management: The patient perspective. *Clinical Nursing Research*, 23(6): 601-626 | Qualitative meta-synthesis | A total of 95 findings from 21 studies found from EMBASE, Medline, CINHAL and web of science/knowledge | Findings were formulated into six themes and evaluated based on these themes | None | Provides insight into behavior many diabetics may experience that hinder their ability to overall diabetes self-care. | III |

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| Strauss, S. M., Singh, G., Tuthill, J., Brodsky, A., Rosedale, M., Bytyci, A., ... & Russell, S. (2013). Diabetes-related knowledge and sources of information among periodontal patients: is there a role for dental hygienists?. *American Dental Hygienists Association*, *87*(2), 82-89. | Self-administered survey study | 111 patients with or at risk for diabetes who were receiving care at periodontics and implant clinic | Examined current knowledge about diabetes and diabetes-related information among periodontal patients. Also collected demographic data | 10-item diabetes knowledge assessment was give to participants | Provides survey data that support the theory that oral health is a neglected part of diabetes education | III |

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| Surucu, H.A. & Kizilci, S. (2012). Use of Orem's self-care deficit nursing theory in the self-management education of patients with type 2: A case study. *Self-Care, Dependent-Care & Nursing*, 19(1), 53-59 | Descriptive case study | Female patient | Baseline laboratory values, self-reported self-care behavior. | Diabetes self-management education was provided based on the self-care deficit nursing theory. | Provides information on Orem's self-care deficit nursing theory in its application to diabetes self-management education of patients with type II diabetes. | III |
| Teeuw, T., Gerdes, V., & Loos, B. (2010). Effect of periodontal treatment on glycemic control of diabetic patients: A systematic review and meta-analysis. *Diabetes Care*, 33, 421-427 | Systemic review and meta-analysis | Literature search using MEDLINE and Cochrane Library selecting publications based on original investigations and controlled periodontal intervention studies | None | None | Reflects on some of the most current, up-to-date research that documents the effects of periodontal disease on type II diabetes and the potential for periodontal treatment to assist with glycemic control. | I |

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| Toobert, D., Hampson, S., & Glasgow, R. (2000). The summary of diabetes self-care activities measure. *Diabetes Care*, 23(7), 943-950 | Systematic review | Review of 5 randomized interventions and 2 observational studies using SDSCA | Measured general diet, specific diet, exercise, blood glucose, foot care and smoking | None | Provides information on diabetes self-care measures necessary to manage diabetes. | I |
| U.S. Commission on Civil Rights. (2004, September). *Broken Promises: Evaluating the Native American health care system.* Washington, DC: Author | Professional Reveiw | Review of literature | None | None | Provides an indepth look at the multiple barriers Native Americans face in health care as well as reviewing the history of the Federal governments trust responsibility | IV |

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| U.S. Department of Health and Human Services. *A National Call to Action to Promote Oral Health.* Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institutes of Health, National Institute of Dental and Craniofacial Research. NIH Publication No. 03-5303, May 2003. | Statement from the Surgeon General | National Statistical data | None | None | Provides background information about the oral health status of the nation and guiding principles for improving oral health and well-being. | IV |

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| Wang, T., Jen, I., Chou, C., & Lei, Y. (2014). Effects of periodontal therapy on metabolic control in patients with type 2 diabetes mellitus and periodontal disease. *Medicine*, 93(28), e292-e299 | Meta-analysis | Web search of Medline, EMBASE and Cochrane Library for studies relevant to periodontal disease and glycemic control. Of 19 studies 4 met inclusion criteria | None | None | Meta-analysis that provides background information on the prevalence of periodontal disease and diabetes while also exploring the importance of oral health in assisting with glycemic control. | I |
| Warne, D. (2006). Research and educational approaches to reducing health disparities among American indian and Alaska natives. *Journal of Transcultural Nursing*, 17(3), 1-6 | Professional review | Explores the role of research and education programs as a means to reduce health disparities in American Indian and Alaska Native populations. | None | None | Provides historical overview of American Indian health disparities and potential causes for these health disparities. | IV |

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| Weinstein, P., Harrison, R., & Benton, T. (2004). Motivating parents to prevent caries in their young children: One year findings. *The Journal of the American Dental Association*, 135(6), 731-738 | Randomized clinical trial | Parents of 240 children aged 6 to 18 months | Assessed caries with visual examinations for both groups along with assessing parenting practices and children's diets. Demographic data was also recorded. | Control group received traditional oral health education in pamphlet form with a 11-minute video. Experimental group received the same two oral health education forms as the control group in addition to a 45 minute counseling session with follow-up phone calls. | This is an RCT that illustrates the effectiveness of motivational interviewing for improving oral health status and oral health behaviors. | I |

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| Wells, P. L., Caplan, D. J., Strauss, R. P., Bell, D., & George, M. (2010). An oral health survey of the Lumbee tribe in southeastern North Carolina. *American Dental Hygienists Association*, *84*(3), 137-144 | Self-administered survey | Convenience sample of 118 Lumbee Indians | Demographic information, OHIP-14, dental care issues, oral health knowledge and self-reported oral health status. | Self-administered survey | Oral health survey study speaking to the lack of oral health knowledge among a group of American Indians. Also highlights possible barriers to oral health and significance they may have on oral-health related quality of life. | III |

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| Wilson, F.L., Baker, L.M., Nordstrom, C.K., & Legwand, C. (2008). Using the teach-back and Orem's self-care deficit nursing theory to increase childhood immunizations communication among low-income mothers. *Issues in Comprehensive Pediatric Nursing*, 31, 7-22 | Quantitative-qualitative research design | Convenience sample of 15 mothers with one child and 15 mothers with more than 1 child. | Rapid Estimate of Adult Literacy (REALM) was used to assess literacy and demographic profile | None | While focusing primarily on the teach-back method for pediatric immunizations. This article provided background information on Orem's Self-care Deficit Nursing Theory. | III |

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| Wilson, A., Brega, A., Batliner, T., Henderson, W., Campagna, E., Fehringer, K., Gallegos, J., Daniels, D., & Albino, J. (2014). Assessment of parental oral health knowledge and behaviors among American Indians of the Northern Plains Tribe. *Journal of Public Health Dentistry*, 74(2), 159-167 | Professional reveiw | Professional review of the historical legislative background of the U.S. Government's obligation to American Indians and its current federal budgeting practices. | None | None | Provides historical background of the federal governments trust responsibility to American Indians and Alaska Natives. Provides some of the most current information on federal budgeting and insight to the budgetary estimates allotted to the Indian Health Service. | IV |

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| Yuen, H.K., Onicescu, G., Hill, E.G., & Jenkins, C. (2010). A survey of oral health education provided by certified diabetes educators. *Diabetes Research and Clinical Practice*, 88(1), 48-55 | Survey study | 12-question survey of 130 diabetes educators | Respondents were asked to rate the coverage of their diabetes curricula with respect to education patients about oral health issues. Topics included controlling diabetes, preventing complications and healthy life-style topics. | 12-question survey | Highlights the contention that oral health is a missing component of comprehensive diabetes education and management programs. | III |
| Zhuo, X., Zhang, P., Barker, L., Albright, A., Thompson, T., & Gregg, E. (2014). The lifetime cost of diabetes and its implications for diabetes prevention. *Diabetes Care*, 37(9), 2557-2564. | Self-administered survey | Convenience sample of 147 participants aged 15 years and older who are English speaking. | Descriptive information about participants, overall oral health knowledge along with oral health behavior scores. | None | Illustrates how socioeconomic factors can influence oral health knowledge and oral health behaviors. | III |

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| American Dental Association [ADA]. (2013). Action for dental health: Bringing disease prevention into communities. Retrieved from http://www.ada.org/~/media/ADA/Public%20Programs/Files/bringing-disease-prevention-to-communities_adh.ashx | Professional Health Organization Position Statement | Position Statement/Review of literature and national statistics | None | None | Provides information on the ADAs position of oral disease prevention. | IV |

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| American Dental Association [ADA]. (2015). American Dental Association Statement on accrediting dental therapy education programs. Retrieved from http://www.ada.org/en/press-room/news-releases/2015-archive/february/statement-on-coda-therapist-standards | Professional Health Organization Position Statement | Position Statement/review of literature and national statistics | None | None | Provides the ADAs position on dental health aid therapists and their reluctance to accept their ability to provide oral health care particularly surgical procedures | IV |

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| American Dental Association [ADA]. (2011). Breaking down barriers to oral health for all Americans: Repairing the tattered safety net. Retrieved from http://www.ada.org/~/media/ADA/Public%20Programs/Files/barriers-paper_repairing-tattered-safety-net.ashx | Professional Health Organization Position Statement | Review of literature on barrier to oral health care especially in underserved populations | None | None | Provides information on the Indian Health Service and the barriers to oral health care for that organization as well as other government health programs such as Medicaid. | IV |
| American Diabetes Association [ADA]. (2015). Fast facts-Data statistics about diabetes. Retrieved from professional.diabetes.org/ResourcesForProfessionals.aspx?cid=91777&loc=dorg-statistics | Professional Health Organization | Overall number of diabetes and prediabetes | None | None | Provides overall statistics of the prevalence of diabetes, undiagnosed diabetes and those with prediabetes. | IV |

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| American Diabetes Association [ADA]. (2014). Statistics about diabetes. Retrieved from www.diabetes.org/diabetes-basics/statistics/ | Professional Health Organization | Overall number of diabetes and prediabetes | None | None | Provides overall statistics of the prevalence of diabetes, undiagnosed diabetes and those with prediabetes. Also provides diabetes information by race/ethnicity. | IV |
| Census and Economic Information Center [CEIC]. (n.d.). *How dense could we be?*. Retrieved from http://ceic.mt.gov/Documents/Maps/Population/PopDensityComparison00.pdf | Montana Government Data | Population density | None | None | Provides population density information for Montana compared to other states. Puts the rurality of Montana in number form. | IV |

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| Centers for Disease Control and Prevention. (2012). National center for health statistics: Leading causes of deaths and numbers of deaths, by sex, race, and Hispanic origin United States 1980-2010. Retrieved from www.cdc.gov/nchs/data/hus/2012/022.pdf | Federal Health Agency | Statistics on leading causes of death from 1980 to 2010: Data is based on death certificates | None | None | Provides leading causes of death and numbers of death by sex, race and Hispanic origin in the United States | IV |
| Center for Disease Control and Prevention. (2012). 2014 National diabetes statistics report. Retrieved from www.cdc.gov/diabetes/data/statistics/2014statisticsreport.html | Federal Health Agency | 2014 National Diabetes Statistics | None | None | Provides statistics of diagnosed and undiagnosed diabetes in the United States | IV |

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| Center for Disease Control and Prevention. (10 July, 2013). Oral health in American: Summary of the Surgeon General's report. Retrieved from http://www.cdc.gov/oralhealth/publications/factsheets/sgr2000_05.htm | Federal Health Agency | Summary of the report of the Surgeon General on Oral Health in America | None | None | Provides major findings from the report of the Surgeon General; one supporting the theory that oral disease is associated with other health problems. | IV |
| Center for Disease Control and Prevention. (10 March, 2015). Periodontal disease. Retrieved from http://www.cdc.gov/oralhealth/periodontal_disease/ | Federal Health Agency | Periodontal disease statistics | None | None | Statistical information on periodontal disease, causes, warning signs, risk factors and prevention and treatment. | IV |

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| Center for Disease Control and Prevention. (6 August, 2015). Prediabetes. Retrieved from www.cdc.gov/diabetes/basics/prediabetes.html | Federal Health Agency | None | None | None | Information on prediabetes, risks and options to reduce a persons risk of developing type II diabetes. | IV |
| Commonwealth Fund. (2010). Alaska and Minnesota: Increasing access to dental care. Retrieved from http://www.commonwealthfund.org/publications/newsletters/states-in-action/2010/mar/march-april-2010/snapshots/alaska-and-minnesota | Professional review | None | None | None | Provides information on the dental health aide therapist, its formation and their role in providing quality care in dental shortage areas. | IV |

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| Delta Dental. (2010) America's oral health: The role of dental benefits. Retrieved from https://www.deltadental.com/AmericaOralHealthRoleDentalBenefits.pdf | Professional review | Provides data from industry and government sources | Medical and dental coverage, cost of dental care, frequency of dental visits and oral health status o children | None | Provides statistical information of medical and dental insurance rates and other information as well as citing the critical role of oral exams in systemic healthcare. | IV |
| Fleck, L. (2010). Dorothea Orem's self-care deficit theory. In M. Parker, *Nursing theories and nursing practice.* Philadelphia, PA: F.A.Davis Company. Retrieved from http://proxybz.lib.montana.edu/login?qurl=http%3A%2F%2Fsearch.credoreference.com%2Fcontent%2Fentry%2Ffadnursthnurspr%2Fdorothea_orem_s_self_care_deficit_theory%2F0 | Published book | None | None | None | Published book that provides information on Dorthea Orem's Self-care deficit theory | IV |

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| Indian Health Service [IHS]. (1999). *An Oral Health Survey of American Indian and Alaska Native Dental Patients*. Retrieved from http://dhss.alaska.gov/dph/wcfh/Documents/oralhealth/docs/Oral_Health_1999_IHS_Survey.pdf | Regional and National survey data | Over 150 dentists and dental hygienists | Oral health status of American Indians and Alaska Native from preschool to elders and treatments needed | None | Provides the most recent survey information regarding the oral health status of Native American adults with type II diabetes. | III |
| Indian Health Service [IHS]. (2015, January). Indian health disparities. Retrieved from www.ihs.gov/newsroom/includes/themes/newihstheme/display_objects/documents/factsheets/Disparities.pdf | Professional Review | Review of health disparity data for the Indian Health Service | Review of statistical data | None | Provides statistical data of the type of health disparities and rate of these health issues | IV |

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| Indian Health Service [IHS]. (2015). IHS Year 2015 Profile. Retrieved from https://www.ihs.gov/newsroom/factsheets/ihsyear2015profile/ | IHS year 2015 profile | Review of population, appropriations, third party collections, human resources and facilities | None | None | Provides budgetary information, population served and per capita personal health expenditures by the Indian Health Service and compared to the general U.S. population. | IV |
| International Diabetes Federation. (2011). *Position statement: Self-management Education.* Retrieved from https://www.idf.org/education/self-management-Education | Position statement | None | None | None | Supports the positions that diabetes self-management education and diabetes self-management support are vital components of reducing complications. | IV |

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| Montana Geographic Information Clearinghouse. (2015). *Area of Montana Counties*. Retrieved from http://geoinfo.msl.mt.gov/Home/geography/geography_facts/area_of_montana_counties.aspx | State government information | None | None | None | Provides geographic information regarding the area of Montana and the counties contained within. | IV |
| National Institute of Diabetes and Digestive and Kidney Disease [NIDDKD]. (June, 2014). Insulin resistance and prediabetes. Retrieved from http://www.diabetes.niddk.nih.gov | Professional review | Review of information on insulin resistance and prediabetes | None | None | Provides pathophysiological, etiological and treatment options for insulin resistance and prediabetes | IV |

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| National Tribal Budget Formulation Workgroup. (2013). *Creating a Legacy of Honor and Trust: Striving for Health Parity for all American Indians and Alaska Natives*. Retrieved from http://www.nihb.org/docs/07112013/FY%202015%20IHS%20budget%20full%20report_FINAL.pdf | Professional budget projections | None | None | None | Provides budgetary projections about the actual need to provide quality health care to American Indians/Alaska Native | IV |
| Native American Aid. (2015). *Living Conditions*. Retrieved from http://www.nrcprograms.org/site/PageServer?pagename=naa_livingconditions | Professional review | None | None | None | Provides evidence on living conditions of American Indians especially on Reservations | IV |

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| Nursing Theory. (2013). Self Care Deficit Theory. Retrieved from http://www.nursing-theory.org/theories-and-models/orem-self-care-deficit-theory.php | Professional review | Review of anecdotal evidence of reversing diabetes | None | None | While evidence is anecdotal, it does offer insight into the diabetics frustration with being diagnosed with type II diabetes. | IV |
| Office of Minority Health. (2015). *Profile: American Indian and Alaska Native*. Retrieved from http://minorityhealth.hhs.gov/omh/browse.aspx?lvl=3&lvlid=62 | Federal Agency | Review of recent statistics | Language, education, economics and insurance coverage | None | Provides statistical information on the profile of American Indians and Alaska Natives | IV |

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| Pew Charitable Trusts. (2015). *The Oral Crisis Among Native Americans*. Retrieved from http://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2015/06/the-oral-health-crisis-among-native-americans | Professional Review | Review of most recent statistics | None | None | Provides statistics on the oral health status of American Indian populations | IV |
| Robert Wood Johnson Foundation. (2013). *Socioeconomic, Cultural and, Geographic Barriers to Preventive Oral Health Care*. Retrieved from http://www.rwjf.org/content/dam/farm/reports/reports/2013/rwjf407853 | Systemic Screening and Assessment Method | Review of longevity and feasibility of oral health programs | 80 summary programs | None | Provided background information about barriers to preventive oral health care. | III |

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| Sobell, L. C., & Sobell, M. B. (2008). *Motivational Interviewing strategies and techniques: Rationales and examples*. Retrieved from http://www.nova.edu/gsc/forms/mi_rationale_techniques.pd | Professional review | None | None | None | Provides information on motivational interviewing strategies and techniques. Particularly focusing on the decisional balance worksheet. | IV |
| Spero, D. (2013). "Reversing" type 2 diabetes. Retrieved from http://www.diabetesselfmanagement.com/about-diabetes/types-of-diabetes/reversing%C2%9D-type-2-diabetes/ | Professional Review | Review of literature and anecdotal evidence | None | None | Provides anecdotal evidence of patients feelings about the diagnosis of diabetes | IV |

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| Thompson, K. (2013). Orem self-care deficit theory description. Retrieved from http://nursingtheoryandtheoristsroyorem.weebly.com/6/post/2013/03/orem-self-care-deficity-theory-description.html | Professional review | Review of nursing theory | None | None | Provides a general description of Orem's self-care deficit nursing theory. | IV |
| U.S. Census Bureau. (14 Oct 2015). *Montana*. Retrieved from http://quickfacts.census.gov/qfd/states/30000.html | National survey | Mail canvass of 50 state government offices | None | None | Provides quick statistical facts about the population of Montana speaking to the rural nature of the state. | III |

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| U.S. Census Bureau. (2009, July). *Population dynamics of the Great Plains: 1950 to 2007*. Retrieved from https://www.census.gov/prod/2009pubs/p25-1137.pdf | National survey | Mail canvass of 50 state government offices | None | None | Provides boundary information regarding the Great Plains region and the description of that area. | III |
| U.S. Census Bureau. (2013, February). *Poverty rates for selected detailed race and Hispanic groups by state and place: 2007-2011*. Retrieved from https://www.census.gov/prod/2013pubs/acsbr11-17.pdf | National survey | Mail canvass of 50 state government offices | None | None | Provides the most current poverty rates for American Indians and Alaska Natives | III |
| U.S. Census Bureau (2010, January). *The American Indian and Alaska Native populations: 2010*. Retrieved from http://www.census.gov/prod/cen2010/briefs/c2010br-10.pdf | National survey | Mail canvass of 50 state government offices | None | None | Provides census data on American Indian and Alaska Native populations | III |

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| U.S. Department of Health and Human Services. (2012). Healthy people 2020. Retrieved from www.healthypeople.gov/2020/about/DisparitiesAbout.aspx | Federal health Agency | National statistical data | None | None | Provides the most recent statistical data regarding health disparities in racial and ethnic minorities in the United States | III |
| U.S. Office of Management and Budget. (1997). The 1997 revisions to the standards for the classification of federal data on race and ethnicity. Retrieved from www.whitehouse.gov/omb/fedreg_1997standards | Federal Revision of Standard for the Classification of race and ethnicity | None | None | None | This regulation provides the Federal government's definition of American Indian and Alaska Native | IV |
| W.K.Kellogg Foundation. (2013). *Native Solutions for Oral Health.* Retrieved from www.wkkf.org | Professional Narrative | None | None | None | Provides a number of narratives from oral health providers serving various American Indian and Alaska Native communities | IV |

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| World Health Organization [WHO]. (2015). Complications of diabetes. Retrieved from http://www.who.int/diabetes/action_online/basics/en/index3.html | Professional Health Orgainzation | Statistical data | None | None | Provides an overview of the complications of diabetes, etiology, symptoms, diagnosis and treatment of each complication. | IV |
| World Health Organization [WHO]. (2012). Oral health. Retrieved from http://www.who.int/mediacentre/factsheets/fs318/en/ | Professional Health Organization | Statistical data | None | None | Provides recent statistics of oral diseases and conditions worldwide. Particularly mention rate of periodontal disease. | IV |

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| World Health Organization [WHO]. (2015). Social determinants of health: Key concepts. Retrieved from www.who.int/social_determinants/thecommission/finalreport/key_concepts/en/ | Professional Health Organization | None | None | None | Provides a basic definition of health inequalities and social determinants of health. | IV |