

The Integration of Oral Health Services in a Nurse Practitioner-Led Primary Care Clinic

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SECTION 1

INTRODUCTION

With the aging baby boomer generation, the number of patients requiring complex care from multiple healthcare providers has increased dramatically (1). “As of 2012, about half of all adults, 117 million people, had one or more chronic health conditions.”(1). Older Americans will present with full dentitions, chronic diseases and multiple medications. To manage complex health needs, multi-disciplinary interprofessional health care teams capable of treating patients comprehensively have been suggested as a potential strategy for improving our health care system (2). Today, oral health care is generally delivered separately from medical care. (3). Lack of coordination and communication between providers has been associated with an increase in mistakes, poor health outcomes, increased costs, and reduced patient satisfaction (3). Recognizing the common risk factors for oral diseases and many chronic diseases, and the intrinsic links among oral health and general health and quality of life, an integrated system may be able to reap broader benefits from health promotion and disease prevention (4). For this reason, both the medical and dental professional communities have asserted a comprehensive health system, one in which oral health works within primary care, is the logical approach.

Integration of oral care into primary care is hypothesized to benefit patients’ overall health; improve patient experience and lower costs (The Triple Aim). Integration of care can be defined as “bringing together inputs, delivery, management and organization of services related to diagnosis, treatment, care, rehabilitation and health promotion.”(6). New types of oral health providers, team-based care, and relaxed practice supervision laws are facilitating the integration and co-location of medical and dental

providers (2). However, demonstration studies investigating both financial and patient outcomes are needed.

Purpose of the Study

The purpose of this study is to investigate if integrating oral health care services into a nurse practitioner-led primary care clinic improves patient-centered outcomes.

Statement of the Problem

Oral health is integral to general health. Chronic diseases and oral diseases share common risk factors (7) and therefore, a common, interdisciplinary approach to chronic disease management is needed to achieve optimal health. Research has shown a periodontal bacterial infection can increase the overall systemic burden of inflammation in the body, establishing a relationship between periodontal disease and diabetes, cardiovascular disease, rheumatoid arthritis, and other systemic health conditions (7). However, professional silos have prevented co-location of medical and dental providers in our health care system. Implementing a model where oral health services are integrated within primary care holds promise for managing chronic disease, improving health outcomes and the patient experience.

Significance of the Study

This study will describe the patient population and the oral and medical services provided at a nurse practitioner-led primary care clinic. The results of this study will provide baseline data on the effects of integrating oral health and primary care services on patient-centered outcomes, as well as inform the development of future models for care delivery in our health care system. As health care costs associated with chronic diseases continue to rise and the oral systemic connection is better understood, it is

critical that the optimal health delivery model achieve the goals of the Triple Aim – better care experience, better health outcomes and lower cost.

Research Question

In a nurse practitioner led clinic, what is the effect of integrating oral health services on patient-centered outcomes?

SECTION 2

REVIEW OF THE RELATED LITERATURE

The Oral Systemic Relationship

One of the most common oral diseases in the adult population is periodontal disease (7). Periodontal disease is a bacterial infection that induces an inflammatory response in periodontal tissues leading to the destruction of the supporting structures of the teeth, including the bone, resulting in tooth loss if left untreated (7). Bacterial biofilm present in the oral cavity causes the progression from health to disease. If the bacterial biofilm is left undisturbed, gingivitis, the first stage of periodontal disease, may progress to advanced periodontal disease. This is due to the body's response, referred to as the host response. The main purpose of the host response is to "defend the life of the individual"(8). In the instance of periodontal disease, the host response triggers the immune system to defend the body from the pathogens present in the plaque biofilm and limit the spread of infection. The response is not to save the tooth or its surrounding structures but rather to rid the body of infection (8). Periodontal pathogens may enter the blood stream and activate an inflammatory response in other parts of the body, adding to the overall systemic inflammatory burden (8). Growing evidence suggests a relationship between periodontal disease and cardiovascular disease, diabetes mellitus, and other systemic conditions such as rheumatoid arthritis and Sjogren's syndrome (7).

Cardiovascular disease is the number one cause of death in the United States (9). One in every three deaths was attributed to cardiovascular disease (10). Atherosclerosis, a form of cardiovascular disease, is a condition where there is hardening and narrowing of blood vessel walls caused by plaque buildup. This type of plaque is made up of fat, cholesterol and other substances found in the blood. Bacteria associated with periodontal disease can attach to these plaques, causing inflammation and damage (10). Evidence has

shown periodontal infections may also contribute to cardiovascular disease and atherosclerosis by contributing to systemic inflammatory challenges. Oral bacteria have been found in carotid atheroma as well (9). Chronic periodontal disease has been strongly associated with an increase of systemic inflammatory markers such as C-Reactive Protein (CRP); this specific inflammatory marker is a predictor of cardiovascular disease (11). Two randomized clinical controlled studies have shown a decrease of periodontal disease is also correlated with a decrease in CRP (11,12). In a study done by Bokhari et al, subjects in the intervention group received periodontal treatment as part of the study while the control group received periodontal treatment after the six-month study period had ended (11). Results of the study showed that after baseline, two months and six months the intervention group showed lower CRP serum levels resulting in a reduced risk of cardiovascular events risk (11). Caula et al, were trying to determine if non-surgical periodontal treatment could influence the inflammatory markers related to the risk factors of cardiovascular disease. The results found a significant decrease in erythrocyte sedimentation rate (ESR) and triglycerides in the test group who were subject to immediate periodontal treatment compared to the control group who received delayed periodontal treatment (12). Both studies suggest that chronic periodontal disease is also associated with a higher risk of cardiovascular disease but periodontal treatment can effectively reduce an associated risk (11,12). However, a causal relationship has not been demonstrated in all studies. Papapanou et al, determined periodontal disease and cardiovascular disease share several common risks factors including but not limited to smoking, age and diabetes mellitus. While their observational studies supported an association, findings did not support a causative relationship (13).

Each specific condition needs further research to evaluate the possibilities of a causative relationship and differentiate treatment strategies (14).

Diabetes mellitus can be defined as a group of disorders characterized by elevated blood glucose (15). Type I diabetes is a form in which not enough insulin is produced by the body, therefore elevating the blood glucose. The cause of Type I diabetes is unknown but could be due to genetic or environmental factors (16). Type II diabetes is characterized as either high blood glucose due to insulin resistance or a lack of insulin most commonly caused by obesity or lack of exercise (16). Evidence supports a bi-directional relationship between periodontal disease and diabetes mellitus (17). Individuals with diabetes have a threefold increase in the risk for periodontal disease (17). Periodontal disease is thought to be the sixth most common complication of diabetes following retinopathy, nephropathy, neuropathy, macro vascular disease and poor wound healing (15,18). The key component linking periodontal disease and diabetes together is inflammation. Inflammation from periodontal disease may cause diabetes to worsen, conversely uncontrolled diabetes can worsen the effects of periodontal disease on the dentition (17). Periodontal disease can lead to bacteremia that can activate the immune response and have destructive effects systemically. Chronic inflammation, as seen in periodontal disease, can trigger an increase in cytokine production, activation of acute-phases protein synthesis and insulin resistance that results in Type II diabetes (19). Patients with periodontal disease have a chronic low-level systemic exposure to periodontal microorganisms; this can lead to changes in the plasma level of cytokines and hormones (19). Prevention and control of periodontal disease must be seen as an integral part of controlling diabetes (19). While uncontrolled diabetes

mellitus can cause changes to the tissues of the periodontium leading to soft and hard tissue loss (9). Treatment of periodontal disease and the reduction of inflammation is deemed a success in diabetic patients if the A1C level is measurably reduced (17). A cluster, randomized controlled clinical trial by Saengtibovorn and Taneepanichskul, investigated the effect of lifestyle changes plus a dental care program with regards to improving the glycemic control and periodontal status in aging patients with diabetes mellitus. A team of medical doctors, nurse practitioners, dentists and dental assistants developed an educational lifestyle changes program as well as an oral health education program for a group of patients with diabetes (18). The results of this study showed the intervention group, those who received more individualized program goals and education, had significantly lower blood glucose and HbA1c levels than those in the control group (18). Also, the subjects in the intervention group had better-controlled periodontal disease than the control group subjects (18). This study demonstrated the effectiveness of collaboration between healthcare providers in achieving better health outcomes.

Rheumatoid arthritis (RA) is a systemic inflammatory disease that often affects women three times more than men (20). It is characterized as a chronic and progressive condition that mostly affects the synovial membranes of joints, this often leads to bone and cartilage destruction (21). Since the temporomandibular joint (TMJ) is a synovial joint it is possible for RA to manifest in the TMJ and cause destruction and possible severe disability within the joint (21). This along with other oral manifestations such as xerostomia, secondary Sjogren's syndrome and periodontal disease have been the focus of research to try to determine what factors or links can be seen between RA and oral manifestations (22).

Studies done show support that RA and periodontal disease may be related to the existence of an enhanced inflammatory state caused by pathogens such as porphyromona gingivalis and inflammatory mediators such as cytokines, HLA-DR antigens and hormones (22). However, there are conflicting study findings, most likely due to the fact that both RA and periodontal disease have sub classifications based on disease severity and some studies group them together as either having RA and periodontal disease with no regard to the sub classifications (23). Studies by Pischon, N; Pischon, T; Kroger, et al; Silvestre-Rangil, Bagan, Silvestri, et al; Mercado, Marshall, Klestove et al accounted for disease severity and found subjects with RA had a significant increase in odds of having periodontal disease compared to healthy control subjects (20,22,24). Clinical parameters for evaluating periodontal disease in these three studies included plaque and bleeding scores, clinical attachment loss, bone loss and probing depth (20,22,24). After these assessments were completed the researchers found evidence that supported a relationship between RA and periodontal disease. The data showed subjects with RA were more likely to experience more significant periodontal disease progression than the control groups in the studies (20,22,24). These results suggest that a collaborative approach between a patient's medical and dental providers may be more patient-centered and lead to improved health outcomes (20).

Sjogren's Syndrome is a complex autoimmune, chronic and systemic disease that mainly affects the exocrine glands (25). There are two classifications of Sjogren's syndrome (SS), primary and secondary. Primary SS is defined by having no other rheumatologic disease. Secondary SS occurs with other rheumatologic diseases such as systemic lupus erythematosus or rheumatoid arthritis (25). Hyposalivation or xerostomia

(dry mouth) is the most common complaint of patients suffering from SS (25,26,27). The oral manifestations most often occurring in patients with SS includes: dental caries, gingivitis/periodontal disease, fungal infections and oral lesions (26). These manifestations all stem from the lack of saliva due to the saliva glands being affected by the disease. Most often it is the parotid, sublingual and submandibular glands that are responsible for about 90% of oral secretions (26). Patients suffering from SS have reported a decrease in the quality of life, according to a study using the Medical Outcome Short Form Health Survey Questionnaire (25). Characteristics involved included patient's perception of physical, emotional and social function. Additionally the decrease in saliva affects self-esteem with regards to esthetics, social interaction and personal comfort (25). A study by Gonzalez et al, found patients with SS visit the dentist more often than those without SS (25) and concluded dental professionals are ideal healthcare providers to help with the oral manifestations of this disease.

This growing body of research suggests there is an inextricable link between a person's oral health and their general health. Periodontal disease and systemic conditions such as cardiovascular disease, diabetes mellitus, rheumatoid arthritis and Sjorgren's syndrome share some of the same common risk factors. These risk factors include, but are not limited to: age, gender, weight, genetic factors, race, smoking/tobacco use, uncontrolled systemic conditions and hormonal influences. The established associations between periodontal disease and systemic diseases support that the oral cavity should not be viewed as a separate entity, but rather one part of a whole (5,17). This view of health underscores the need to integrate oral health within primary care.

Collaborative Practice

Collaborative practice describes co-located healthcare professionals from different disciplines working together to provide comprehensive care services (28). The World Health Organization (WHO) sees collaborative practice as “all health professions students are deliberately working together with the common goal of building a safer and better patient-centered and community/population-centered US health care system.”(29). Interprofessional practice is viewed as a key strategy to achieve the goals of the Triple Aim. The Triple Aim framework developed by the Institute for Healthcare Improvement (IHI) describes an approach to optimizing health system performance via team-based care (30). Scholars from many disciplines such as education, psychology, sociology, pharmacy, nursing and medicine have researched the role of team-based care and have found integrated care systems can be beneficial from a clinical and economic perspective (6, 29). Research on team-based care can be found repeatedly in medical studies focusing on the nurse practitioner – physician relationship. Studies have focused on the gaps in knowledge by comparing a traditional physician-only model of care with a team-based nurse practitioner – physician model (31). When comparing physician only care to care provided by a nurse practitioner there seemed to be no difference in the care provided (31). Protocols of care were deemed to be equal in terms of prescribing medications, reimbursement and hospital admittance between physicians and nurse practitioners depending on state laws (31, 33). Elements of the studies evaluated disease management in terms of personnel-related costs, clinical outcomes and the impact on the patient perspective (31). Results from the study showed promise that the team-based approach could be successful in terms of clinical outcomes and increased patient satisfaction but did not show a cost reduction (31).

The separation of medicine and dentistry has fostered a mindset among healthcare providers and patients that does not value oral health as a part of general health. However, the literature suggests a paradigm shift toward integrating oral health into primary care delivery is underway. In 2016, Maxey and Weaver, studied five health centers that used an interprofessional collaboration model to deliver oral health care services. The investigators defined oral health services as “activities focused on assessing a patient’s oral health care which consisted of risk assessments evaluation, prevention, education and care coordination.” (4). They found that even though each organization used a different way to incorporate interprofessional collaboration each center was successful at integrating oral health care with primary care. Evidence suggests that providing preventive oral health care for people with chronic systemic diseases will improve oral health and reduce the cost of dental treatment. (32). One thought as to why this may be is that people with chronic illnesses may have a better understanding of the oral/systemic link due to their medical providers educating them on the importance of oral health to help control their systemic condition (32).

Another example is the Neighborhood Outreach Action for Health (NOAH). The NOAH program began by incorporating oral screenings and referrals, but has since evolved to include interdisciplinary, integrated care planning and provision of preventative and restorative dental health services at health clinic sites (34.)

NOAH was created to help meet the oral health care needs of low-income immigrant families by providing comprehensive medical and oral health care in one location. At well-child visits nurse practitioners complete oral screenings and place more emphasis on education to help families understand the importance of oral care. Nurse

practitioners also began applying fluoride varnish on children during their checkups. Babies were seen every three months thru two years of age to receive a fluoride varnish (34). Legislation allowed a registered dental hygienist to provide services at a clinic under general supervision of a dentist or have a contract with an affiliated dentist. (34). Patient satisfaction increased, as patients of the clinic were happy about being able to complete a medical visit with the nurse practitioner and, within the same complex, see a dental hygienist for dental services (34).

With early childhood caries (ECC) being the most prevalent childhood disease, more and more pediatric primary care clinics deliver oral health services such as oral health education, risk assessments and fluoride applications (35). Evidence suggests that these oral health benefits received at a child's well-visit exam can help reduce the incidence of ECC (35). Primary care providers often see children and their families at a much higher frequency than dental providers making this a promising delivery method. Currently over 40 state Medicaid programs have started to reimburse primary care providers for rendering oral health services such as caries-risk assessments, oral health counseling for parents, an open-mouth evaluation and fluoride applications (36). Children that have benefited from these oral health services in primary care clinics have shown a decrease in total caries-related treatments (35). The integration of oral health services into primary care settings is relatively new in the US and faces many challenges (6). Emerging evidence suggests collaboration between interdisciplinary providers may improve the general and oral health of patients. However, more studies are needed in this area. Therefore, the purpose of this study was to investigate if integrating oral health care services into a nurse practitioner-led care clinic improves patient-centered outcomes.

SECTION 3

ABSTRACT

Given oral health is an integral part of overall health; an interdisciplinary approach to clinical care is needed to achieve optimum health. Implementing a model in which oral health care services are integrated into primary care settings holds promise for achieving better overall health. The purpose of this study was to investigate an integrated care model to improve patient-centered outcomes. Secondary data from a nurse practitioner-led primary care clinic was assessed to determine the impact on patient-centered outcomes: access to care, preventive oral health services, oral health quality of life and patient satisfaction. Results revealed patients who visited the clinic either lived or worked within five miles, were satisfied with the services provided by the clinic, considered their oral health quality of life good, had a positive experience and were generally satisfied with the care received.

MANUSCRIPT

This manuscript will be submitted to the Journal of Interprofessional Care.

Introduction

The baby boomer generation is expected to live well into old age, as women and men have life expectancies of 85 and 83 years, respectively. As this population grows, their chronic health conditions and risky lifestyle behaviors of “high blood pressure; elevated cholesterol; diabetes; overweight and obesity; smoking; and physical inactivity” (CDC, 2012) will continue to follow them into the latter years of their lives. Of persons 65 years old and older, (26%) were diabetic, (42%) did not seek regular dental care, and (25%) reported fair to poor oral health status. These conditions not only affect a person’s physical health, but are also contributors to disability, poor quality of life, and early mortality (CDC,2012). Additionally, unlike previous generations, older Americans will present with full dentitions and require a full range of oral health services. To manage complex health needs, multi-disciplinary interprofessional health care teams capable of treating patients comprehensively have been suggested as a potential strategy for improving our health care system (Bodenheimer, Chen & Bennett, 2009). Today oral health care is generally delivered separately from medical care (Kaufman, Castrucci & Pearsol, 2014). However, the relationship between oral health, systemic health and overall quality of life suggest an integrated health system may be able to reap broader benefits in terms of disease prevention and improved health outcomes (Maxey & Weaver, 2016). For this reason, both the medical and dental professional communities have asserted an integrated health system, one in which oral health works within primary care, is the logical approach.

Collaborative or interprofessional practice is viewed as a key strategy to achieve the goals of the Triple Aim through team-based care (IHI, 2016). Collaborative practice describes co-located healthcare professionals from different disciplines working together to provide comprehensive care services (Stutsky & Laschinger, 2014). Integration of care can be defined as “bringing together inputs, delivery, management and organization of services related to diagnosis, treatment, care, rehabilitation and health promotion.” (Emami, Harnage & Girard, 2016). In the past two decades, nurse practitioners have become an integral part of our health care system. A significant body of research has focused on the gaps in knowledge by comparing a traditional physician-only model of care with a team-based nurse practitioner-physician model (Litaker, Mion, Planavsky et al., 2003). When comparing physician only care to care provided by a nurse practitioner there seemed to be no difference in the care provided (Litaker, Mion, Planavsky et al., 2003). Protocols of care were deemed to be equal in terms of prescribing medications, reimbursement and hospital admittance between physicians and nurse practitioners depending on state laws (Litaker, Mion, Planavsky et al., 2003). Elements of their study evaluated disease management in terms of personnel-related costs, clinical outcomes and the impact on the patient perspective. Results suggested a team-based approach could be successful in terms of clinical outcomes and increased patient satisfaction, but did not show a cost reduction (Litaker, Mion, Planavsky et al., 2003). Integration of oral care into primary care is hypothesized to benefits patients’ overall health; improve patient experience and lower costs (The Triple Aim). New types of oral health care providers, team-based care, and relaxed practice supervision laws are facilitating the integration and co-location of medical and dental providers (Bodenheimer et al, 2009). Integrated models

of care delivery are finding that interprofessional collaboration can be achieved in primary care settings; however, the method in which integration takes place may be different. Maxey and Weaver, 2016 focused their study on five health centers designed to support oral health integration into primary care. The health centers incorporated oral health risk assessments, clinical assessments, education, preventive interventions, and dental care coordination into primary care. Some centers relied on doctors to implement integration while other centers had dental hygienists, nurses, medical assistants, and outreach team members implement the integration. Their conclusions deemed interprofessional integration successful to improve the delivery of oral health care services to their patients regardless of how or who implemented the integration (Maxey & Weaver, 2016). The Neighborhood Outreach Action for Health (NOAH) and pediatric primary care providers are providing children with oral services at their well-child exams (Heuer, 2007; Pahel et al, 2011). Patient satisfaction has increased and incidences of early childhood caries have decreased thanks to programs such as these (Heuer, 2007; Pahel et al., 2011).

Emerging evidence suggests collaboration between medical and dental providers may improve the general and oral health of patients. However, more studies are needed to determine the outcomes of an integrated care model. Therefore, the purpose of this study was to investigate if integrating oral health services into a nurse practitioner-led care clinic improves patient-centered outcomes.

Methods and Materials

The research design for this quantitative study was descriptive. Data was collected from the clinic's medical and dental software databases, EPIC and AxiUm respectively, for the purpose of describing the effect of integrating oral health services on patient-centered outcomes. Specific outcomes studied were access to care, preventive oral health services, oral health quality of life and patient satisfaction. The study was conducted at the University of Minnesota Nurse Practitioner Clinic from June 2017 to December 2017. The clinic opened in April 2015 downtown Minneapolis, close to the University of Minnesota and public transportation depots. Oral health providers, specifically a dental hygienist and dental therapist, were incorporated into the clinic in March 2016 on a part time basis. However, preventive and restorative services were not provided until April 2017. Up to the time of providing services the DT and DH were integrating equipment and supplies necessary for dental services to be incorporated into the clinic. This clinic setting was selected because of its affiliation with the University of Minnesota and its interdisciplinary composition of providers: nurse practitioners (NP), certified medical assistant (CMA), pharmacist, dental therapists (DT), and dental hygienist (DH).

Study Sample. Patients visiting the University of Minnesota Nurse Practitioner Clinic for medical, dental and pharmaceutical services comprised the study sample. The sampling strategy was a nonprobability sampling technique of convenience with no randomization. To be eligible to participate in the study, subjects had to be 18 years of age or older, able to read/understand English and had an appointment at the clinic within the study period. All patients of record from the designated time period were considered to obtain the largest population base possible. Data from the clinic's databases were used to investigate

patient-centered outcomes using the following metrics: 1). Access to care as measured by distance traveled to the clinic (zip codes) obtained from the patient registration form; 2). Types of preventive dental services provided as measured by current dental terminology codes (CDT codes); 3). Range of services provided by all health providers during an appointment as measured by CDT codes and medical (CPT) diagnostic codes; 4). Oral health related quality of life as measured by the Oral Health Impact Profile (OHIP5) 5 question survey; and; 5). Patient satisfaction as measured by a thirteen-question survey. All data collected for the study, including personal protected health information was de-identified and stored securely via the data shelter.

Instruments. The five-item version of the Oral Health Impact Profile (OHIP5) (Appendix A) was used to assess the subject's perceived quality of life. This instrument has been validated and deemed reliable as seen within the literature (Flynn, John, Kohli, Naik & Self, 2016). The OHIP5 asks questions related to the frequency of the following issues during the past month: difficulty chewing, painful aching in the mouth, feelings about appearance, flavor quality of food and difficulty in performing usual jobs. The survey uses a Likert scale from 0-4; 0 = never, 1 = hardly ever, 2 = occasionally, 3 = fairly often and 4 = very often. The OHIP questionnaire was given to NP clinic patients that were seen for a dental visit or patients seen during a combined medical and dental appointments.

The clinical team at the University of Minnesota Nurse Practitioner Clinic initially developed the patient satisfaction survey. The survey was modified for study purposes to obtain information on patient-centered outcomes. The survey consisted of 13 questions pertaining to a patient's experience at the clinic, as well as demographic data.

The survey was piloted at the clinic for four months to help determine if questions were valid. Based on feedback gained during the pilot, revisions to the survey were made. (Appendix B). Every patient that had an appointment at the clinic was given the opportunity to complete the survey.

Statistical Analysis. Categorical variables such as age, gender, provider encounters and types of services provided were reported using frequencies and percentages. Descriptive statistics, mean and standard deviation were calculated for each question pertaining to patient experience and the OHIP -5 score. The alpha level that was used is 0.05. The statistical program used by the statistician for analysis was SAS Version 3, SAS Institute Inc., Cary, NC. This study was approved by the IRB at the University of Minnesota, #00000375.

Results.

During the study period, 609 patients visited the clinic for medical care; 75 patients sought dental care only and 23 patients had co-visits (n=707). Patients who were seen at the clinic had a range of education levels but the majority of the population had a bachelor's degree (See Table 1 for participant characteristics). The majority of dental and co-visit patients did not want to disclose their ethnicity or left the question blank on the questionnaire; 86% of the medical population identified themselves as white. The majority of the medical patient population was female, while the majority of the dental and co-visit populations were male. The average age of the patients in all three groups was between 18-30 years old. Patients seeking only care by a medical provider saw a nurse practitioner or a pharmacist. Patients seeking only dental care saw a dental therapist

or dental hygienist while patients seeking both medical and dental care (co-visits) saw a combination of providers.

Relating to access to care, most of the participants traveled less than five miles to visit the clinic with the longest distance away being just over fifteen miles (Figure 1; Point C). The most common reason for coming to the clinic for a dental and/or co-visit was for an oral assessment. Oral assessments included a patient's dental history, a clinical examination, and diagnostic radiographs to assess a patient's oral health; an individualized treatment plan was then developed if needed. The patients with medical visits were most commonly seen for evaluations that included consultations and outpatient services such as blood draws and lab work.

Overall, the results indicated patients who had both dental visits and co-visits (n=98) were satisfied with their oral health related quality of life, as the average score on the Oral Health Impact Profile (OHIP) was 7.1 out of a possible 20. Five patients were under the age of 18 and therefore their OHIP questionnaires were excluded from the study.

Findings from the patient satisfaction survey revealed the top two ways people heard about the clinic were referral from another clinic (24%) and referral from a family member (16%). (See Table 4). The top three reasons people decided to visit the clinic for their health care needs were: 1) they could get an appointment right away (42%), 2) the clinic was close proximity to either work or home (34%) and 3) the clinic was recommended by a trusted source (21%). Overall, the survey results showed a positive experience at the clinic and people were generally satisfied with the care received (See Table 4).

Discussion

This study set out to evaluate the effect of integrating oral health services in a nurse practitioner-led primary care setting on patient-centered outcomes, specifically, access to care, preventive oral health services, oral health related quality of life and patient satisfaction.

Access to Care. Accessibility and location of the clinic showed to be a large contributing factor as to why people chose to visit the clinic. Of interest, was the fact that the majority of the patients were young (18-30), lived or worked within five miles of the clinic and were well educated, 30% had a bachelor's degree. This age group, known as Millennials, are the second largest in the US history and make up 35% of the US labor force (Fry, 2018; Sweeney, 2006). In contrast to GenXers and Baby Boomers, Millennials are more likely to prefer speed and convenience from their healthcare providers over a personal connection (PR Newswire, 2016). They also expect more selectivity, personalization and customization of their products and services (Sweeney, 2006). The efficiency of having access to medical, pharmaceutical, and dental services in a location close to work or home undoubtedly was appealing to the Millennial generation. The NP clinic is located one block from public light rail station and since work-life balance is very important to Millennials, the speed and accessibility of the NP clinic may have fit their lifestyle preferences (PR Newswire, 2016). Patients in this study were very satisfied with the wait time for appointments and viewed the ability to coordinate schedules and services with multiple providers as an advantage of the interdisciplinary clinic.

Preventive Oral Health Services. During the study period, fewer patients were seen for dental visits than for medical, as medical services had been offered since April 2015.

Dental and co-visit services were added to the clinic in April 2017. Since the addition of dental services such as oral examinations, dental radiographs, dental cleanings and restorative services, the number of co-visits has been rising. Evidence suggests that providing preventive dental care for people with chronic systemic disease will improve oral health and reduce the cost of dental treatment (Pourat, Moonkyung & Chen, 2018). In an integrated health system, dental providers may screen for both oral and systemic diseases and a common approach to managing these diseases can be initiated. Dental providers are then able to reinforce health care recommendations from medical providers and vice versa.

OHIP. There is a growing body of evidence suggesting that a patient's overall health and quality of life is influenced by his or her health status (Hummel, Phillips, Holt & Hayes, 2015). Good oral health has many advantages, effective and efficient chewing, good nutrition, better sleep and concentration and a higher self-esteem. Patients who visited the clinic completed a five-question oral health impact profile at their appointment. The average score was 7.1 out of a possible 20, indicating a higher quality oral health status. These results are likely due to the demographics of the patients visiting the clinic. Had the population been older, patients may have a different perception of their oral health. Elderly populations have a higher probability of suffering from multiple health disorders, and poorer economics, combined with a higher likelihood of cultural, educational and inadequate social interactions which could all result in a poor quality of life (Khaje-Bishak, Payahoo & Pourghasem, 2014).

Patient Satisfaction. Overall, the majority of patients with co-visits were satisfied with the services of the nurse practitioner-led clinic. Findings from the patient satisfaction survey

suggest those who saw more than one provider (39%) were very satisfied in the services provided, as well as the explanation of diagnosis or treatment recommendations they received. This finding supports existing literature, as studies have found that team-based care leads to higher levels of patient satisfaction (Litaker, Mion, & Planavsky et al, 2003; Munding, Kane, & Lenz et al, 2000). Previous studies done on medical team-based care, physician-nurse practitioner relationships and utilizing registered nurses to their full capacity, have shown promise that a team-based care approach could be successful as well as interdisciplinary, integrated care models (Litaker, Mion & Planavsky 2003; Heuer 2007; Borges Da Silva, Brault, & Pineault, 2018). When viewing the benefits of a team-based care approach it is important to evaluate the benefits from a patient satisfaction standpoint as well as a cost/benefit standpoint. One study that evaluated the impact on costs as well as clinical effectiveness and patient perception showed an increase in patient's perceptions, as well as better clinical outcomes, due to the team-based approach. However, the results of this study also found an increase in costs associated with team-based care (Litaker et al, 2003). The higher costs were associated with the increase of healthcare personnel (nurse practitioner and physician) treating the patient rather than just the physician. However, it was stated that if the study period was extended, a "steady state" might have been achieved resulting in comparable personnel costs (Litaker et al, 2003). Due to the differences in experiences and professional knowledge, collaborating healthcare team members can increase the effectiveness and value to patient care (Litaker et al, 2003). The NP clinic in this study employed a dental therapist and a nurse practitioner rather than a dentist and a physician; in doing so, this NP-led clinic model may be more cost-effective by keeping personnel costs down because the salaries of

dental therapists and nurse practitioners are less than dentists and physicians. Future studies are needed to evaluate the cost-efficiencies of care models similar to the NP clinic.

Oral health is integral to general health and therefore a common, interdisciplinary approach is needed to achieve optimal health (Mawardi, Elbadawi & Sonis, 2015). This study adds to the body of knowledge that integrating oral health care services into primary care delivery may benefit patient-centered outcomes. However, integration of interdisciplinary providers is not always a seamless transition. Interoperability of electronic medical and dental records is a barrier, although efforts are underway to eliminate this hurdle, progress is slow. There are also potential problems in regards to leadership roles within an interdisciplinary setting. Can two or more disciplines work together and respect each other's knowledge and experience without creating tension among the group when differences of opinion occur? A study by Borges Da Silva et al, was completed that looked at the difficulties in collaboration and the results showed that "team members often do not acknowledge, do not understand, or do not respect each other's roles and knowledge contributions." (Borges Da Silva et al, 2018) This can lead to issues in having a cohesive clinic and creating an environment that improves patient care.

Interprofessional collaboration and integrated care is a new concept that still needs more investigation to determine if integrated care does in fact improve overall health; improve patient experience and lower costs of health care. Future investigative studies should take into account all aspects regarding patient care (diagnosing, treatment, prevention) and the personnel needed to achieve a successfully integrated clinic to

determine if integrative care meets the goals of the Triple Aim. This study could have been longer in duration to gather more patient data and allow more time for dental services to be incorporated into the clinic.

Limitations. The addition of dental providers to the NP clinic was new at the time of this study. Integration of dental services took longer than originally anticipated due to the part time nature of the dental service offerings, unanticipated obstacles such as delays in incorporating dental equipment and supplies into the clinic, as well obstacles to increasing the number of patients seen for dental services. The study sample was small and therefore the results cannot be generalized.

Conclusion

The effects of integrating oral health services on patient-centered outcomes in the nurse practitioner-led primary care clinic were favorable. The NP clinic provided access to care close to home or work. Patients were satisfied with wait time and valued the efficiency of seeing more than one provider. Patients who had a co-visit appointment were able to have a diagnostic oral assessment to evaluate for future dental needs.

REFERENCES

- Bodenheimer, T., Chen, E. & Bennett, HD. (2009). Confronting the growing burden of chronic disease: Can the U.S. health care workforce do the job? *Health Affairs*, 28, 64-74.
- Borges Da Silva, R., Brault, I., & Peneault, R., et al. (2018). Nursing practice in primary care and patients' experience of care. *J Primary Care & Community Health*, 9, 1-7
- Emami, E., Harnagae, H., & Girard, F., et al. (2016). Integration of oral health into primary care: a scoping review protocol. *BMJ Open*.
- Flynn, P., John, M.T., Kohli, N., Naik, A., & Self, K. (2016). Validation of the English-language version of 5-item oral health impact profile. *Journal of Prosthodontics Research*, 60, 85-91.
- Fry, R. (2018). Millennials are the largest generation in the U.S. labor force. *Pew Research Center*. Retrieved from www.pewresearch.org
- Heuer, S. (2007). Integrated medical and dental health in primary care. *Journal for Specialists in Pediatric Nursing*, 12, 61-65
- Hummel, J., Phillips, K., Holt, B., & Hayes, C. (2015). Oral health: an essential component of primary care. *Aulis Health*.
- Institute for Healthcare Improvement. (2016). Initiatives. Retrieved from www.ihl.org.
- Kaufman, N., Castrucci, B., & Pearsol, J., et al. (2014). Thinking beyond the silos: emerging priorities in workforce development for state and local government public health agencies. *Journal of Public Health Management Practice*, 20, 557-565
- Khaje-Bishak, Y., Payahoo, L., & Pourghasem, B., et al. (2014). Assessing the quality of life in elderly people and related factors in Tabriz, Iran. *J Caring Sci*, 3, 257-263.
- Litaker, D., Mion, L., & Planavsky, L., et al. (2003). Physician-nurse practitioner teams in chronic disease management: the impact on costs, clinical effectiveness and patients' perception of care. *Journal of Interprofessional Care*, 17.
- Mawardi, H.H., Elbadawi, L.S., & Sonis, S.T. (2015). Current understanding of the relationship between periodontal disease and systemic disease. *Saudi Medical Journal*, 36, 150-158.

- Maxey, H., & Weaver, D. (2016). Oral health and primary care: exploring integration models and their implications for dental hygiene practice. *Int J Evid Based Pract Dental Hygienist*, 2, 196-202
- Pahel, B.T., Rozier, R.G., & Stearns, S.C., et al. (2011). Effectiveness of preventive dental treatments by physicians for young Medicaid enrollees. *Journal of Pediatrics*, 127, 682-688.
- Pourat, N., Moonkyung, K.C., & Chen, X. (2018). Evidence of effectiveness of preventive dental care in reducing dental treatment use and related expenditures [published online ahead of print February 6, 2018]. *J Public Health Dent*.
- PR Newswire. (2016). Compared to older generations, millennials are more likely to prefer speed and convenience over personal, comprehensive interactions with healthcare professionals. *WebMD Health Services*. Retrieved from www.prnewswire.com
- Stutsky, B.J. & Laschinger, H.K.S. (2014). Development and testing of a conceptual framework for interprofessional collaborative practice development and testing of a conceptual framework. *Interprofessional Collaborative Practice*, 2.
- Sweeney, R. (2006). Millennial behaviors and demographics. *University Librarian, New Jersey Institute of Technology*.
- Ward, B.W., Schiller, J.S. & Goodman, R.A. (2014). Multiple chronic conditions among US adults: a 2012 update. *Preventing Chronic Disease*, 11, 130-389.

SECTION 4

TABLES

Table 1: Sample Characteristics

AGE	Medical Group	Dental Group	Co-Visit Group	Total
Under 18	0 0.00%	5 6.67%	0 0.00%	5
18-30 years	206 33.83%	30 40.00%	11 47.83%	247
31-40 years	126 20.69%	12 16.00%	5 21.74%	143
41-50 years	98 16.09%	21 28.00%	5 21.74%	124
51-60 years	87 14.29%	7 9.33%	1 4.35%	95
Over 60 years	92 15.11%	0 0.00%	1 4.35%	93
Total	609	75	23	707

GENDER	Medical Group	Dental Group	Co-Visit Group	Total
Male	245 40.23%	42 56.00%	16 69.57%	303
Female	364 59.77%	33 44.00%	7 30.43%	404
Total	609	75	23	707

ZIP CODE	Medical Group	Dental Group	Co-Visit Group	Total
Missing Data	0 0.00%	3 4.00%	1 4.35%	4
55102	8 1.31%	1 1.33%	0 0.00%	9
55112	4 0.66%	2 2.67%	1 4.35%	8
55124	0 0.00%	0 0.00%	1 4.35%	1
55401	32 5.25%	5 6.67%	1 4.35%	38
55404	89 14.61%	35 46.67%	13 56.52%	137
55406	19 3.12%	11 14.67%	1 4.35%	31
55408	12 1.97%	4 5.33%	0 0.00%	16
55412	10 1.64%	0 0.00%	2 8.70%	12
55414	36	6	1	43

	5.91%	8.00%	4.35%	
55415	43 7.06%	0 0.00%	1 4.35%	44
55418	23 3.78%	6 8.00%	0 0.00%	29
55421	4 0.66%	2 2.67%	0 0.00%	6
55454	3 0.49%	0 0.00%	1 4.35%	4
Total	283	75	23	382

Table 2: Services Provided at the Clinic Within Study Timeframe

Services Provided	Medical Group	Dental Group	Co-Visit Group	Total
Medical Evaluation & Management	312 51.23%	0 0.00%	13 56.52%	325
Medical Anesthesia	0 0.00%	0 0.00%	0 0.00%	0
Medical Surgery	134 22.00%	0 0.00%	1 4.35%	135
Medical Radiology	0 0.00%	0 0.00%	0 0.00%	0
Medical Laboratory/Pathology	189 31.03%	0 0.00%	4 17.39%	193
Medical Medicine	62 10.18%	0 0.00%	2 8.70%	64
Dental Diagnostic	0 0.00%	48 64.00%	23 100%	71
Dental Preventative	0 0.00%	10 13.33%	0 0.00%	10
Dental Restorative	0 0.00%	17 22.67	0 0.00%	17

Table 3: OHIP Results

Question	N	N Miss	Mean	Std Dev	Min	Max
Q1	93	1	1.9	1.7	0.0	4.0
Q2	93	1	2.1	1.6	0.0	4.0
Q3	92	2	1.5	1.6	0.0	4.0
Q4	91	3	0.8	1.3	0.0	4.0
Q5	92	2	0.9	1.3	0.0	4.0
OHIP Score	91	3	7.1	6.2	0.0	19.0

Table 4: Patient Survey Results

Highest Level of Education	
No High School Diploma	11 7.14%
High School Diploma	16 10.39%
Some College	30 19.48%
BS Degree	47 30.52%
MS Degree	25 16.23%
PhD	20 12.99%
Prefer not to Disclose	1 0.65%
Missing Data	4 2.60%

Where you are currently receiving your oral care	
Emergency Room	1 0.65%
MN School of Dentistry	62 40.26%
Private Dental Office	2 1.30%
None	21 13.64%
Missing Data	68 44.16%

Type of Patient: New or Returning	
New Patient	122 79.22%
Returning Patient	25 16.23%
Missing Data	7 4.55%

How Satisfied Were You with Explanation of Diagnosis and Treatment	
Somewhat Satisfied	4 2.60%
Very Satisfied	127 82.47%
Does not Apply	3 1.95%
Missing Data	20 12.99%

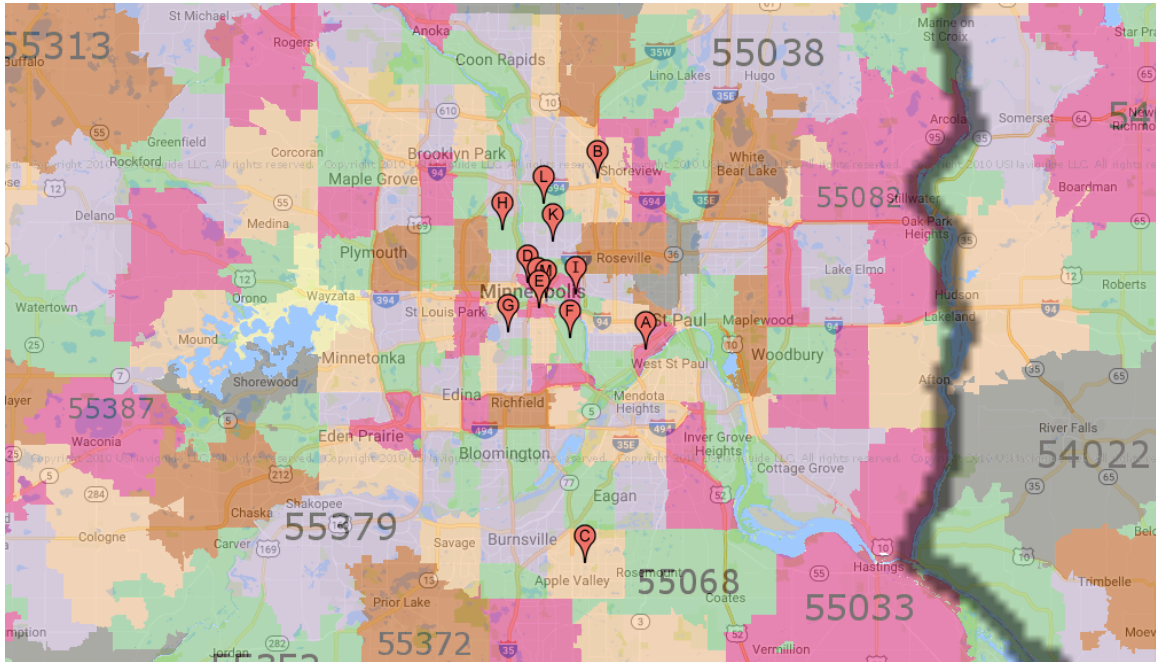
How Satisfied Were You with Seeing More Than One Provider	
Somewhat Satisfied	4 2.60%
Very Satisfied	60 38.96%
Does Not Apply	65 42.21%
Missing Data	24 15.58%

How Satisfied Were You With The Wait Time For An Appointment	
Very Satisfied	141 91.56%
Somewhat Satisfied	4 2.60%
Not Satisfied	1 0.65%
Does Not Apply	1 0.65%
Missing Data	7 4.55%

Which Provider(s) Did You See	
Nurse Practitioner (NP)	133 86.36%
NP + Dental Therapist (DT)	1 0.65%
NP + Pharmacist	5 3.25%
DT	2 1.30%
Pharmacist	1 0.65%
No Data	12 7.79%

FIGURES

Figure1: Represented Zip Codes



SECTION 5

PRACTICAL APPLICATION

Oral health is integral to general health. Chronic diseases and oral diseases share common risk factors (7) and therefore, a common, interdisciplinary approach to chronic disease management is needed to achieve optimal health. This study set out to determine if incorporating oral health care services into a nurse practitioner-led primary care clinic could improve patient outcomes; access to care, preventative oral health services, oral health quality of life and patient satisfaction. The results of this study showed that overall patients who visited the clinic were satisfied with the services they received, the convenience of the clinic, considered their oral health quality of life to be high and in general were satisfied with the clinic. This study can be used to fill in a gap of knowledge in regards to interprofessional collaboration; it shows that two different healthcare professions can work cohesively to provide better overall patient care. This study is of interest because as more of the younger population wants their healthcare streamlined and the older population are living longer, new ways need to be developed for people to receive the best possible healthcare. By combining oral health care and primary care into a single practice people are able to coordinate their care between medical and dental providers more easily and healthcare providers are able to coordinate care for their patients more efficiently.

SECTION 6

APPENDICES

APPENDIX A: ORAL HEALTH IMPACT PROFILE FORM

Oral Health Impact Profile (5-item version)

INSTRUCTIONS

THE QUESTIONNAIRE.

This questionnaire asks how troubles with your teeth, mouth, dentures or jaws may have caused problems in your daily life. We would like you to complete the questionnaire even if you have good dental health. We would like to know how often you have had each of the 5 listed problems during the LAST MONTH.

HOW TO ANSWER THE QUESTIONS

Each question on the left hand side of the page asks you about a particular dental problem. You should think about each question in turn, and check the box under the answer to the right of the question, to indicate how often you have had the problem during the last month.

How often have you had the following problem during the LAST MONTH?	VERY OFTEN	FAIRLY OFTEN	OCCA-SIONALLY	HARDLY EVER	NEVER
1. Have you had <u>difficulty</u> chewing any foods because of problems with your teeth, mouth, dentures or jaws?					
2. Have you had <u>painful aching</u> in your mouth?					
3. Have you felt <u>uncomfortable</u> about the <u>appearance</u> of you teeth, mouth, dentures or jaws?					
4. Have you felt that there has been <u>less flavor</u> in your food because of problems with your teeth, mouth, dentures or jaws?					
5. Have you had <u>difficulty</u> doing your usual <u>jobs</u> because of problems with your teeth, mouth, dentures or jaws?					

APPENDIX B: PATIENT SATISFACTION SURVEY

UNIVERSITY OF MINNESOTA NURSE PRACTITIONER CLINIC PATIENT SATISFACTION SURVEY



We are interested in hearing how you felt about your visit today. Please take a few minutes to answer the following questions and let us know! We will use your feedback to improve our clinic. You do not have to complete this survey; it is voluntary and anonymous. Your response will not affect your care at our clinic.

WHAT BROUGHT YOU HERETODAY

Date you were seen: ____ (Day) / ____ (Month) / ____ (Year)

How did you hear about us?

- Postcard mailer
- Flyer in building
- Saw the sign
- Family member, friend or co-worker
- News/Article
- Suggestion of scheduling person on phone
- Website
- Referral from another clinic: _____
- Other: _____

What made you decide to visit this clinic (please check all that apply)?

- Prefer Nurse Practitioner
- Could get in right away
- Had good prior experience
- Close to home or work
- Recommended by trusted source
- Couldn't get in to regular doctor
- Cost effective
- Referral from another clinic/scheduler: _____
- Other: _____

YOUR EXPERIENCE

Who did you see today (please check all that apply)? Nurse Practitioner Dental Therapist Pharmacist

How satisfied are you with...	Very Satisfied ³	Somewhat Satisfied ²	Not At All Satisfied ¹	Does not Apply
How long you waited to get an appointment ¹	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being seen by more than one health care provider (e.g., pharmacist, dental professional) ²	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The way your health care provider(s) explained your diagnosis and treatment plan ³	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

TELL US A BIT ABOUT YOURSELF

Patient type⁷ Where are you currently receiving your oral health care?¹
 New patient¹ Emergency room¹ Private Dental Office²
 Returning patient² MN School of Dentistry² None⁴

Gender⁷ Age⁸
 Female¹ Other, please specify²: _____ Under 18¹ 41-50⁴ Prefer not to disclose⁷
 Male² Prefer not to disclose⁴ 18-30² 51-60⁵
 31-40³ Over 60⁶

Race/Ethnicity¹² Select all that apply
 American Indian or Alaska Native³ Hispanic, Latino, or Spanish origin⁴ White⁷
 Asian² Middle Eastern or Northern African⁵ Other, please specify²: _____
 Black or African American³ Native Hawaiian or Other Pacific Islander⁶ Prefer not to disclose⁹

Highest Level of Education¹³
 Did not complete High School¹ Bachelor's Degree⁴ Prefer not to disclose⁷
 High School/GED² Master's Degree⁵
 Some College³ Advanced Graduate work or Ph.D.⁶

Do you have any comments or concerns about today's visit?¹⁴ _____

APPENDIX C: AXIUM AND EPIC DATA COLLECTION SHEET

<u>Pt</u> <u>Id</u>	<u>Age</u>	<u>Gender</u>	<u>Ethnicity</u>	<u>Zip</u>	<u>Medical</u> <u>Provider</u>	<u>Dental</u> <u>Provider</u>	<u>Service</u>	<u>OHIP</u>	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Q5</u>

APPENDIX D: COMPREHENSIVE LIST OF REFERENCES

1. Ward BW, Schiller JS, Goodman RA. Multiple chronic conditions among US adults: a 2012 update. *Prev Chronic Dis*. 2014;11:130-389.
2. Bodenheimer T, Chen E, Bennett HD. Confronting the growing burden of chronic disease: Can the U.S. health care workforce do the job? *Health Affairs*. 2009;28(1):64-74.
3. Kaufman N, Castrucci B, Pearsol J, et al. Thinking beyond the silos: emerging priorities in workforce development for state and local government public health agencies. *J Public Health Management Practice*. 2014;20(6):557-565.
4. Maxey H, Weaver D. Oral health and primary care: exploring integration models and their implications for dental hygiene practice. *Int J Evid Based Pract Dental Hygienist* 2016;2(3):196-202
5. Bansal M, Rastogi S, Veneeth NS. Influence of periodontal disease on systemic disease; inversion of a paradigm: a review. *J Med Life*. 2013;6:126-130.
6. Emami E, Harnagae H, Girard F, et al. Integration of oral health into primary care: a scoping review protocol. *BMJ Open* 2016. doi:10.1136/bmjopen-2016-013807.
7. Mawardi HH, Elbadawi LS, Sonis ST. Current understanding of the relationship between periodontal and systemic diseases. *Saudi Med J*. 2015;36(2):150–8.
8. Gehrig J, Willmann D. *Periodontics for the Dental Hygienist*. 4th ed. Philadelphia, PA: Wolters Kluwer; 2016.
9. John V, Alqallaf H, De Bedout T. Periodontal Disease and Systemic Diseases: An Update for the Clinician. *J Indiana Dent Assoc*. 2016;95(1):16–23.
10. Sanchez P, Everett B, Salamonson Y, et al. Oral healthcare and cardiovascular disease. *Journal of Cardiovascular Nursing*. 2017.
11. Bokhari SAH, Khan AA, Butt AK, et al. Non-surgical periodontal therapy reduces coronary heart disease risk markers: a randomized controlled trial. *J Clin Periodontol* 2012;39:1065-1074. doi: 10.1111/j.1600-051x.2012.01942.x.
12. Caula AL, Lira-Junior R, Tinoci EMB, et al. The effect of periodontal therapy on cardiovascular risk markers: a 6-month randomized clinical trial. *J Clin Periodontol* 2014;41:875-882. doi: 10.1111/jcpe.12290.
13. Lockhart P, Bolger a, Papapanou P, Osinbowale O, Trevisan M, et al. Periodontal disease: does the evidence support an independent association? A statement from the American Heart Association. *J American Heart Association* 2012.
14. Kim J, Amar S. Periodontal disease and systemic conditions: a bidirectional relationship. *Odontology* 2006;94:10-21.

15. Lamster IB, Lalla E, Borgnakke W, et al. The relationship between oral health and diabetes mellitus. *J American Dent Association* 2008;139.
16. Alberti KGMM, Zimmet PZ. Definition, diagnosis and classification of diabetes mellitus and its complications. *Diabetic Medicine* 1998;15(7):539-553.
17. Glascoe A, Brown R, Robinson G, Hailu K. Periodontics and oral-systemic relationships: diabetes. *Journal of the California Dental Association*. 2016;44(1):29-34.
18. Saengtibovorn S, Taneepanichskul S. Effectiveness of lifestyle change plus dental care program in improving glycemic and periodontal status in aging patients with diabetes: a cluster, randomized, controlled trial. *J Clin Periodontol* 2015;507-515.
19. Kim J, Amar S. Periodontal disease and systemic conditions: a bidirectional relationship. *Odontology* 2006;94:10-21. doi: 10.1007/s10266-006-0060-6.
20. Pischon N, Pischon T, Kroger J et al. Association among rheumatoid arthritis, oral hygiene and periodontitis. *J Clin Periodontol* 2008;6:979-986.
21. Hoyuela CPS, Furtado RNV, Chiari A, et al. Oro-facial evaluation of women with rheumatoid arthritis. *J of Oral Rehabilitation* 2015;42:370-377.
22. Silvestre-Rangil J, Bagan L, Silvestre FJ, et al. Oral manifestations of rheumatoid arthritis, a cross sectional study of 73 patients. *Clin Oral Invest* 2016;20:2575-2580.
23. Bartoid PM, Marshall RI, Haynes DR. Periodontitis and rheumatoid arthritis: a review. *J Clin Periodontol* 2005;76(11):2066-2074.
24. Mercado FB, Marshall RI, Klestov AC, et al. Relationship between rheumatoid arthritis and periodontitis. *J Clin Periodontol* 2001;6:779-787.
25. Gonzalez S, Sung H, Sepulveda D, et al. Oral manifestations and their treatment in Sjogren's syndrome. *Oral Disease* 2014;20:153-161.
26. Napenas J, Rouleau T. Oral complications of Sjogren's syndrome. *Oral Maxillofacial Surg Clin N AM* 2014;55-62.
27. Mathews SA, Kurien BT, Scofield RH. Oral manifestations of Sjogren's syndrome. *J Dent Res* 2008;87(4):308-318.
28. Stutsky BJ, Laschinger HKS. Development and testing of a conceptual framework for interprofessional collaborative practice development and testing of a conceptual framework. *Interprofessional Collaborative Practice*. 2014;2(2).
29. Brandt B, Lutfiyya MN, King J, Chioreso C. A scoping review of interprofessional collaborative practice and education using the lens of the triple aim. *Journal of Interprofessional Care*. 2014;28(5):393-399.

30. Institute for Healthcare Improvement. [Internet]. Cambridge; 2016. Initiatives. Available from: www.ihl.org
31. Litaker D, Mion L, Planavsky L, et al. Physician-nurse practitioner teams in chronic disease management: the impact on costs, clinical effectiveness, and patients' perception of care. *Journal of Interprofessional Care*. 2003;17(3).
32. Pourat N, Moonkyung KC, Chen X. Evidence of effectiveness of preventive dental care in reducing dental treatment use and related expenditures [published online ahead of print February 6, 2018]. *J Public Health Dent*. <https://doi.org/10.1111/jphd.12262>
33. Mundinger MO, Kane RL, Lenz ER, et al. Primary care outcomes in patients treated by nurse practitioners or physicians. *J American Medical Association* 2000;283:59-68.
34. Heuer S. Integrated medical and dental healths in primary care. *Journal for Specialists in Pediatric Nursing*. 2007;12(1):61-65.
35. Pahel BT, Rozier, RG, Stearns SC, et al. Effectiveness of preventive dental treatments by physicians for young Medicaid enrollees. *Pediatrics* 2011;127:682-688.
36. Kranz A, Rozier RG, Preisser JS, et al. Examining continuity of care for Medicaid enrolled children receiving oral health services in medical offices. *Matern Child Health* 2015;19(1):196-203.