

Implementing A Routine Diabetic Foot Screening in A Primary Care Clinic

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Notes from the Author

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Abstract

Diabetic foot ulcers are one of the chief complications associated with diabetes, which can be managed in a primary care setting through early identification, lifestyle modification, diabetic management, and referral. This DNP project aimed to implement provider and staff education to improve diabetic foot screening practices and implement a “Three-Minutes Diabetic Foot Screening” tool for all diabetic patients in a primary care setting at every visit. The project leader conducted a four-week retrospective chart audit on foot assessments prior to staff education, and weekly chart audits over twelve weeks to evaluate the progress of the diabetic foot screening after the post-educational intervention. At the completion of the project, of the 450 diabetic patients seen, 204 (45.3%) patients were screened. Of the 204 that were screened, 29 (14.2%) patients were identified with diabetic foot complications. Out of the 29 patients with complications, seven (24.1%) patients were referred to podiatry and vascular surgery, and the other 22 (75.9%) patients were managed at the project site. The new screening tool and patient education reduced the incidence or severity of complications such as diabetic foot ulcers and amputations. Regular staff education, frequent foot screening, diabetic foot education at every visit, precise documentation, early diagnosis and treatment, and referral to a specialist will improve the outcomes of diabetic patients at a primary care clinic.

Keywords: diabetes, diabetic foot, foot assessment, foot care, education, and prevention

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Section I. Introduction

Background

Diabetic Mellitus (DM) is a chronic disease and causes significant health problems globally. The incidence and prevalence of diabetes have been progressively increasing over the past few decades (World Health Organization, 2016). According to International Diabetes Federation (2019), one out of eleven people has diabetes worldwide, with a projection that more than 642 million people will have diabetes in 2040. Diabetes is the seventh-leading cause of death in the United States, with over 79,000 deaths annually (The United Health Foundation, 2020). Diabetic patients with uncontrolled blood sugar, constant pressure or friction, lack of self-foot care practice, higher body mass index (BMI), loss of foot sensation, decreased lower extremity circulation, and smoking history are highly likely to develop foot ulcers (Mariam et al., 2017). A diabetic patient is also at an increased risk of developing other foot complications such as neuropathy and lower-limb amputations (American Diabetes Association, 2019). Neuropathy and peripheral arterial diseases are the main predisposing factors that lead to diabetic foot ulcers (DFUs), and trauma is the primary triggering factor (Jeffcoate et al., 2018). An evidence-based study showed that 15% of diabetic patients may progress to a foot ulcer during their lifetime (Allen et al., 2016). Diabetic foot ulcers may lead to increased mortality and morbidity, loss of function, and higher amputation rates (Allen et al., 2016).

Organizational Needs Statement

A lower extremity foot ulcer is devastating, complex, and costly, with the possibility of severe consequences. Diabetic patients reported non-traumatic lower extremity amputations, which affect daily living activities, decreased mobility, and capacity to work or socialize, which place them at a higher risk for depression and consequent amputations (American Diabetes

Association, 2019). The prevalence of diabetic foot ulcers recognized between Medicare beneficiaries was 6%, 5% among the US veterans, and 6.3% globally (Armstrong et al., 2017). Diabetic foot ulcers increase the financial burden on patients and families, healthcare systems, and the country as well. The average yearly cost of a diabetic foot ulcer per patient is \$8659 (Zhang et al., 2016). The Agency for Healthcare Research and Quality (AHRQ) evidence-based Care Transformation Support (ACTS) quadruple aims are improved clinician and patient experience, lower the cost, and better outcomes (Agency for Healthcare Research and Quality, n.d.). Educating the clinician on a routine diabetic foot assessment could improve provider experience, early detection of risk factors, treatment, referrals, patient satisfaction, lower costs, and better patient outcomes. Diabetic patients are at increased risk of developing heart disease, retinopathy, peripheral vascular diseases, infections, and nerve damage leading to severe injuries, infections, the new onset of diabetic foot ulcers, or delayed wound healing or amputations (Rastogi et al., 2020). These complications can be identified and treated earlier if the providers follow a standard foot assessment guideline during the primary care visit. One of the Healthy People 2030 objectives is to reduce lower extremity amputations from 4.9 to 4.3 per 1,000 adults (Healthy People 2030, 2020). However, there is no data available to measure the diabetic foot ulcers at the primary care site.

The incidence and prevalence of diabetes in North Carolina (NC) have increased steadily. They have become more than double during the past decade, estimated as 1.27 million NC adults having prediabetes or diabetes (Young & Potru, 2011). According to the AHRQ, the national benchmark for hospital admission for lower extremity amputations per 1,000 adults with diabetes is 13.5. However, the estimated lower extremity amputation is 32.1 per 1,000 people, far away from the national benchmark. There is currently no organizational benchmark available since the

site has no existing process for diabetic foot screening. The American Diabetic Association recommends yearly foot examinations for all diabetic patients and more frequent screening for patients with high risk for diabetic foot ulcers (ADA, 2019). The comprehensive annual examination includes risk assessment stratification, visual inspection, lower extremity pulse assessment, and a sensory check (ADA, 2019). International, national, and local guidelines recommend annual foot screening for all patients with diabetes (Allen et al., 2016).

A diabetic foot ulcer is one of the chief complications associated with diabetes, which can be managed in a primary care setting through early identification, lifestyle modification, diabetic management, and referral (ADA, 2019). Providers in the primary care setting for the project were responsible for diabetic foot screening, early detection of risk factors, initiating interventions and referrals based on assessment findings, documentation, and providing patient education on diabetic foot care and medication adherence. This site is located in the Southeast region of NC. Providers in this primary clinic are inspired to ensure routine foot assessment to identify high-risk patients and offer early intervention to stop or postpone the progression of DFUs. Even though there are guidelines and standards of care for diabetic patients, diabetic foot screening is often overlooked due to the patients' complexity and time constraints during the routine office visit to address this problem ([REDACTED] personal communication, April 12, 2021). The site has not followed the standardized practices or guidelines for the providers to perform diabetic foot screenings ([REDACTED] personal communication, April 12, 2021).

Problem Statement

Diabetes has become a major epidemic in NC, and it threatens its residents' health and well-being. North Carolina is considered the 10th highest state with obese adults in America and has the 13th highest occurrence of diabetes in the nation (Young & Potru, 2011). The American

Diabetic Association (2019) recommends yearly comprehensive foot examinations and risk assessments to all diabetic patients to prevent diabetic foot ulcers. At present, the project site does not have standardized screening and assessment protocols or documentation for diabetic patients with foot complications. Instead, this site uses a paper chart, and there is no identified area to document a diabetic foot assessment. There are no guidelines for health care providers to perform diabetes foot screenings at each visit.

Purpose Statement

The DNP project included implementing provider and staff education to incorporate a “Three-Minute Diabetic Foot Screening” for all diabetic patients in a primary care setting at every visit to increase the diabetic foot screening practices. The three-minute diabetic foot examination includes a one-minute history of identifying high-risk patients, a one-minute examination of what to look for, and a one-minute patient education (Miller et al., 2014). The primary outcome for this project was implementing this screening tool to assess diabetic patients at every visit to reduce diabetic foot ulcers and promote better patient outcomes. The compliance with screening and documentation was analyzed during the project and at the end of the project to determine if any changes in the process were needed, as well as the rate of any patients with foot ulcers or other complications ([REDACTED] personal communication, April 25, 2021).

Section II. Evidence

Literature Review

A literature review was conducted utilizing the databases of Cumulative Index of Nursing and Allied Health Literature (CINAHL) and PubMed. Google Scholar and Ovid online are other search tools that were helpful to sort the relevant and most recent articles (Appendix A). The MeSH terms used in PubMed include diabetes, diabetic foot, foot care, education, and prevention. The filters applied for this search were full text, clinical trial, meta-analysis, systemic review, written in the English language, and articles published in the last five years. This search revealed 19 results. After reading the full texts, eleven research articles were chosen for review as they were directly related to diabetic foot care and education in primary care settings. Eight articles were excluded because they were not pertinent to the primary care settings used in hospitals. The MeSH keywords were also used in other database searches. The search terms were altered to obtain the most relevant articles pertaining to this project in CINAHL. The words diabetic AND “foot assessment” AND “education” were combined with expanding the search results. The Boolean/phrase search modes were chosen, full text, the English language, and the articles published from 2016 to 2020 were the limiters. This search yielded a result of seven articles. After reading the full text, two articles directly related to the project were chosen. One article was duplicated, and one article was the same as in PubMed. The duplication was avoided by including it only once.

Search strategy maps were used to figure the search process, display the keywords, and record the number of studies used or discarded after review (Appendix A). Including PubMed (n=11), CINAHL (n=2), Google scholar (n=3), and Ovid online (n=3), 19 studies/articles were carefully chosen to be included in the literature review for this project (Appendix A).

Information was gathered from websites including the American Diabetic Association (ADA) and the International Working Group on the Diabetic Foot (IWGDF). In addition to that, policies, procedures, and guidelines at the practice site were reviewed. The Evidence-Based Medicine Pyramid was used to determine the level of evidence, and three articles with lower than level IV evidence (two scoping reviews and one opinion) were also eliminated (Appendix B). Currently, there are no guidelines in place at the project site for diabetic foot assessment and management. Annual foot screening was not done for all diabetic patients, and there was no documentation of diabetic foot screening.

Current State of Knowledge

Diabetic patients are at increased risk of developing diabetic foot ulcers (DFUs). Hence, routine foot screening and education should be performed regularly to prevent future diabetic foot ulcer development or recurrence (Allen et al., 2016; American Diabetic Association, 2019; Monteiro-Soares et al., 2021; Persaud et al., 2018; Rastogi et al., 2020; Sibbald et al., 2019). The Healthy Foot Screen is an easy-to-use, rapid, clinical tool developed to evaluate foot health by facilitating primary care provider acknowledgment and treatment of the most common foot problems (Persaud et al., 2018). Diabetic peripheral neuropathy is the most common and bothersome complication of diabetes, with over half of the patients diagnosed with diabetes projected to develop neuropathy later. Diabetic foot complications such as ulcers, infections, callus, osteomyelitis, and Charcot's foot can go unnoticed by patients and caregivers due to diabetic peripheral neuropathy (Persaud et al., 2018). Ghavami et al. (2018) evaluated the effects of lifestyle interventions on the severity of diabetic neuropathy in diabetes type 2 patients using randomized control trials. The results showed that lifestyle interventions could reduce the severity of diabetic peripheral neuropathy and consequently decrease neuropathic pain (Ghavami

et al., 2018). A systematic review of nine articles conducted by O’Keeffe & Moore (2020) showed promising results that skin temperature monitoring devices such as thermographic cameras, liquid crystal thermography, and infrared thermometers could be utilized as an adjunctive diagnostic tool to track the course of diabetic foot complications and start early interventions. Researchers created a validated 60-second General Foot Screen tool consisting of 10 screening items to assess foot health on 120 patients; reported 74.17% had at least one positive anomaly, and only 25.83% of patients had low-risk feet. The authors reported indications of early recognition and treatment of common foot problems and permit effective inhibition and quality care (Sibbald et al., 2019).

Multiple studies have demonstrated that patient education and involvement in care leads to improved foot care and fewer complications because the patients are more knowledgeable about their foot health and more likely to follow the provider’s advice (Ahmad Sharoni et al., 2018; Coppola et al., 2018; Eroglu & Sabuncu, 2021; Makiling & Smart, 2020; Monteiro-Soares et al., 2021; Nguyen et al., 2019; Siegel et al., 2020; Silva et al., 2020; van Netten et al., 2020). The studies primarily included randomized control trials (RCT) and cohort studies on patient education and foot care management. The patients included in all these studies were all adults diagnosed with diabetes. The FOOtCAre trial II study was a single-blind, two-parallel-arm RCT where subjects were provided intervention and an educational booklet with guidelines to promote foot–ankle exercises as a self-management behavior in patients with diabetic peripheral neuropathy. The patients were able to preserve achieved results after the intervention through continued dedication to their plan of care (Silva et al., 2020). The systematic review of 122 articles from 1985 to 2017 was conducted by Siegel et al. (2020) to evaluate the potential value of cost-effective interventions to manage diabetes and its complications to encourage providers

to prioritize interventions and utilize health care resources. The RCT study of a self-efficacy enhancing program recommends augmenting foot self-care behavior for elderly diabetic patients by incorporating the foot self-efficacy theory into diabetic education (Ahmad Sharoni et al., 2018). Another RCT study provided evidence that individualized patient therapeutic education in newly diagnosed type 2 diabetes decreases mortality and incidence of diabetic complications, especially the occurrence of microvascular complications, which may imply a revision of guidelines for diabetic treatment in patients (Coppola et al., 2018). Monteiro-Soares et al. (2021) found that implementing structured diabetic foot care services greatly impacted the prevention of lower extremity amputation. Self-care management and foot care interventions have strong evidence to prevent recurrent diabetic foot ulcers and lessen the burden on patients and healthcare resources (van Netten et al., 2020). The study done by Nguyen et al. (2019) provided evidence that the theory-based foot care education program significantly improved outcomes in just six months and decreased the prevalence of foot risk factors for ulceration. The combined effect of education and phone reminders revealed a significant increase in diabetes self-management and self-efficacy in patients with type 2 diabetes (Eroglu & Sabuncu, 2021). A cohort study conducted by Makiling & Start used visual descriptors and clinical demonstrations to every patient and their family to support them in understanding information provided in the lectures and discussions (Makiling & Smart, 2020).

Several studies found that continuing education for providers increased risk identification and detection of active foot disease through foot assessments. Guttormsen et al. (2020) found that teaching non-specialist practitioners about various foot examinations and providing a structured, evidence-based management plan resulted in improved knowledge and confidence in all foot examinations. Participants in a quasi-experimental and mixed-methods study

demonstrated substantial improvements in diabetes knowledge, skills, and clinical practice that meet the current needs of primary care providers based on a six-month training program about diabetes-related competencies (Lim et al., 2020). Charlton et al. (2017) implemented a simple foot-screening tool with staff training, with an increased number of completed foot assessments post-intervention.

Current Approaches to Solving Population Problem(s)

The project lead found no existing protocol for routine diabetic foot screening at the project site. A guideline for foot assessment should be in place at the project site to ensure patients are adequately screened, educated, and documented. According to Ahmad Sharoni et al. (2016), health education programs improve foot self-care practice and foot problems in older adults. The results showed that individualized care plans, multidisciplinary collaboration, and the development and implementation of a scientific assessment tool for diabetic foot assessment could determine patients' long-term goal of foot self-care. Healthy Foot Screen is a screening tool that may encourage early management of foot conditions to promote better patient outcomes with proper referrals and the best use of resources. The foot screen may help to identify people with undiagnosed or undertreated diabetes by screening for common nail and foot deformities (Persaud et al., 2018). Implementing the validated 60-second General Foot Screen may support the early identification and management of foot problems. This tool will allow for early diagnosis and appropriate referrals as needed resulting in improved patient outcomes (Sibbald et al., 2019).

Evidence to Support the Intervention

The American Diabetic Association (2019) recommends yearly foot examination for all diabetic patients and more frequent screening for patients with high risk for diabetic foot ulcers.

The comprehensive annual examination includes detailed health history, risk assessment stratification, visual inspection of lower extremities, lower extremity pulse assessment, and a sensory check (American Diabetic Association, 2019). The International Working Group on the Diabetic Foot (IWGDF) recommends that a foot examination be carried out to identify whether a patient is at risk of developing ulceration (Bus et al., 2020). The practice recommendations are foot screening at every visit for all patients with suspected or confirmed cases of diabetes and rapid risk stratification. The other recommendation is implementing a risk-based referral system with a specialist's care (Miller et al., 2014). A systematic review and meta-analysis of RCTs revealed that the lack of a standardized assessment tool made it difficult to establish the effects of education alone in improving foot care knowledge and self-care practices to prevent/reduce diabetic foot ulcer and amputation rates (Adiewere et al., 2018). Persaud et al. (2018) recommend that for all diabetic patients, the health care provider complete the use of an easy and rapid clinical tool, "Simplified 60-second screen," to identify the person at high risk for a foot ulcer and potential amputation. The International Working Group on the Diabetic Foot (Bus et al., 2020) states the key elements to prevent amputation include identifying the high-risk foot, regularly inspecting, and examining the high-risk foot, educating the health care providers, patients, and family, appropriate footwear, and treating risk factors for ulcers.

Evidence-Based Practice strongly recommends that consistent delivery of foot care services and preventive care can significantly reduce amputations among diabetic populations (Miller et al., 2014). The American Diabetes Task Force created the Comprehensive Foot Examination and Risk Assessment (Boulton et al., 2008, Miller et al., 2014). The Comprehensive Foot Examination is comprised of a detailed health history, which includes a history of diabetic peripheral neuropathy, peripheral artery disease, foot deformity, previous history of foot ulcers

or amputation, poor glycemic control, and smoking history (Boulton et al., 2008, Miller et al., 2014).

Even though the practice guidelines exist, data show that only 12-25% of diabetic feet are evaluated in the primary care settings (Miller et al., 2014). According to the literature, the most significant barriers to conducting routine foot exams as part of the regular office visits for diabetic patients are lack of time, lack of specialized equipment (Weinstein monofilament, vibratory threshold device, and tuning fork), and lack of training for providers and staff (Miller et al., 2014). The three-minute diabetic foot examination consists of three components of assessment: a one-minute history, a one-minute foot exam, and a one-minute education (Miller et al., 2014). A three-minute foot examination is less complicated; a range of healthcare professionals can use it. It takes less time than the Comprehensive Foot Exam and eliminates common barriers to assess the patient at each visit.

The International Working Group on the Diabetic Foot recommends risk stratification to identify patients at risk for developing foot ulcers, groups them into five categories, and recommends screening frequency for each category (Bus et al., 2020). Diabetic patients in category 0 (very low risk) require annual foot screening and referral within 1-3 months. Patients in category 2 (moderate risk) require foot screening every 2-3 months and referral within 1-3 weeks. In category 3 (high risk), patients are required to have foot screening every 1-2 months and immediate or next available referral. In category 4 (very high risk), these patients need immediate referral/consultation with a specialist and follow-up as suggested by the specialist (Bus et al., 2020).

Completing a patient history in one minute can help the provider to recognize the patient's risk for diabetic foot complications sensation (Miller et al., 2014). According to Miller

et al. (2014), a one-minute physical examination includes careful examination of the feet at every office visit, performed in all patients with confirmed cases of diabetes or suspected diabetes. The Ipswich Touch Test (IpTT) is a fast and dependable test used for a neurological exam (Miller et al., 2014). Any health care professional can perform this test to identify patients at risk for diabetic foot complications without any special equipment (Miller et al., 2014).

The last step in the three-minute diabetic foot exam is patient education. Patient education improves patient's knowledge and self-care behaviors. Lack of knowledge and understanding about self-care for diabetes is a common obstacle to prevention. Lack of appropriate foot care education constitutes 90% of recurrent diabetic foot ulcers (El-Nahas et al., 2008; Miller et al., 2014). After completing a three-minute foot exam, providers should generate a treatment, follow-up, and referral plan depending on the risk stratification and referral based on ADA guidelines (Miller et al., 2014).

Evidence-Based Practice Framework

The operational framework for this project was Plan-Do-Study-ACT (PDSA). The PDSA uses a four-step process and spiral learning approach, and the success of this framework is the continuum in spiral learning and improvement (The W. Edwards Deming Institute, 2019). Dr. Deming modified the PDSA cycle from 1950 to 1993 (Moen & Norman, 2010). The cycle begins with the Plan step to identify a purpose, formulate the theory, define the success metrics, and put the plan into action. As related to the project, the purpose was to perform the three-minute diabetic foot exams on 80% of diabetic patients seen in a primary care setting at every visit. The next step was the Do step, in which the components of the plans were implemented. In the second step, providers and staff were educated on the three-minute foot exam. The plan was implemented with routine foot exams for all diabetic patients and encouraged providers to

perform the exam on all diabetic patients at each visit. Next came the study step, collecting data and monitoring outcomes evaluating for success or problems and areas needing improvement. The outcomes were measured based on the three-minute foot assessment, foot complications, documentation, how frequently the foot exams were conducted in each visit, and how often the patients were referred to multi-specialists for diabetic foot complications. The last step was the Act step, which closed the cycle, integrating the learning produced by the entire process. The project was discussed with key stakeholders and evaluated as to whether the project site would continue the application and sustainability.

Ethical Consideration & Protection of Human Subjects

The Doctor of Nursing Practice (DNP) project was a quality improvement project designed to implement an educational intervention using diabetic foot screening tool to promote a routine three-minute diabetic foot screening at every visit in a primary care clinic. The project leader explained the benefits of the project to all providers at the project site. The educational intervention helped to educate and prepare providers and staff at the primary care clinic to implement the proposed quality improvement project and promote quality and safety in the clinical setting. It was not expected to cause any harm to any providers involved as the intervention suggested based upon current evidence and poses no risk to the patients. Pre and post chart audits were completed with no identifying patient and provider information collected. The project leader was prepared to identify ethical considerations regarding project implementation by completing the University Collaborative Institutional Training Initiative (CITI) modules. The project site does not have a formal Institutional Review Board (IRB) process in place. The University IRB process was completed with submission of Self Certification Quality/IRB Qualtrics survey to evaluate whether the project was classified as

quality improvement (QI) or research. From the review, the project was deemed as quality improvement and required no further IRB review.

Section III. Project Design

Project Site and Population

The project site was a primary care clinic in southeastern NC, which provides long-term and comprehensive medical care to all age groups, including services to children, adults, gerontology, obstetrics, and gynecology. The practice site specializes in allergy and internal medicine. The organization's mission is to improve health conditions and reduce health disparities by delivering diversified primary care, specialty care, and social services to patients across the lifespan (██████████ personal communication, May 26th, 2021). This primary care center renders care to diabetic patients daily. Providers in the facility are responsible for routine diabetic foot screening, patient education on diabetic foot care, risk stratification, initiating interventions and referrals. The practice site's director identified the need to implement an intervention to ensure routine diabetic foot assessment, to identify high-risk patients, and offer early intervention to stop or postpone the progression of diabetic foot ulcers.

The project leader conducted a Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis, with strengths identified as an empowered director, the project site champion's directions, strong support from the management and providers, and active involvement of ancillary staff (Appendix C). The weakness of the project site included the lack of an electronic health record system, shortage of staff, lack of diabetic foot care knowledge, the unwillingness of providers/staff, and time constraints. The opportunities recognized were the availability of evidence-based literature to support the effectiveness of three-minute routine diabetic foot screening and referrals. Some threats identified included the current COVID-19 pandemic situation, which required social distancing and avoiding mass gathering for educational interventions.

Description of the Setting

The project site serves patients local to the area. This practice accepts patients of all age groups, diverse cultures, socio-economic statuses, and acute and chronic diseases. Providers at the site are multilingual and speak English, Spanish, Swahili, Hindi, and Arabic. Most of the patients are Middle Eastern, and many of them speak only Arabic. Patients travel far to come to this facility, as they feel comfortable and confident in receiving care from this site because many employees and providers speak Arabic and Spanish. In this primary care site, providers accept most insurance, and approximately 80% of those patients are covered by Medicare and Medicaid (██████████ personal communication, May 26th, 2021).

Description of the Population

The healthcare team consists of one physician, the facility director, three nurse practitioners (NPs), one registered nurse (RN), one office manager, eight medical assistance (MAs), one lab technician, and one certified nursing assistant (CNA). The population and stakeholders of this project are the primary care providers (PCPs), RN, MAs, CNA, the office manager, the lab technician, and diagnosed diabetic patients 18 years and older. In addition, the PCPs serve as preceptors for NP students from different universities regularly.

Project Team

The project team consisted of three members. The Doctor of Nursing Practice (DNP) student served as the leader of the project. The project leader analyzed and synthesized the research related to the subject, developed an educational intervention plan for the providers, and created an assessment screening tool for the project. The project leader evaluated the process and disseminated the findings. The second team member was the site champion, the primary care center medical director. The site champion provided space and time to conduct the educational

intervention, guidance, and support the project. The third person on the project team was the faculty member from the University College of Nursing. The faculty member was the project coach and mentor for the project and provided mentorship throughout the project's extent.

Project Goals and Outcome Measures

The project goal was to educate providers and staff at the project site on a routine three-minute diabetic foot assessment. This assessment was provided to all diabetic patients 18 years and above at each visit. The process included standardized documentation, diabetic foot education, early intervention, and referral to multi-specialized care. The project leader conducted an educational intervention to empower providers to follow Miller et al.'s (2014) three-minute diabetic foot exam protocol and developed an assessment screening tool. The project leader conducted a post-educational survey to assess the knowledge attainment of the participants from the educational intervention. The PDSA cycle framework was implemented to execute the DNP project in practice (The W. Edwards Deming Institute, 2019). (See Appendix D).

Description of the Methods and Measurement

This project was a quality improvement initiative intended to increase the percentage of a routine three-minute diabetic foot exam performed on diagnosed diabetic patients aged 18 and older in a primary care setting. This project aimed to implement a routine three-minute diabetic foot exam, identify patients at risk for developing diabetic foot ulcers and implement early intervention and referral for specialized care. Data collections included pre-intervention and post-intervention data on the total number of comprehensive diabetic foot exams, education, referrals, documentation, and a staff post-intervention survey.

Pre-intervention data was collected prior to the educational intervention. A retrospective chart audit was conducted on four weeks of data regarding the total number of comprehensive foot exams and documentation completed for people with diabetes. After the pre-intervention data collection, the project leader met with providers and other healthcare workers for an informal conversation. This meeting was to identify barriers, such as lack of communication between providers and staff, the reason for not performing comprehensive foot exams, lack of knowledge, and inaccurate documentation. The project leader gave a PowerPoint presentation on a three-minute diabetic foot examination and introduced the 3-minute diabetic foot screening tool to the primary care providers (PCPs), a nurse manager, RNs, medical assistants (MAs), and the CNA with the implementation of the project started on August 30th, 2021. Areas discussed were the current barriers and facilitators in conducting comprehensive foot screening and barriers preventing proper documentation and introducing the new screening tool, "a three-minute diabetic foot exam."

Tools developed for this project included the pre-and post-intervention chart audit tracking tool, a three-minute diabetic foot screening tool, a PowerPoint presentation for educating providers and other health care professionals, and a post-education survey. The pre-and post-chart audit tools were used to collect data for analysis before and after implementing an evidence-based three-minute foot exam. The PowerPoint outlines the objectives, incidence of diabetic foot ulcers, the significance of the routine diabetic foot exam, the screening tool, and how to perform a "three-minute diabetic foot exam."

The three-minute diabetic foot examination consists of three components of assessment one-minute history, one-minute foot exam, and one-minute education (Miller et al., 2014). Completing patient history takes only one minute; the health care provider should ask about the

history of diabetes, duration, previous history of diabetic foot ulcers, lower extremity amputations/surgery, and smoking. History should also include burning or tingling in legs or feet, leg or foot pain, changes in skin color or lesions, and loss of lower extremity sensation (Miller et al., 2014). One-minute physical examination involves a visual inspection of the legs, feet, toes, and between toes where the lesions may go unnoticed. The inspection includes observing skin color, ulceration, fissure, calluses, corns foot deformities, ROM of the joints, and hot, red, or inflamed midfoot. The vascular exam includes observing hair distribution on the lower extremities, the temperature difference between the left and right foot, and palpable pulses on the dorsalis pedis and posterior tibial artery (Miller et al., 2014). During the Ipswich Touch Test, while the provider places his finger on each of the patient's first, third, fifth toes for 1-2 seconds, the provider asks the patient to close his/her eyes and coach the patient to respond with "yes" when they feel the touch (Miller et al., 2014). The final step in the three-minute diabetic foot exam is patient education.

Discussion of the Data Collection Process

Paper charting was used for documentation at the project site. Data was collected from pre-and post-intervention chart reviews. Patient identifying information such as name or date of birth was not collected. Demographic data such as patient's initials, date of an office visit, gender, age, duration of diabetes, and ethnicity were collected using the screening tool. Data for outcome measures included three-minute foot exam documentation, patient education, educational handouts, identifying foot complications, early intervention and medication compliance, the patient at risk for developing diabetic foot ulcers, and referral for further follow-up. All data were stored on a password-protected computer in a locked office. Only the project leader and site champion had access to the data spreadsheet.

Implementation Plan

The PDSA cycle was used to execute the proposed DNP project. The project site has a low incidence of foot screenings and documentation, and there was no consistency in assessing the diabetic foot unless the patients complained of foot problems. The project leader analyzed and synthesized research data on a three-minute diabetic foot exam and developed an intervention plan.

The pre-intervention data were collected using four weeks of retrospective chart auditing to identify the total number of comprehensive foot exams and documentation completed for patients diagnosed with diabetes. The provider's educational intervention goal was to help providers and staff to understand the significance of routine diabetic foot screening, the three-minute diabetic foot screening tool, compliance with documentation, early intervention, and referral. The project leader developed a three-minute diabetic foot screening tool (Appendix E). The screening tool consists of one minute for history, one minute for the exam, and one minute for education. The medical assistants were instructed to separate the diabetic patient's charts from other charts by using a color-coded sticker with the diagnostic coding and placing the three-minute screening tool in every diabetic patient's charts. In addition, educational handouts and signs of a clock with "three-minute foot exam" stickers were placed in every room as a friendly reminder for the providers and other healthcare professionals. Moreover, instructions were provided to all diabetic patients to remove their socks and shoes while waiting for the provider, which was a visual clue. They reminded the providers and other healthcare professionals to perform the three-minute diabetic foot screening.

The provider was instructed to educate the patient on the significance of self-care behavior and give educational handouts on taking care of their feet. Patient education improves

patients' knowledge and self-care behaviors. Lack of knowledge and understanding about self-care for diabetes was a common obstacle to prevention.

After the educational intervention, a post-educational survey was given to evaluate the effect of the educational intervention and provider satisfaction (Appendix F). The outcomes of the proposed DNP project were evaluated by conducting weekly prospective chart audits for twelve weeks. A weekly chart audit of all diabetic patients aged 18 and older attending the clinic was conducted to track the project's progress. Data collected included the number of diabetic patients, the number of documented foot exams, complications, risk identification, health education, handouts given to patients, early intervention, and referrals. The project leader contacted the providers and other healthcare professionals weekly to identify any barriers and need for further education and clarification.

Timeline

The planning for the project occurred in the summer of 2021. Project implementation occurred over twelve weeks in the Fall of 2021. Provider and staff education was provided in August. The post-intervention data collection occurred weekly to evaluate the project's outcomes over twelve weeks following the educational intervention. A post-educational survey was conducted one week after the educational intervention. Meetings with the site champion and faculty were held biweekly to update the project's progress and obtain further suggestions for improvement. In November, data was analyzed, and a volunteer for sustainability was identified; a written report and dissemination of findings will be completed in May 2022 (Appendix K).

Section IV. Results and Findings

The primary outcome of this quality improvement project was implementing provider and staff education to incorporate a "three-minute diabetic foot screening" for all diabetic patients in a primary care setting. The pre-intervention data collected over four weeks prior to implementation revealed no foot screening was performed or documented. The educational intervention's original goal was to introduce the new screening tool to the site and achieve an 80% compliance in a routine diabetic foot screening in twelve weeks. Over the twelve weeks, 450 diabetic patients were seen, with only 204 (45.3%) patients receiving diabetic foot screenings. There were 204 diabetic patients ranging in age from 18-85 years with a diagnosis of diabetes. Of the 204, 38% (78) were males and 62% (126) females. Out of 204 patients, 50% (102) of patients were Middle Eastern, 24% (49) were African American, and 18% (37) were Hispanic. Out of 450 patients, the number of foot exams performed documented was 198 (44%), the foot health education provided documented was 196 (43.5%), and the educational handouts provided to the patients documented were 189 (42%). The number of complications identified, and referrals made to other specialties were 29 (6%) and 7 (1.5%) out of 450 patients, respectively (Appendix I).

The outcomes data included the number of diabetic foot screenings performed in the project site for twelve weeks. The data was measured by counting the number and percentages of the foot screening performed, patient education and educational handouts provided to patients, foot complications identified, and referrals to appropriate specialties. Of the 204 patients who were screened, 29 (14.2%) patients were identified with foot complications, which included ten patients with burning and tingling, eight with foot deformities, five patients who had a fungal infection, two patients identified with previous foot ulcers/ amputations, two patients had open

wound/ulcer, one patient with a loss of protective sensation, and one patient had Charcot neuropathy. Though 29 patients were identified with foot complications, only seven (24.1%) patients out of the 29 were referred to other specialties, and the other 22 (75.9%) patients were managed at the project site. Tracking the data helped to understand the progress, barriers, changes needed, and success of the process in the project evaluation.

A post-educational questionnaire was conducted to learn if the educational intervention was effective. The post-educational intervention questionnaire measured staff motivation, knowledge, and confidence regarding diabetic foot screening, patient education, identifying risk assessment, and referrals (Appendix F). Twenty-two employees worked at the project site and participated in the education session. After the education session, all participants answered the knowledge question correctly. Of the 22 participants, 4.5% (1) were physicians, 13.5% (3) were nurse practitioners, 4.5% (1) were nurses, 36% (8) were medical assistants, 4.5% (1) were laboratory technician, 4.5% (1) were office manager, 4.5% (1) were CNAs, and 28% (6) were NP students (Appendix G).

Discussion of Major Findings

The educational intervention was effective. The educational intervention and introduction of the new three-minute diabetic foot screening tool (Appendix E) helped increase the participants' motivation, awareness, and confidence. The pre-intervention data collected over four weeks prior to implementation revealed no foot screening performed or documented. The initial analysis revealed the project was going smoothly, and the results were promising. The educational intervention was effective, and the number of foot assessments, patient education, and referrals increased as the project progressed. However, at the end of the fifth week, the

project leader observed the percentage of foot screening had drastically dropped and recognized an immediate need for further action.

The project leader identified barriers associated with the decline in diabetic foot screening by discussing with the providers. The non-compliance in foot assessment was due to forgetfulness, provider turnover, acute shortage of staff, lack of knowledge of the three-minute diabetic foot screening tool, new employees, the large volume of patients, and lack of staff motivation. In discussions with the providers, new staff, and students, the project leader identified the need for further education. The project leader met with the site champion and investigated possibilities for improving the rate of diabetic foot screening. Various options were considered and discussed with the site champion to overcome these barriers, such as spending more time with the providers and staff through frequent site visits. The project leader reeducated the team, which increased their confidence and willingness to participate. The color-coded stickers were placed outside of the diabetic patient's chart, making the chart easy to locate. Wall posters stating "three-minute diabetic foot screening" were placed throughout the office to serve as visual triggers for the providers, staff, and patients.

The project leader introduced new visual prompts and cues, the screening tool, and patient education handouts placed at the patient's room's prime locations for easy access. In addition, friendly reminders, morning text messages, incentives, thank you cards, and motivational talks helped improve diabetic foot screening. The post-intervention data for weeks six through twelve indicated ongoing compliance in diabetic foot screenings. To conclude, the compliance of diabetic foot screening was more promising than initially expected. Over the twelve-week, there was an increase in compliance as depicted in Appendix I.

Section V. Interpretation and Implications

Costs and Resource Management

The project involved a great amount of time, money, effort, and the project leader spent approximately 10-12 hours per week over twelve weeks. The estimated total cost associated with implementing the project was \$969.13. The project supplies and printing costs, such as the screening tool, patient education handouts, writing tool, file rack, paper files, and clipboards, were estimated \$355.63 (Appendix L). A lunch and learn format were also utilized for the educational intervention and conducted in the staff breakroom. The educational expense was \$559.51, including snacks, coffee, thank you cards, and gift cards. The prices for the visual reminders, such as wall posters and stickers, were \$53.99. The project leader provided two educational sessions for participants to attend, lasting approximately 30 minutes. Providers and nursing staff invested time in screening and patient education. The office staff kept track of diabetic patient charts and placed stickers for easy identification and access, and the billing section billed for foot examinations.

Resource Management

More than the financial expenses, the organization spent resources such as the provider's and staff's time, contributing to the project's success resulting in positive outcomes. Despite their busy schedules, providers and RNs invested their time screening diabetic patients, educating patients on diabetic foot care management, risk stratification, referring patients to podiatry and other specialties, and documenting in patients' charts. The site champion met with the project leader every week for at least 15 minutes to discuss the progress, limitations, alternatives, and other necessary changes needed to improve the project and patient outcomes, which totaled six

hours. The team described above invested a considerable amount of time in the effective implementation and continuity of the project.

Approximately 22 hours and 12 minutes were associated with project implementation. There were 450 diabetic patients seen during the implementation time. The front desk staff separated the diabetic patients' charts and placed a color-coded sticker for easy identification. The office staff spent approximately one minute on each chart, which accounted for seven hours and thirty minutes. Office staff spent approximately twenty minutes weekly with data collection, totaling four hours. Nursing staff and providers invested an average of three minutes with 204 patients for screening and education, which accounted for ten hours and twelve minutes. The project leader trained the staff volunteer at the project site and dedicated thirty minutes of training. A staff volunteer is responsible for the project continuation, data collection, quarterly education, and feedback.

Routine diabetic foot screening practices could decrease the morbidity and mortality rate of diabetic patients, decrease hospitalization/hospital stay, reduce individual costs, and increase patient satisfaction. The cost associated with diabetic foot screening is \$50-95. The average annual expenditure on diabetic foot care in the US is \$8659 per patient (Raghav et al., 2017). The indirect expenses can contribute to productivity loss, family costs, and loss of quality of life. The costs of lower limb amputations range between \$16,488 and \$66,215. The minor lower limb amputations' costs were \$43,800, while the major lower limb amputations' costs were \$66,215 (Raghav et al., 2017). Other expenses included rehabilitation medicine, nursing homes, and internal medicine. Studies clearly state that preventing diabetic foot ulcers and lower limb amputations may be the most effective way to reduce the high cost (Raghav et al., 2017).

Implications of the Findings

Implications for Patients

Diabetic foot ulcers and other foot complications secondary to diabetes are prevalent, complicated, and expensive, increasing mortality and morbidity. Unfortunately, many patients are unaware of lower limb complications, their consequences and what to look for, and self-care management of diabetic foot. Additionally, patients with a loss of protective sensation cannot identify the injury to their feet, which leads to tissue damage and diabetic foot ulcers.

Implementing the three-minute diabetic foot screening in primary care settings could identify more diabetic foot complications/ulcers than the annual comprehensive foot exam, decreasing costs to the patients, families, and the facility. Early identification of diabetic foot complications/ulcers means easy and less aggressive treatment and better patient outcomes. Routine foot screening and risk stratification of patients will be easy to perform with a three-minute diabetic foot screening tool without extensive screening training.

Consistently empowering diabetic patients with foot care knowledge can lead to optimal patient outcomes, improved quality of life, and reduced hospital admissions, foot complications, and amputations. Patient education on diabetic foot care management and patient engagement in their foot care would prevent diabetic foot complications and improve patient outcomes.

Providing basic education to the patients and families for early identification of foot complications will reduce the incidence of diabetic foot complications and prevent foot ulcers. Patient engagement in self-care management of diabetic foot, the importance of regular foot examination by a health care provider and assessing self-care ability to perform foot care would improve patient outcomes.

Implications for Nursing Practice

Primary prevention, safety, and quality improvement are the essential elements of nursing practice. The implementation of the foot screening practices ensures injury prevention, patient safety, and patient education to prevent complications and improve the quality of life. The educational intervention and screening tool used for this quality improvement project promotes foot screening practices, therefore, supporting the nursing values by educating the patient, family, and caregivers on preventing diabetic foot complications, leading to loss of limbs and death.

Interprofessional collaboration and communications might help to improve the identification of high-risk patients, early treatment, referrals to specialty care, long-term care, and improved patient outcomes. By implementing this project, nurses can lead the change with the interprofessional team to improve patient care and outcomes by developing educational interventions through evidence-based practices and encouraging the continuity of care among the team. Nursing leadership may be inclined to ensure nurses are well-prepared by offering training opportunities that will positively impact the quality of diabetic foot care education provided at the outpatient primary clinic.

Impact for Healthcare System(s)

The project leader identified the gaps in practice and facilitated the project site to develop and implement the new screening tool for a routine diabetic foot screening. The educational intervention was intended to meet the organization's needs to positively impact diabetic patients and their health outcomes in the community. The diabetic foot screening and educational program are transferable to other clinical settings and, therefore, can improve the diabetic foot-care management and health care services at different organizations in the community.

When the providers are diligent with routine foot screenings, diabetic foot education, and referral to podiatry in primary care, it improves patient outcomes. It reduces the cost to individuals, families, and the health care system. The average yearly cost of a diabetic foot ulcer per patient is \$8659. The total medical expenditure for the management of diabetic foot in the United States ranges from \$9 to \$13 billion, in addition to the cost for the management of diabetes alone (Raghav et al., 2017). The project had a positive impact on relieving the financial burden of diabetic patients, families, the community, and the health care system through early detection of foot complications with frequent foot screening at every visit and daily foot care management at home by the diabetic patients. Early detection of foot complications supports early treatment options, delays the progression of the foot injury or ulcer, and decreases the incidence of hospital admissions for extensive ulcer treatment or lower limb amputations.

The Agency for Healthcare Research and Quality (AHRQ) evidence-based Care Transformation Support (ACTS) quadruple aims are improved clinician and patient experience, lower the cost, and better outcomes (Agency for Healthcare Research and Quality, n.d.). Providing education improves patient satisfaction and patient experience. Educating the clinician on a routine diabetic foot screening could improve provider experience, early detection of risk factors and diabetic foot complications, early intervention, and referral according to the risk stratification. Early identification of high-risk patients and treating them could reduce the diabetic foot complications and diabetic foot ulcers and amputations, which lower the cost for the patient and health care system and provide better patient outcomes.

Sustainability

Sustainability at the site was an integral part of the project. Continuing education helps to keep the consistency and sustainability of the project. A project volunteer was selected to be

responsible for conducting the quarterly audit for a routine three-minute foot screening and patient education. The project volunteer and six DNP students were educated on how to conduct the chart audit and report the quarterly audit, which will provide consistency and feedback on the diabetic foot screening. The project leader provided the PowerPoint presentation to the staff volunteer for use in educating new providers and staff and reeducation as needed.

The primary care providers will continue to be responsible for screening, documentation, and referral. The site champion will be in charge of the overall project and has committed to providing extra time for the providers and staff to perform routine foot screening and education. The site champion will incorporate the three-minute screening tool and patient education materials into the standard of care at the site. The organization will provide resources, including printers, to continue diabetic screening.

Dissemination Plan

An abstract was submitted for a podium presentation during the nurses' week celebration at the Indian American Nurses Association of North Carolina (IANA-NC) chapter. The project leader chose the IANA-NC chapter for the presentation because the nurses belong to the Asian community, with a high incidence of diabetes. It is an educational opportunity for the nurses, and they can provide education on self-care management to diabetic patients. The event is scheduled for May 14th, 2022. The project results were presented to the College of Nursing on April 5th and at the project site on April 8th. The final paper was also submitted online to the University Scholarly Repository for public access.

Plans are underway to present the project at the Veteran Affairs (VA) Primary Care settings and the diabetic clinic. Before presenting, the project leader plans to present to the Hospital Practice Council for approval. The Council meetings are conducted every Wednesday

of the month, and the project leader plans to present in May 2022. After this presentation, the project leader will present it to VA primary care clinic and the diabetic clinic. Another effective way to disseminate the results of this project is through poster presentation in a community seminar. The poster presentation will be helpful to share the relevant concepts and results of the project with the targeting audience like NPS, PAs, RNs, and nursing students. It can be used as a visual tool to support the presentation. Lastly, the DNP QI project can be disseminated with an abstract or manuscript submission to a professional journal such as the Journal of the American Association of Nurse Practitioners (JAANP).

Section VI. Conclusion

Limitations and Facilitators

Numerous limitations and facilitators were identified during the project, including the COVID-19 pandemic, shortage of staff, a large volume of patients, chart audit, and a short time frame for the project. The clinic transitioned to virtual telehealth appointments during the pandemic, and services were rendered utilizing a telehealth platform. When the clinic reopened, many patients elected to stay with virtual meetings. The number of telehealth patients varies from six to ten per day. Diabetic foot screening was not done for telehealth patients since they were seen virtually. These diabetic patients were not included in the data collection. Another limitation was the shortage of providers and staff, making the implementation process difficult. As a result, many diabetic patients were not screened, educated, or screening documented. A large volume of outpatients and frequent walk-ins keep the clinic busy. The time constraints with each patient affected the diabetic foot screening process and patient education. Other project barriers included incomplete charts due to lack of staff motivation, staff resistance to accepting new changes, lack of staff knowledge and competency, and lack of communication among providers and staff. The project leader instructed the providers and staff to keep the diabetic patient's chart separately for chart auditing. The diabetic patients' charts were color-coded for this purpose. However, most of the time, the diabetic patient's chart got mixed with other charts. The project site does not use an electronic medical record; therefore, chart auditing was difficult and time-consuming due to the paper charting. Lastly, a twelve weeks' time frame for the project was a short period. Due to the short time frame, the data collected may not accurately determine the project's success. Monitoring the project over one year would have provided more precise

data on providers' compliance with foot screening, documentation, patient education, and referral to podiatry.

The support and encouragement from the site champion and other stakeholders were facilitators. During the fifth week of the implementation, foot assessments had dropped drastically. The project leader informed the site champion, and the site champion took the lead on the screening initiative. The site champion mandated diabetic foot screening education and patient education for all providers and staff. The project leader was asked to reeducate the team and evaluate their diabetic foot assessment and patient education competency. All diabetic patients were asked to remove their shoes and socks while waiting for the provider, which prompted the providers to assess the feet in one minute, making foot examinations easier. Other facilitators were the motivated staff, staff volunteers, and NP students, who helped the smooth flow of diabetic foot screening and data collection.

Recommendations for Others

The project leader recommended quarterly education of providers and staff and selecting a dedicated team for the project's sustainability. The project leader would recommend focusing more on patient education in the patient waiting room. Uploading the educational materials on the project site's website and visual cues on the waiting area TV screens would make education materials readily available for all patients and their families. Listening to the education on self-care management of diabetic foot multiple times increases awareness of patients and families, which will be an additional resource for the patient.

The project leader printed the educational materials in English and Spanish, improving patient understanding, better patient outcomes, and increased patient satisfaction. Language barriers have adversely affected health care in numerous ways, including access to care, quality

of care, medical errors, and challenges to comprehend, preventing effective communication and reducing patient satisfaction. It is also recommended that printed educational materials be provided in different languages. Printed educational materials in different languages could help bridge the language barrier. Additionally, patient education materials should be integrated into the patient portal in different languages.

Using technology such as videoconferencing and zoom meetings on diabetic foot self-care management would also improve patient awareness and provide better outcomes. Utilizing technology for online classes, zoom meetings, and virtual foot assessment would also improve diabetic foot care assessment, identify high-risk patients, and manage foot care complications. Another recommendation was to implement the electronic medical record (EMR), incorporate the diabetic foot screening tool into the EMR assessment, and incorporate an alert system or an automatic referral based on diabetic foot screening.

Implementing the three-minute diabetic foot screening tool in another primary care will be an outstanding achievement for project sustainability in the community. Providers in other clinics can adopt this project and utilize the same tool or make necessary changes depending on their clinical site needs. Each site must have a dedicated champion and staff to support the project's continuity.

Recommendations Further Study

The project's outcome indicates that implementing a routine three-minute diabetic foot screening tool and patient education in a primary care setting impacts primary care providers' regular diabetic foot screening practices. In addition to the diabetic foot screening, the providers offer diabetic foot education and written educational materials to the patient, which increases the self-care management of diabetic patients and reduces the incidence of diabetic foot ulcers.

Moreover, the screening tool prompts providers to document patient education as they complete the foot exam and standardize documentation practices of diabetic foot care screening and education documentation practices.

The recommendation for future projects is to implement the new diabetic foot screening tool in more primary care settings and with more providers. Letting other primary care providers use this routine screening tool in their primary care settings would increase the reliability of the screening tool. The higher numbers would also support retaining the diabetic foot screening tool. Diabetic foot ulcers increase individual and healthcare costs. Implementing the three-minute diabetic foot screening in primary care settings could identify more diabetic foot complications/ulcers than the annual comprehensive foot exam, decreasing costs to patients, families, and the facility. Early identification of diabetic foot complications/ulcers means easy and less aggressive treatment, better patient outcomes, and lesser costs. Routine foot screening and risk stratification of diabetic patients will be easy to perform with a three-minute diabetic foot screening tool without extensive training. Another recommendation is to have a standardized guideline or protocol for a routine diabetic foot screening and patient self-care education to ensure patients are adequately taken care of and providers follow the guidelines. An additional recommendation for further study on patient engagement in self-care management of diabetic foot care is to do follow-ups after the initial diabetic foot screening using a Mobile Phone App such as MyFootCare. The Mobile app shows promising features to engage people in diabetic foot ulcer self-care.

The American Diabetic Association recommends annual foot exams for all diabetic patients and more frequent screening for patients with a high risk for diabetic foot ulcers (ADA, 2019). The last recommendation is to continue this project for a year. An extended time frame

would provide a more precise result of the providers' compliance with the three-minute foot screening tool and patient education. Extending the time frame for the diabetic foot screening project to a year would allow patients with complications identified and referred patients with diabetic foot ulcers to be tracked during their treatment. This would help decide if the new screening tool and patient education reduced the incidence or severity of foot problems.

Final Thoughts

While the project leader was doing the first clinical rotation, it was observed that annual diabetic foot screenings were not performed at the project site. After a few inquiries with the providers, the explanation was due to the time constraints, large patient volume, and acute staff shortage. Evidence-based articles for diabetic foot screening showed that the “three-minute diabetic foot screening tool” is helpful for routine diabetic screening at every visit. The project leader discussed the new screening tool with the facility director. The director requested that the project leader conduct a quality improvement project on diabetic foot screening routinely at every visit. The project leader prepared the PowerPoint presentation, discussed it with the site champion, and implemented the educational intervention for providers, staff, and NP students. The project leader demonstrated how to perform a foot screening assessment during the education section and described the screening tool. The project leader conducted a four-week retrospective chart audit to identify the data available before the educational intervention. Weekly chart audits were conducted over 12 weeks to evaluate the progress of the diabetic foot screening after the post-educational intervention. After the twelve weeks of project implementation of 450 diabetic patients, 204 (45.3%) patients were screened, 29 (6%) patients were identified with diabetic foot complications, and seven (1.7%) patients were referred to podiatry and vascular surgery.

The QI project focused on educating the health care providers and diabetic patients regarding the importance of increasing the frequency of diabetic foot screening to prevent or lessen foot complications that frequently lead to lower limb amputations. The new screening tool and patient education reduced the incidence and severity of complications such as diabetic foot ulcers and amputations. Regular staff education, frequent foot screening, diabetic foot education at every visit, precise documentation, early diagnosis and treatment, and referral to a specialist will improve the outcomes of diabetic patients at a primary care clinic.

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Appendix A
Literature Search

PubMed

Key word used: diabetes, diabetic foot, foot care, education, and prevention

Filters: Full text, clinical Trial, Meta-Analysis, systemic Review, English, and articles from 2016-2021

Search Results

19 articles

Inclusion & Exclusion criteria

After reading the full text, eleven articles (n=11) were chosen for review as they were directly related to the project. Seven articles were excluded because they were not pertinent to primary care and education. One article was excluded due to lack of access to full text.

CINAHL

Keywords: Diabetic AND “foot assessment” AND education

Filters: Boolean/Phrase, Full text, English language, Articles from 2016-2020

Search Results

7 articles

Inclusion & Exclusion criteria

After reading the full text of three articles directly related to the project was chosen (n=2). One article was duplicated, one was the same as in PubMed. Articles that had less than level 4 evidence were excluded.

OVID

Total Articles = 3

Google Scholar

Total articles = 3

PubMed =11 articles
CINAHL = 2 articles
Ovid = 3 articles
Google scholar = 3 articles
Total articles = 19

Appendix B

Literature Matrix

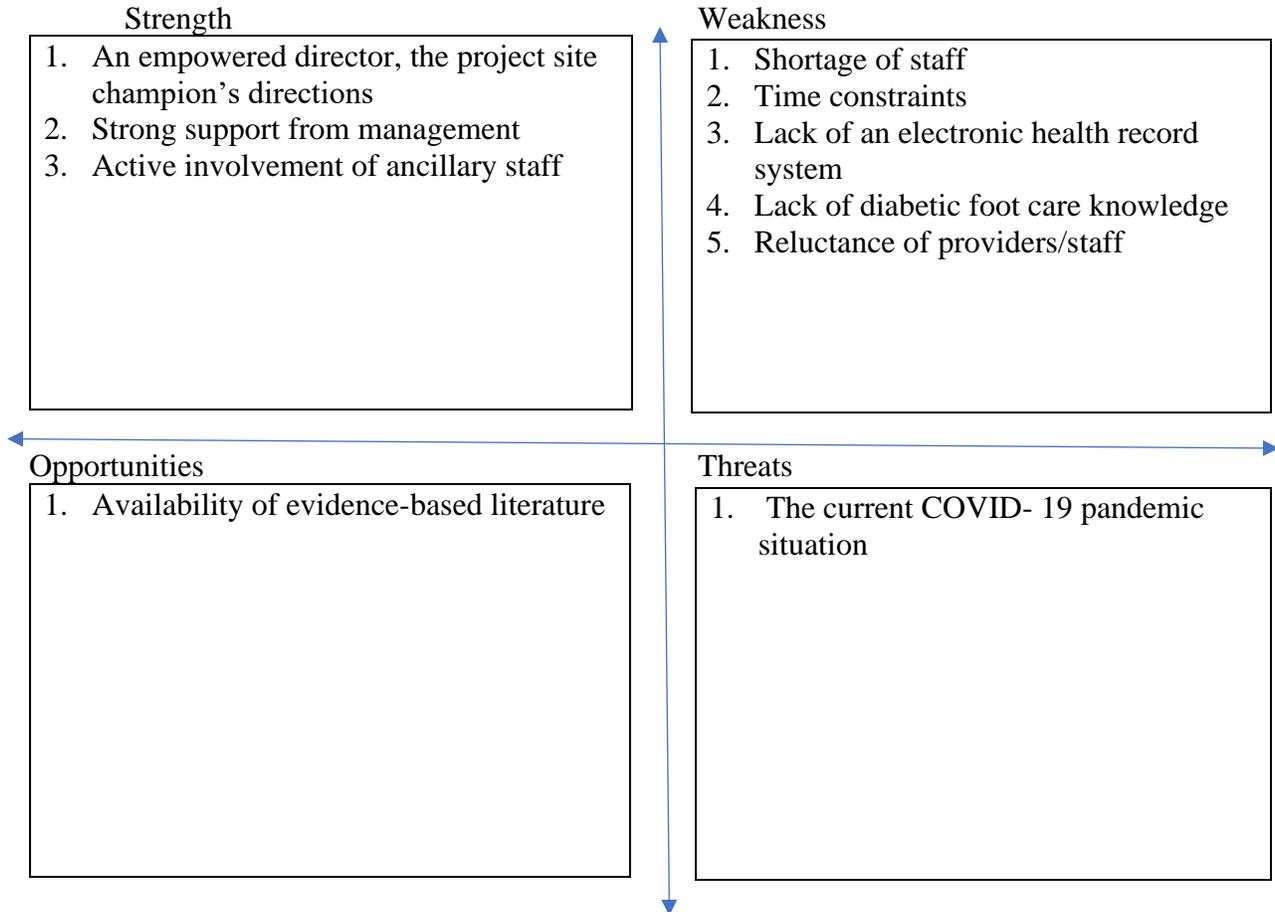
Authors	Year of publication	Title	Level of Evidence	Summary
Adiewere, P., Gillis, R. B., Imran Jiwani, S., Meal, A., Shaw, I., & Adams, G. G.	2018	A systematic review and meta-analysis of patient education in preventing and reducing the incidence or recurrence of adult diabetes foot ulcers (DFU)	I	Intensive patient educational interventions can help reduce the incidence of diabetic foot ulcers. However, the lack of a standardized assessment tool was a common theme.
Ahmad Sharoni, S. K., Abdul Rahman, H., Minhat, H. S., Shariff-Ghazali, S., & Azman Ong, M. H.	2018	The effects of self-efficacy enhancing program on foot self-care behavior of older adults with diabetes: A randomized controlled trial in elderly care facility, peninsular Malaysia	I	Self-efficacy theory-based health education programs may improve foot self-care behaviors in older adults.
Ahmad Sharoni, S. K., Minhat, H. S., Mohd Zulkefli, N. A., & Baharom, A.	2016	Health education programs to improve foot self-care practices and foot problems among older people with diabetes: A systematic review.	I	Health education programs that utilized Individualized care plans, multidisciplinary collaboration, and the development and implementation of a scientific assessment tool for diabetic foot assessment reported improvements in long-term patient foot self-care practices.
Bus, S. A., Lavery, L. A., Monteiro-Soares, M., Rasmussen, A., Raspovic, A., Sacco, I. C. N., van Netten, J. J., International Working Group on the Diabetic Foot, & on behalf of the International Working Group on the Diabetic Foot	2020	Guidelines on the prevention of foot ulcers in persons with diabetes (IWGDF 2019 update)	I	The International Working Group on the Diabetic Foot recommends that a foot examination be carried out for risk stratification to identify patients at risk for developing foot ulcers grouped into five categories and recommend screening frequency for each category.
Charlton, R., Murchison, R., Gooday, C., & Dhatariya, K.	2017	Implementation of a new foot assessment tool for people with diabetes in hospital	II	This study assessed the implementation process of a new diabetes foot screening tool in a hospital. The results showed that there was an increased number of foot assessments being performed.
Coppola, A., Luzzi, L., Montalcini, T., Giustina, A., & Gazzaruso, C.	2018	Role of structured individual patient education in the prevention of vascular complications in newly diagnosed type 2 diabetes: The Individual therapeutic education in newly diagnosed type 2 diabetes (INTEND) randomized controlled trial	I	The objective of this study was to assess the impact of individualizing patient therapeutic education in type 2 diabetes patients. The results showed decreased mortality and incidence of diabetic complications.
Eroglu, N., & Sabuncu, N.	2021	The effect of education given to type 2 diabetic individuals on diabetes self-management and self-efficacy: Randomized controlled trial	II	Education and phone reminders play a vital role in increasing self-management and self-efficacy and decreasing metabolic values.

Guttormsen, K., Tilbury, J., Khurana, R., Huyton, D.,	2020	Application of simplified diabetic foot assessment in an acute medical unit	III	The quality improvement study investigated the effectiveness of locally delivered training relating to simplified assessment and structured management in an acute medical care clinic. The results showed that simplifying foot risk assessment and making it accessible to non-specialist medical practitioners improves the assessment after training.
Ghavami, H., Radfar, M., Soheily, S., Shamsi, S. A., & Khalkhali, H. R	2018	Effect of lifestyle interventions on diabetic peripheral neuropathy in patients with type 2 diabetes, result of a randomized clinical trial	II	Focusing on lifestyle interventions could contribute to reducing the severity of diabetic peripheral neuropathy in type 2 diabetes patients.
Lim, S. C., Mustapha, F. I., Aagaard-Hansen, J., Calopietro, M., Aris, T., & Bjerre-Christensen, U.	2020	Impact of continuing medical education for primary healthcare providers in Malaysia on diabetes knowledge, attitudes, skills and clinical practices	I	The study investigated the effect of a 6-month continuing education training program about diabetes for primary healthcare providers to diagnose and treat diabetes-related competencies.
Makiling, Meryl and Hiske Smart	2020	Patient-Centered Health Education Intervention to Empower Preventive Diabetic Foot Self-Care	I	The objective of this study was to demonstrate how actively involving patients in deciding their plan of care yields improved prevention of complications.
Monteiro-Soares, M., Vale-Lima, J., Martiniano, J., Pinheiro-Torres, S., Dias, V., & Boyko, E. J.	2021	A systematic review with meta-analysis of the impact of access and quality of diabetic foot care delivery in preventing lower extremity amputation	I	Appropriate access and quality of diabetic foot care can impact the occurrence of diabetic foot ulcers. Structured foot care delivery can drastically decrease the risk of lower extremity amputations.
Nguyen, T. P. L., Edwards, H., Do, T. N. D., & Finlayson, K	2019	Effectiveness of a theory-based foot care education program (3STEPFUN) in improving foot self-care behaviors and foot risk factors for ulceration in people with type 2 diabetes (Quasi-experimental study)	I	Evidence of improved preventative behaviors related to foot care management and decreased risk of diabetic foot ulcers after the theory-based foot care education intervention program (3STEPFUN).
O'Keeffe, S.F., Moore, Z	2020	The prevention and detection of diabetic foot complications in an at-risk patient employing novel skin temperature monitoring techniques: a systematic review	I	This study investigated how skin temperature monitoring devices such as thermographic cameras, liquid crystal thermography, and infrared thermometers could be utilized as a diagnostic tool to track DFCs and start early interventions.
Persaud, R., Coutts, P. M., Brandon, A., Verma, L., Elliott, J. A., & Sibbald, R. G.	2018	Validation of the healthy foot screen: A novel assessment tool for common clinical abnormalities	III	This study found evidence that a healthy foot screening tool that promotes early intervention tool results in better patient outcomes.
Sibbald, R. G., Maliyar, K., Persaud-Jaimangal, R., Elliott, J. A., Brandon, A., Kotru, B., & Armstrong, D. G.	2019	Validated 60-second general foot screen: A pilot trial and guide to diagnoses and treatment	IV	This pilot study indicated that a 60-second foot screen could be beneficial for early diagnosis and treatment options.
Siegel, K. R., Ali, M. K., Zhou, X., Ng, B. P., Jawanda, S., Proia, K., Zhang, X., Gregg, E. W., Albright, A. L., & Zhang, P.	2020	Cost-effectiveness of interventions to manage diabetes: Has the evidence changed since 2008? A systemic review	I	A systemic review of 122 studies were conducted over the period 1985-2017. This study evaluated the cost-effectiveness of the interventions used to manage diabetes and its complications. They found that the ADA recommendations for diabetes management interventions were the most cost-effective.

Silva, E. Q., Suda, E. Y., Santos, D. P., Veríssimo, J. L., Ferreira, J S S P, Cruvinel Júnior, R. H., Monteiro, R. L., Sartor, C. D., & Sacco, I. C. N.	2020	Effect of an educational booklet for prevention and treatment of foot musculoskeletal dysfunctions in people with diabetic neuropathy: The FOOtCAre (FOCA) trial II, a study protocol of a randomized controlled trial.	I	This study aimed to distribute an educational booklet about foot care and evaluated its effects on the clinical outcomes of patients with DPN. The booklet was found to be an effective self-management tool.
van Netten, J. J., Raspovic, A., Lavery, L. A., Monteiro-Soares, M., Rasmussen, A., Sacco, I. C. N., & Bus, S. A.	2020	Prevention of foot ulcers in the at-risk patient with diabetes: A systematic review.	I	This study investigated the effects of various interventions such as foot skin temperature measurements and therapeutic footwear to prevent foot ulcers for patients at risk for diabetic foot complications. The study found supporting evidence for the effectiveness of integrated foot care.

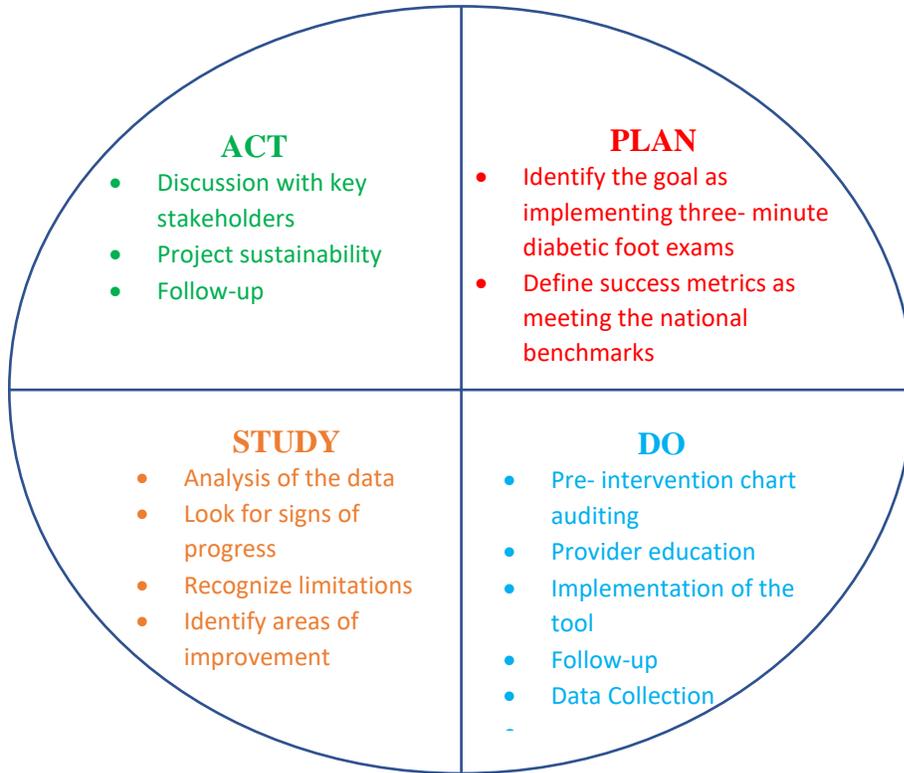
Appendix C

SWOT Analysis



Appendix D

Plan-Do-Study-Act (PDSA) Cycle



Appendix F

Post-Education Survey

Instruction: Please circle your best answer

1. I feel motivated to educate the patients and families regarding diabetes and foot care

- a. Strongly Agree
- b. Agree
- c. Neither agree nor disagree
- d. Disagree
- e. Strongly disagrees

2. I have awareness about the warning signs of diabetic foot and its complications

- a. Strongly Agree
- b. Agree
- c. Neither agree nor disagree
- d. Disagree
- e. Strongly disagrees

3. I have the confidence to examine/teach patients regarding daily foot care

- a. Strongly Agree
- b. Agree
- c. Neither agree nor disagree
- d. Disagree
- e. Strongly disagrees

4. I feel comfortable and recommend this screening tool

- a. Strongly Agree
- b. Agree
- c. Neither agree nor disagree
- d. Disagree
- e. Strongly disagrees

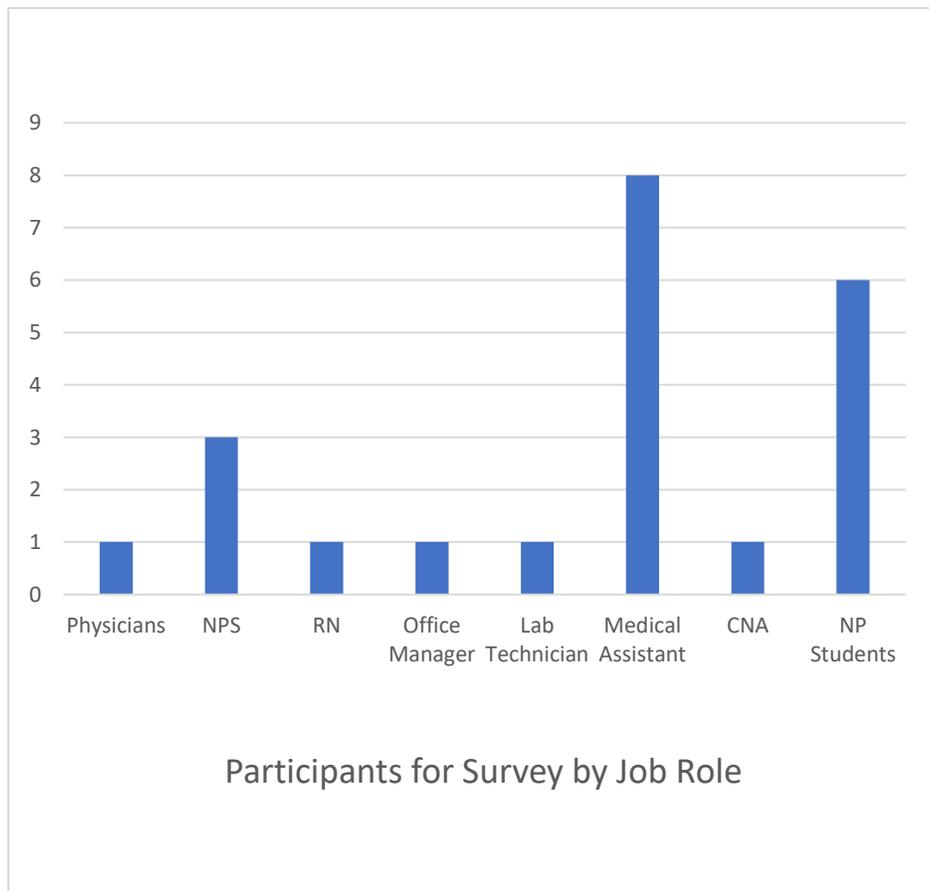
5. What are the sign and symptoms of Charcot neuroarthropathy?

- a. Hot
- b. Red
- c. Swollen foot
- d. All the above

Appendix G

Post- Education Survey Results

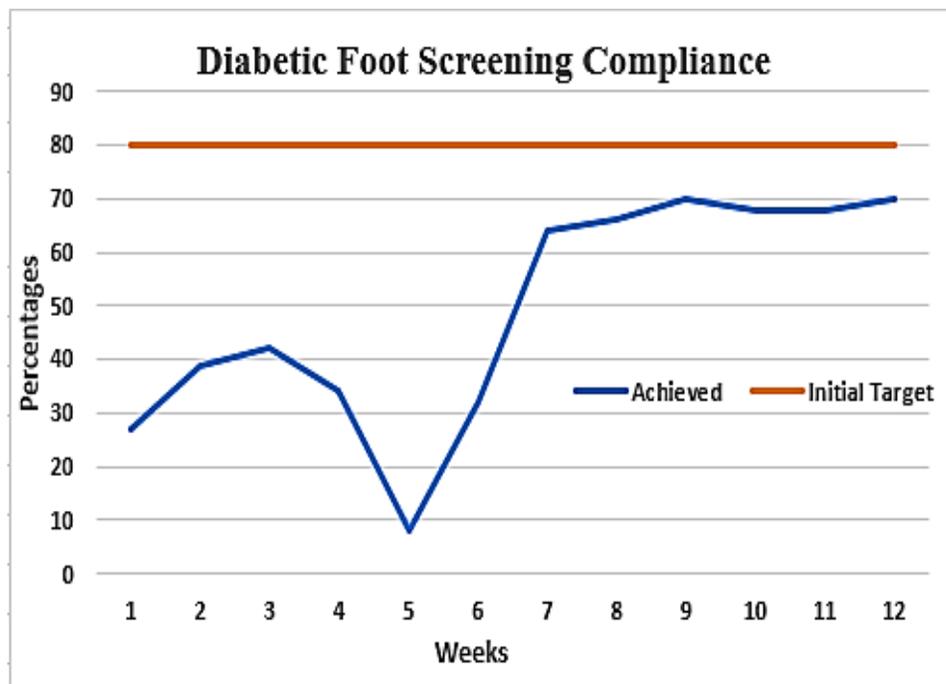
	Motivation		Awareness		Confidence		Would Recommend	
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Strongly Agree	16	72.7	18	81.8	20	90.1	18	81.8
Agree	4	18.2	2	9.1	2	9.1	1	4.5
Neutral	2	9.1	2	9.1	0		3	13.6
Disagree	0		0		0		0	
Strongly Disagree	0		0		0		0	



Appendix I

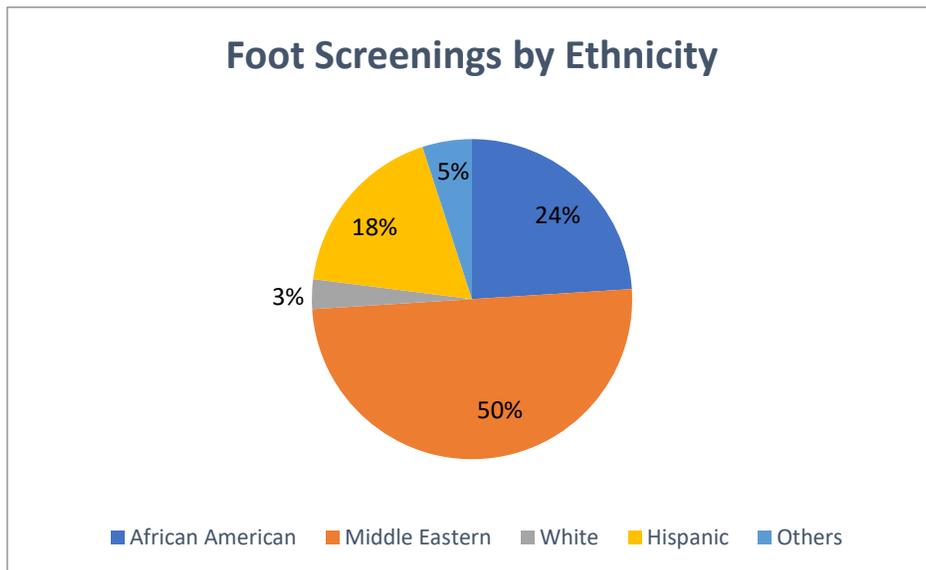
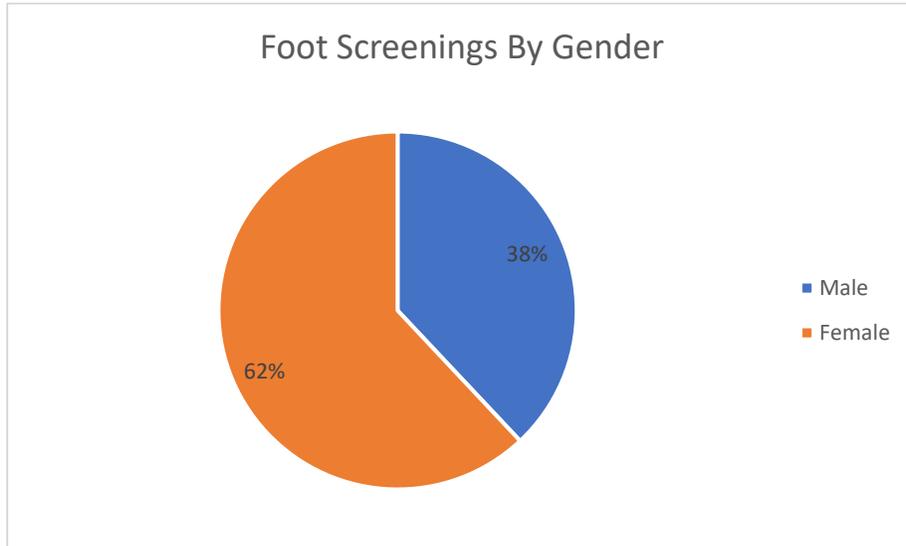
Post- Intervention Data Collection Results

Post- Intervention Data Collection Tracking Tool for twelve weeks													
Weeks	Diabetic Cases	Foot Exam Performed		Foot Exam Documented		Education Documented		Handouts Provided		Complication Documented		Referred Cases	
		N	n	%	n	%	n	%	n	%	n	%	
1	33	9	27	9	27	9	27	9	27	2	6	1	3
2	33	13	39	13	39	13	39	13	39	1	3	0	0
3	38	16	42	16	42	16	42	16	42	3	8	0	0
4	29	10	34	10	34	10	34	10	34	2	7	0	0
5	36	3	8	1	3	1	3	1	3	1	3	0	0
6	38	12	32	12	32	11	29	10	26	1	3	1	3
7	33	21	64	20	61	19	58	16	48	1	3	0	0
8	44	29	66	29	66	29	66	26	59	4	9	1	2
9	34	24	70	24	70	24	70	24	70	3	9	0	0
10	34	23	68	22	65	22	65	22	65	4	12	2	6
11	34	23	68	21	62	21	62	21	62	5	15	2	6
12	30	21	70	21	70	21	70	21	70	2	7	0	0
Total	450	204	45.3	198	44	196	43.5	189	42	29	6	7	1.5



Appendix J

Diabetic Foot Screening by Gender & Ethnicity



Appendix K

Project Timeline



Appendix L
Project Budget

Item	Quantity	Unit Cost	Total
Project Supplies			
Questionnaires (post-educational survey)	25	\$0.50	\$12.50
Educational Brochures for patient (printing cost)	200	\$1.00	\$200.00
Screening tool	100	\$0.50	\$50.00
Marker	5	\$2.49	\$12.45
Clip boards	10	\$1.49	\$14.90
Paper files	12	\$5.49	\$29.88
File rack	1	\$10.99	\$10.90
Pen	25	\$1.00	\$25.00
Educational Expenses			
Flash drive	1	\$10.99	\$10.99
High lighter	3	\$1.59	\$4.77
Lunch expenses	25	\$12.00	\$300.00
Snacks	25	\$1.25	\$31.25
Coffee	25	\$1.50	\$37.50
Thank you, cards	25	\$2.00	\$50.00
Gift cards	5	\$25.00	\$125.00
Expenses for Visual Reminders			
Wall posters laminated	10	\$5.00	\$50.00
Color-coded stickers	1-roll	\$3.99	\$3.99
Total			\$969.13

Appendix M

Doctor of Nursing Practice Essentials

	Description	Demonstration of Knowledge
Essential I <i>Scientific Underpinning for Practice</i>	<p>Competency – Analyzes and uses information to develop practice</p> <p>Competency -Integrates knowledge from humanities and science into context of nursing</p> <p>Competency -Translates research to improve practice</p> <p>Competency -Integrates research, theory, and practice to develop new approaches toward improved practice and outcomes</p>	<ul style="list-style-type: none"> • During this DNP project, the project leader investigated different databases and evidence-based national and international practice guidelines to translate the knowledge gained through research and implementing the intervention to improve practice and outcomes.
Essential II <i>Organizational & Systems Leadership for Quality Improvement & Systems Thinking</i>	<p>Competency –Develops and evaluates practice based on science and integrates policy and humanities</p> <p>Competency –Assumes and ensures accountability for quality care and patient safety</p> <p>Competency -Demonstrates critical and reflective thinking</p> <p>Competency -Advocates for improved quality, access, and cost of health care; monitors costs and budgets</p> <p>Competency -Develops and implements innovations incorporating principles of change</p> <p>Competency - Effectively communicates practice knowledge in writing and orally to improve quality</p> <p>Competency - Develops and evaluates strategies to manage ethical dilemmas in patient care and within health care delivery systems</p>	<ul style="list-style-type: none"> • During this QI project, the project leader demonstrated leadership skills by conducting meetings with stakeholders and leading the project, promoting patients’ safety, outcomes, and quality of care. • The project leader created the budget and cost analysis. • The project leader improved her communication skills to translate the knowledge to the audience through the poster presentation and academic writing. • The CITI modules and IRB process for the DNP project increased awareness and strategic planning regarding ethical dilemmas in patient care

		and healthcare delivery systems.
Essential III <i>Clinical Scholarship & Analytical Methods for Evidence-Based Practice</i>	<p>Competency - Critically analyzes literature to determine best practices</p> <p>Competency - Implements evaluation processes to measure process and patient outcomes</p> <p>Competency - Designs and implements quality improvement strategies to promote safety, efficiency, and equitable quality care for patients</p> <p>Competency - Applies knowledge to develop practice guidelines</p> <p>Competency - Uses informatics to identify, analyze, and predict best practice and patient outcomes</p> <p>Competency - Collaborate in research and disseminate findings</p>	<ul style="list-style-type: none"> • The project leader conducted a literature review and critically analyzed it, and the levels of evidence were explored before adopting the practice for implementation. • Successful implementation was conducted using the knowledge gained through evidence-based research articles. • Implementing this QI project would promote safety, efficacy, and quality of care for patients. The data collected were analyzed and predicted the best practices and patient outcomes. • The project will be disseminated to various sites through the poster presentation and publication of the academic paper to increase the awareness of the health care professionals and the public. • The current plans for dissemination include Indian American Nurses Association (IANA) during the Nurses Week Celebration and the Veteran's Affairs diabetic clinic.
Essential IV	Competency - Design/select and utilize software to analyze practice and consumer	<ul style="list-style-type: none"> • Technology such as Excel, Microsoft Word, PowerPoint,

<p>Information Systems – Technology & Patient Care Technology for the Improvement & Transformation of Health Care</p>	<p>information systems that can improve the delivery & quality of care Competency - Analyze and operationalize patient care technologies Competency - Evaluate technology regarding ethics, efficiency, and accuracy Competency - Evaluates systems of care using health information technologies</p>	<p>voiceover, and various health care software applications and databases such as CINAHL, PubMed, Ovid Online, and Google Scholar were used to plan, implement, assess, and analyze the DNP project.</p>
	<p>Description</p>	<p>Demonstration of Knowledge</p>
<p>Essential V Health Care Policy of Advocacy in Health Care</p>	<p>Competency- Analyzes health policy from the perspective of patients, nursing and other stakeholders Competency – Provides leadership in developing and implementing health policy Competency –Influences policymakers, formally and informally, in local and global settings Competency – Educates stakeholders regarding policy Competency – Advocates for nursing within the policy arena Competency- Participates in policy agendas that assist with finance, regulation, and health care delivery Competency – Advocates for equitable and ethical health care</p>	<ul style="list-style-type: none"> • The current practice guideline recommendations are foot screening at every visit for all patients with suspected or confirmed cases of diabetes and rapid risk stratification. These practice guidelines were analyzed and advised to the stakeholders involved in the DNP project. • During the educational intervention, the project leader discussed the costs and benefits of the process in terms of finances, resources, early identification, prevention, treatment, early referral, and patient outcomes and reinforced quality of care and patient education.
<p>Essential VI Interprofessional Collaboration for Improving Patient & Population</p>	<p>Competency- Uses effective collaboration and communication to develop and implement practice, policy, standards of care, and scholarship Competency – Provide leadership to interprofessional care teams</p>	<ul style="list-style-type: none"> • The project leader collaborated with the site champion, providers, and staff during this DNP project. • Further collaboration would be needed with the community leaders and

<p>Health Outcomes</p>	<p>Competency – Consult intraprofessionally and interprofessionally to develop systems of care in complex settings</p>	<p>stakeholders to disseminate the project.</p>
<p>Essential VII Clinical Prevention & Population Health for Improving the Nation’s Health</p>	<p>Competency- Integrates epidemiology, biostatistics, and data to facilitate individual and population health care delivery Competency – Synthesizes information & cultural competency to develop & use health promotion/disease prevention strategies to address gaps in care Competency – Evaluates and implements change strategies of models of health care delivery to improve quality and address diversity</p>	<ul style="list-style-type: none"> • During this DNP project, the project leader used the World Health Organization, Centers for Disease Control, the United Health Foundation, and North Carolina Diabetes Advisory Council data regarding the incidence and prevalence of diabetes, diabetic foot complications, and lower extremity foot amputations. • The Healthy People 2030 objectives and the Agency for Healthcare Research and Quality(AHRQ) quadruple aim is to reduce the lower extremity amputations and lower the cost. This data helped assess the need for improved diabetic foot screening practices, educational intervention for providers and staff, early identification of high-risk patients, early referrals, prevent lower extremity amputations, and decreased individual and healthcare costs. The information was synthesized and translated to practice to prevent diabetic foot complications, lower extremity amputations, and better patient outcomes.

		<ul style="list-style-type: none"> • The operational framework for this project was the PDSA cycle. The project leader conducted an educational intervention to improve knowledge and increase diabetic foot screening practices and patient education. • The outcomes of the intervention were measured to evaluate the effectiveness of education.
<p>Essential VIII <i>Advanced Nursing Practice</i></p>	<p>Competency- Melds diversity & cultural sensitivity to conduct a systematic assessment of health parameters in varied settings Competency – Design, implement & evaluate nursing interventions to promote quality Competency – Develop & maintain patient relationships Competency –Demonstrate advanced clinical judgment and systematic thoughts to improve patient outcomes Competency – Mentor and support fellow nurses Competency- Provide support for individuals and systems experiencing change and transitions Competency –Use systems analysis to evaluate practice efficiency, care delivery, fiscal responsibility, ethical responsibility, and quality outcomes measures</p>	<ul style="list-style-type: none"> • The DNP project designed and implemented the three-minute diabetic foot screening tool using advanced clinical judgment to improve diabetic foot screening practices at every patient visit in the primary care clinic. • This QI project provided educational intervention to providers and staff, which helped to enhance providers and staff awareness, improved diabetic foot screening practices, provided patient education, and improved patient outcomes. • The outcomes were measured and analyzed systematically. The University IRB board deemed this project a QI project and required no further IRB review. • This project made a practice change and

		<p>developed a new policy at the site. It is mandated that all new employees must undergo the educational PowerPoint presentation for diabetic screening using the three-minute diabetic foot screening tool.</p> <ul style="list-style-type: none"> • Throughout the DNP project, the project leader reeducated the providers and staff and reinforced the importance of routine foot screening and patient education to prevent diabetic foot ulcers and lower limb amputations. • All providers, staff, and patients were given equal opportunities to participate in the project. • Privacy and patient confidentiality were maintained adequately through the use of password protection of data storage.
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